Meeting Report: BBS Annual Meeting and Conference

10-11 September 2016

Jenny Rowntree reports on the 2016 Autumn Meeting held at Manchester Museum, Manchester

The 2016 meeting was held at the Manchester Museum, Manchester. Committee meetings, followed by the Council meeting were held on the afternoon and evening of the 9th. On Saturday the 10th members and invited speakers gathered at the Museum for an eclectic progamme of seven talks ranging from floristic accounts of beautiful islands, bryophyte taxonomy to restoration of heathlands by *Sphagnum* 'beads'. Some participants stayed on for the Sunday field excursion to Anglezarke Reservoir and Lead Mines at Clough near Chorley, approximately 15 miles north of Manchester. Both sites contain remnant of ancient woodland, which were enjoyed in relatively warm weather and some sunshine. The society AGM was held on the afternoon of the 10th after the paper reading programme.

The Talks Programme

Session 1: Field bryology and collections

Bryophytes of the Cyclades, Greece: the Flora of the Island of Andros. *Tom Blockeel*

Bryophyte collections at Manchester Museum. *Rachel Webster*

Session 2: Bryophyte taxonomy

Orthodontium in the UK: conservation value in a global context. *Neil Bell*

Orthotrichaceae in tropical Africa: Taxonomic work on *Macromitrium*. *Joanna Wilbraham*

Session 3: Experimental bryology

Bryophytes on remote oceanic islands - lessons from Ascension Island. *Silvia Pressel*

Overview of peatland restoration trials using micro-progagated *Sphagnum*. *Anna Keightley*

Social media and the BBS. *Louise Marsh*

Bryophytes of the Cyclades, Greece: the Flora of the Island of Andros

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A full article based on this presentation can be found in *Field Bryology* 117 (2017), p. 36.

Collections at Manchester Museum

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The herbarium at Manchester Museum (MANCH) contains approximately one million specimens. It was principally formed from three major donations from wealthy Manchester businessmen, but also incorporates research material from staff at the University of Manchester, and collections from notable botanists and local societies. The collections contain in the region of 90,000 mosses and 25,000 liverworts. The collection is worldwide in scope and includes material from Richard Spruce (via Dr B. Carrington), William Wilson, William H Pearson, Dr JB Wood and Dr Sean Edwards amongst others.

The 2003 list of type mosses at MANCH can be viewed here: https://herbologymanchester.wordpress.com/publications-and-lists/

▷Bryophyte specimens in Manchester herbarium (MANCH). R. Webster

△Fig. 1. Sandstone exposure in Roslin Gen, Midlothian, where *Orthodontium gracile* was recorded by Gordon Rothero as recently as 2000. Repeat surveys in 2011 and 2016 failed to find it, and the spots where it occurred are now occupied by *Orthodontium lineare*. N. Bell

Orthodontium in the UK: conservation value in a global context

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Orthodontium gracile is a rare species in the UK, with recent surveys suggesting a potentially catastrophic decline. Elsewhere in Europe it is probably now only found on Madeira, while it also has scattered occurrences in the Americas and in Africa. Recently I have been able to make use of David Long's collections in Edinburgh to extend its known distribution to Yunnan, India and Nepal (Ellis *et al*., in press) and it probably occurs right across the Sino-Himalaya. Although this has been controversial in the past, it seems increasingly likely from recent surveys (by the author, Gordon Rothero and others at Roslin Glen near Edinburgh and by Des Callaghan in Cheshire, 2015a, 2015b, 2015c) that a significant contributor to its recent decline in the UK is competitive exclusion from *Orthodontium lineare*. This invasive introduction from the southern hemisphere appears to have a wider ecological niche and is very hard to tell apart from *O. gracile* in the field (although Rowntree *et al*., 2010 showed that the two species are molecularly distinct). Thus the native species appears to face a type of acute threat that may be unique in the British bryophyte flora.

What does *Orthodontium gracile* represent? How distinct is it from *O. lineare* and how much would it matter in the wider scheme of things if the UK populations became extinct? Conservation assessments rarely take account of phylogenetic distinctness or biogeographic history, yet these dimensions of diversity are essential for quantifying what we have and what we stand to lose.

Orthodontium is derived from within a small family of largely southern temperate and tropical species, the Orthodontaceae, in which some genera are pleurocarpous and some acrocarpous. The earliest divergence within the large clade of around 5000 species that includes all of the true pleurocarps was between the Orthodontaceae and the rest. *Orthodontium* itself probably represents a reversal from pleurocarpy, i.e. despite being an acrocarp it probably had pleurocarpous ancestors (Coudert *at al*., 2017). Thus the genus, and the morphological and genetic diversity it contains, is a potentially invaluable source of information for understanding how pleurocarpy evolved.

Recently I conducted a phylogenetic study of *Orthodontium* world-wide in order to place the threatened UK populations of *O. gracile* in a wider evolutionary context (Bell, *in prep*.). The results reveal the existence of a predominantly Eurasian and North American clade that includes both species of the Asian genus *Orthodontopsis* (which should now be recognised in *Orthodontium*) as well as *Orthodontium gracile*, but is quite distinct from the southern temperate *O. lineare*, which naturally occurs only in Australasia, southern

South America and southern Africa. Despite their superficial similarity, it is likely that the lineages giving rise to *Orthodontium gracile* and *O. lineare* have been separated for many millions of years. Like *Orthodontopsis*, *Orthodontium gracile* likely has its centre of extant diversity in the Sino-Himalaya, with UK and North American populations being genetically almost uniform and sharing a relatively recent common ancestor, probably subsequent to the last glaciation (a hypothesis that is currently being tested with molecular dating methods). Nonetheless these populations are molecularly and to some extent morphologically distinct from the known Himalayan and African ones, and it has yet to be determined whether the form they represent still occurs elsewhere.

A further twist to the story is that in North America, where *Orthodontium gracile* occurs in California and Oregon along with the morphologically quite different *O. pellucens*, the two species appear to have undergone introgressive hybridisation, with some of the sampled specimens of *O. gracile* having chloroplast genes (but not the nuclear ITS2 region) identical to those of *O. pellucens*. There are historical collections of *Orthodontium pellucens* from southern France and northern Spain, but in Europe these two species appear to be geographically separated. This potentially increases the importance of our UK *Orthodontium gracile* populations, although raises questions about the possibility of hybridisation in the UK between *O. gracile* and *P. lineare*, despite their not particularly close relationship.

In 2002 there were apparently only five populations of *Orthontium gracile* remaining in the UK from a historical 16, in Roslin Glen (Midlothian), Bolton Abbey (Yorkshire), Alderly Edge and the Peckforton Hills (Cheshire), and the Wealden Sandrocks (East Sussex). It now appears to be extinct at Roslin (Fig. 1), while Des Callaghan found only a single small colony at Peckforton in 2015 and failed to find it elsewhere in Cheshire (Callaghan, 2015a, 2015b, 2015c). The status of the species at the other two sites is unknown. On a positive note, a single collection was made recently by Peter Martin at a new site Gloucestershire. It is possible that surveys of potential habitat elsewhere could reveal other surviving populations.

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Orthotrichaceae in sub-Saharan Africa: Taxonomic work on *Macromitrium*

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The Orthotrichaceae is a diverse family of mosses with most of the familial diversity accommodated in the genera *Orthotrichum*, *Ulota*, *Zygodon* (genera familiar to UK bryologists as cushion forming epiphytes), *Macromitrium* and *Schlotheimia*. The family can form a conspicuous element of tropical montane forests with the creeping genera *Macromitrium* and *Schlotheimia* often forming a conspicuous component of the moss flora.

Macromitrium is one of the most speciose moss genera in the world, with a pantropical distribution. *Macromitrium* attracted a large number of superfluous names during early phases of bryological exploration, largely due to the differing taxonomic concepts employed during that era. Assessing which previously described names comprise unique species concepts and confirming the correct application of names is a careful process requiring the study of original nomenclatural type material and original descriptions (protologues). A great deal of taxonomic work is still required to produce an accurate picture of bryophyte diversity in the tropics and this talk focused on recent research on *Macromitrium* in tropical Africa. Specimens collected during the *BBS Tropical Bryology Group* meetings to east African countries in the 1990s have provided an invaluable resource for this work, enabling variation across a wide range of specimens to be observed; equally essential has been a number of specimen loans from herbaria around the world.

The genus *Macromitrium* is recognised by its typically robust habit, often with a reddish brown coloration, branch leaves contorted when dry, often with the laminal cells papillose or tuberculate (though they can also be smooth) and the distinctive large mitrate calyptra.

◁ The tropical genera *Macromitrium* and *Schlotheimia* are often common epiphytes in tropical montane forests.

A thorough review of *Macromitrium* in southern Africa was carried out by van Rooy (1990) and the genus was also treated for the Flora of southern Africa (Magill & van Rooy, 1998). By comparison, until recent years, the *Macromitrium* of tropical Africa and the East African Islands have received very little taxonomic attention and the large number of superfluous names and lack of identification keys have been a serious impediment to floristic and ecological studies.

Progress has been made in these areas with taxonomic treatments of *Macromitrium* for Uganda (Wilbraham, 2008), Réunion Island (Ellis & Wilbraham, 2008; Wilbraham & Ellis, 2010) and Malawi (Wilbraham, 2015). A total of 51 names were listed under *Macromitrium* in O'Shea's *checklist of sub-Saharan Africa* (O'Shea, 2006). This number is now reduced to *c.*31 names, though this is estimated to reduce to *c.*25 as further work is required to confirm the status of all currently accepted names which have not yet been described in the literature since their publication and to resolve some taxonomically complex species groups. An updated checklist of African *Macromitrium* in planned for publication to summarise these recent changes.

▽ *Macromitirum sulcatum*; the commonest member of the genus to be found in tropical Africa.

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Bryophytes on remote oceanic islands - lessons from Ascension Island

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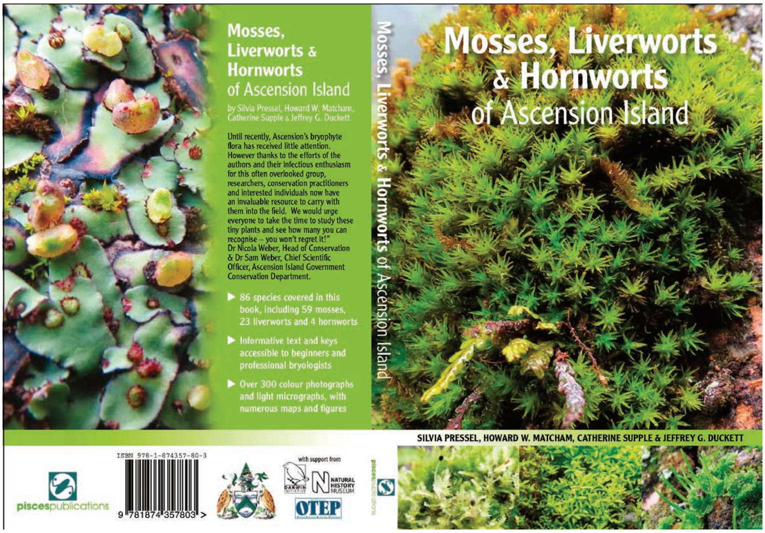
Silvia presented an update on our work on the bryophyte flora of Ascension Island (UKOT), in the South Atlantic Ocean. This follows on from the full article discussing our field work on the Island which was published in *Field Bryology* 112 (2014), p. 38. We were privileged to visit Ascension on two occasions, in 2012 and 2013, as part of a DEFRA Darwin Initiative; *Implementing a Darwin Initiative Biodiversity Action Plan for Ascension Island* and lucky to collaborate with a very helpful, enthusiastic and knowledgeable Conservation team which made our exploration of the island a major success. We are equally grateful for all the advice and specimen-sharing back in the UK from Martin Wiggington, the only other dedicated bryologist to have visited the Island prior to us in 2005, en route from completing the fieldwork for his bryophyte flora of St Helena (Wigginton, 2012), another very isolated yet beautiful island in the waters of the South Atlantic, which we had the pleasure to visit recently, in May 2017, with our Brazilian colleagues Denise Pinehiro da Costa and Diego Knop.

Our two excursions on Ascension, plus further year-round collecting by Catherine Supple, the resident botanist, resulted in an extensive collection of over 1000 specimens; so while it might have been arduous at times to reach some of the bryophytes on Ascension, e.g. the only population of *Marchantia pappeana* inconveniently confined to a precarious wet cliff face at Stetson's Ledge (Fig. 1), the real hard work was yet to begin. Back in the UK luck was yet again on our side, when we were joined in our efforts by Howard Matcham, whose expertise was to prove vital, especially when trying to identify some of the more obscure pottiaceous mosses from the Island. Also key as it turned out were the extensive BM collections - which include historic specimens from Ascension dating as far back as Hooker's gatherings in 1843, and most type specimens; one of the best natural history literature collections in the world hosted by NHM library; not to mention the much appreciated guidance from Len Ellis and Jo Wilbraham on all things calymperaceous and orthotrichaceous.

So after much work delving through new and ancient specimens, obscure literature including for example reports of early Antarctic expeditions, cross-checking with type specimens, removing dubious records of mis-catalogued taxa, or for which no specimens exist, and correcting numerous misidentifications together with wholesale sectioning of *Campylopus* leaves (one of the most speciose genera on the island), we now have a much better all-round understanding of the bryophyte flora of this young, volcanic island. So what have we learnt?

The bryophyte flora of Ascension Island comprises 86 species, four hornworts, 23 liverworts and 59 mosses, 16 of which are endemics including three shared species with St. Helena (*Physcomitrium flexifolium* - presumed extinct on St. Helena; *Hookeriopsis pallidifolia;*

▽Fig. 1. The only population of *Marchantia pappeana.*



△Fig. 2. The bryophyte flora of Ascension Island is now in press.

Cheilolejeunea ascensionis) and one with Gough Island, in the Tristan da Cunha Archipelago (*Dicranella goughii*). Thus, bryophyte endemism on Ascension is much higher than for vascular plants (seven endemics, including two flowering plants and five ferns). Sixty three of the Ascension bryophytes are found elsewhere (excluding taxa that could not be identified to species level), of which 16 species are cosmopolitan, 15 pantropical and 16 from Africa alone, with 22 species also found in Europe. All of the latter are also found on the Northern Altantic oceanic Macaronesian islands. Only three species (*Lejeunea laetevirens, Pseudosymblepharis schimperiana, Schlotheimia jamesonii*) certainly came from the Americas. Four taxa stand out for having particularly odd distributions: *Phaeoceros evanidus*, found elsewhere only in Australia (Cargill & Fuhrer, 2008); *Anastrophyllum piligerum*, an East not West African liverwort; *Dicranella goughii* a species shared with Gough Island, much further south, but not occurring on St. Helena; *Entosthodon borbonicus*, an island species found in Madagascar, Mauritius, Réunion and St Helena but apparently restricted to Rwanda in mainland Africa (O'Shea, 2006). Also striking on Ascension is the absence of weedy cosmopolitan species, such as *Bryum radiculosum*, *Ceratodon purpureus* and *Tortula muralis*, all of which do occur on St. Helena. Turning to reproductive biology, careful examination of every specimen collected by us, and others before, revealed that overall liverworts and mosses on Ascension rely on sexual reproduction considerably less than their mainland counterparts and that 25 species (29% of the Island's bryoflora) are represented by a single sex, clearly pointing to their origin from single propagules. These comprehensive biological data on the Ascension bryophytes, a first for a tropical desert island, are very much in line with two of the major tenets of Island Biogeography Theory (MacArthur & Wilson, 1967; Losos & Riclefs, 2010). All this information and much more, including discussions on bryophyte threats and conservation, can be found in our upcoming *Mosses, Liverworts & Hornworts of Ascension Island* (Pisces Publications), currently in the press and expected out in print before the end of the year (Fig. 2).

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Overview of peatland restoration trials using micro-propagated *Sphagnum*

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Sphagnum mosses perhaps occupy a unique position among bryophytes in that they bio-engineer their own environment to be wet, acidic and low-nutrient, they have few natural limits to growth in ideal conditions, and they are a major player in the carbon sequestration of peatlands and thus climate change mitigation - pristine *Sphagnum*-dominated bogs have low decomposition rates, ensuring carbon stored by plants during growth is retained. However, *Sphagnum*-dominated peatlands have been lost on a grand scale over much of the UK. Lowland peatlands have been subject to intensive drainage through urbanisation, agriculture and afforestation, and more recently through large-scale peat extraction for the horticultural industry. In the uplands, peatlands have been heavily degraded due to atmospheric pollution, intensive grazing and heather burning, leaving large areas of exposed peat which are eroded and oxidised, affecting quality in water run-off in to reservoirs, and adding to atmospheric CO_2. Large scale conservation projects, particularly on the uplands, are stymied by a lack of *Sphagnum* source material for re-introduction, necessary to repair the bog habitat and eco-hydrological function.

MicroPropagation Services Ltd have been developing techniques to bulk-up material from small amounts using tissue culture and creating products to deliver *Sphagnum* onto the restoration sites in large quantities effectively. The benefits of micro-propagation are several: it is a sterile process, so no foreign biota or weeds are introduced, there is no damage to donor sites and production is unlimited, products can be adapted to particular sites using local material, and there are many growing points in the juvenile plants leading to rapid establishment. The three products are BeadaMoss® – tiny fragments protected in a soft gel ‘bead’ which are easy to spread in volume, but slower to grow because of immaturity; BeadaGel™ – larger strands of material (1-10mm) in a unique hydrocolloid gel medium which sticks the *Sphagnum* to the peat surface and carries some nutrient which supports establishment; BeadaHumok™ – BeadaGel™ grown on to create a ‘plug plant’ for an instant result and faster coverage. All products contain a range of *Sphagnum* species so that each can find its optimum niche on the varied topography of restoration sites. These products have been applied to extensive areas of the Pennines after peat-stabilisation, and small lowland sites, and success depends largely on a high, stable water table and supporting vegetation cover. A paper outlining results of wide-ranging trials, showing the influence of site characteristics and management, is due to be submitted to the journal ‘Mires and Peat’ shortly (Caporn *et al.*).

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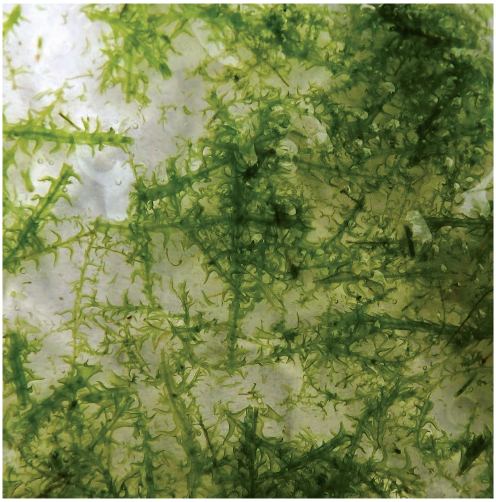

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The restoration process to establish *Sphagnum* mosses to peatlands has implications for greenhouse gas (GHG) emissions, in that plants needed to 'nurse' *Sphagnum* through the early stages of development against the drying effects of wind and sunshine (such as *Eriophorum angustifolium* common cottongrass) can emit large amounts of methane (CH_4), a more potent GHG than CO_2. However, on the degraded bogs studied, re-wetting and re-vegetating the sites had benefits for sequestering carbon which far outweigh the amount of CH_4 emitted, so we hope that more can be done to aid conservation efforts to repair our peatlands, restore their *Sphagnum* moss cover and improve the diversity and extent of this fascinating bryophyte in the UK.

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