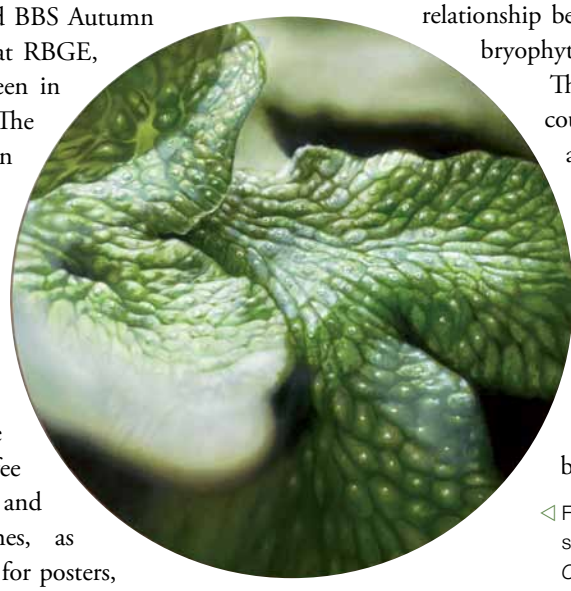
BBS Autumn meeting 2023: BBS Centenary AGM and RBG Edinburgh Bryology Conference

Neil Bell summarises the varied programme at this celebratory meeting

The Royal Botanic Garden Edinburgh (RBGE) had the privilege of hosting the BBS AGM in the centenary year of the society on Saturday 9 September 2023, as part of the RBGE Bryology 2023 Conference. The Council Meeting was held at 5 pm on Friday 8 September and a field trip to Alva Glen in Clackmannanshire followed on Sunday 10 September.

This was the third BBS Autumn meeting to be held at RBGE, the others having been in 2002 and 2014. The lecture theatre in the RBGE science buildings provided an ideal venue for the talks on the Saturday, with the adjacent conference room offering ample space for chatting over coffee break refreshments and lunchtime sandwiches, as well as display space for posters, bryologically inspired art and highlights from the BBS centenary photography competition. Everyone at RBGE involved with facilitating the meeting is warmly thanked, especially the estates staff responsible for keeping the building open at the weekend and Prof. Pete Hollingsworth, Director of Science, who introduced the session on Saturday morning with a welcome from the gardens stressing the importance of the synergetic relationship between the society and bryophyte science at RBGE.

There was an impressive count of 52 BBS attendees at the session on Saturday, in addition to a small uncounted contingent of RBGE staff and students. Those arriving on Friday were treated to a tour of the RBGE bryophyte herbarium



◁ Figure 1. Inês-Hermione's spectacular oil painting of *Conocephalum conicum*.

△ Figure 2. Attendees at the meeting at RBGE, 9 September 2023.

by David Long, while a display of *Sphagnum* related literature and photographs could be viewed in the library foyer display cabinets. Particularly spectacular was a display of paintings in the conference room by Inês-Hermione, a local artist and the creative force behind a bryophyte and lichen trail at Dundee Botanic Garden. Inês' work showcases the intricate beauty of mosses and liverworts at a hyper-realistic scale, helping to bridge the gap between how most people see bryophytes and how we as bryologists see them (Fig. 1). Many members went on to attend a highly enjoyable conference dinner in the evening at The Raeburn Hotel in Stockbridge.

9 September: talks and AGM

We had twelve talks in total, four of which were grouped together under a 'bryophyte research at RBGE' theme. The keynote presentation by Isabel Draper from the Universidad Autónoma de Madrid was hastily rescheduled for the final slot as Isabel's flight was unexpectedly delayed. Fortunately, she was rushed from the airport to RBGE by taxi just in time to deliver a remarkably unflustered talk! Subjects ranged from bryophyte distributions, taxonomy and phylogeny through databases and keys, to bryophyte symbioses and functional morphology. Most attendees made an appearance for the group photograph after lunch, immediately before the afternoon session (Fig. 2).

Hamlyn Jones gave the first talk of the day, **Challenges in developing multi-access keys for mosses**. After the initial challenges setting up Lyn's Apple Mac to be able to give live demonstrations of the software during the talk, we heard about the ongoing development of this potentially invaluable project, which uses the FSC's Identikit toolkit to facilitate moss ID from character states supplied by the user (see Jones, 2024).

Wouter Van Landuyt from the Belgian Research Institute for Nature and Forest then presented his talk **Changes in bryophyte distribution in Flanders during the last 40**

years. Reporting on a project that formed the basis of a recent article published in *Journal of Bryology* (Van Landuyt & Van Calster, 2022), Wouter told us how changing air quality, climate change and other factors have affected the distribution of bryophyte species in the highly urbanised, intensively farmed region of Flanders. This was based on records from the "Werkgroep Bryology", the Flemish bryological society, compiled since 1978.

Rory Hodd then told us about Ireland's very special oceanic moss and liverwort flora in **An exploration of Ireland's disjunct bryophyte flora**. Comparing Ireland's temperate rainforests to others Rory has seen himself in New Zealand and the Western Ghats, we heard about species such as *Lejeunea hibernica*, found only in Ireland and Macaronesia, as well as dramatically disjunct species of other oceanic habitats such as S*capania nimbosa*, found in Ireland, Scotland, south-west Norway and across the Sino-Himalaya. He discussed how these disjunctions may have come about, and how the picture may be different for fertile species and others that are not known to be fertile in Britain and Ireland.

Jeff Duckett wrapped up the morning session with a talk by himself, **Silvia Pressel** and **Harold Schickler** entitled **Never mind molecular biology: basic morphology provides the key to understanding stomatal function in bryophytes**. We heard that in angiosperms, stomata open and close by a mechanism mediated by potassium pumps in response to a range of environmental factors. The discovery of a multitude of stomatal genes common to vascular plants and bryophytes, including liverworts, has led to the notion of the acquisition of stomatal function early in land plant evolution. However, measurements of stomatal apertures in thousands of hornworts and mosses show these to be completely unresponsive to external cues, which, together with absence of potassium pumps, leads to the conclusion that bryophyte stomata are primarily involved in sporophyte desiccation and spore discharge, not the regulation of gaseous exchange.

Following lunch and the group photograph, **Des Callaghan** presented our one pre-recorded talk, on ***Sphagnum balticum* in Britain**. Des was at some altitude over the Atlantic at the time, somewhat constraining his ability to give an in-person presentation. This was our second talk of the day based on an article recently published in *Journal of Bryology* (Callaghan *et al*., 2023) and described fieldwork and molecular analysis of material from all sites from which *S. balticum* had been recorded recently in Britain. The results showed that the species has been over-recorded, in part due to confusion with forms of *S. cuspidatum* and *S. fallax*, and actually occurs at only three sites in Britain.

Silvia Pressel's talk entitled **Symbiotic fungi in liverworts and hornworts: where are we in 2023?** was delivered by the co-author **Jeff Duckett**, speaking for the second time during the conference and on this occasion on behalf of Silvia, who was unable to attend. Cytological studies in the last 20 years have revealed the widespread occurrence of symbiotic fungi in liverworts and hornworts, mirroring vascular plant mycorrhizas, but their absence in mosses. Extensive molecular studies subsequently showed that endophytes ranged from Glomeromycotina and Mucoromycotina in thalloid liverworts and hornworts, basidiomycetes in Aneuraceae and the Lophoziaceae and rhizoidal ascomycetes in the Schistochilaceae, Lepidoziaceae and Cephaloziaceae. From *in vitro* and physiological studies we now know that the liverwort fungi transfer nitrogen and phosphorus to their hosts and that the different endophytes respond differently to environmental changes,

particularly elevated CO_2. The ubiquitous cyanobacteria in hornworts provide their hosts with nitrogen, but the role of the fungi in the association remains unknown. Research is now focusing on bryophyte microbiomes and their roles in ecosystem functioning and productivity.

Mark Hill delivered a joint talk with **Chris Preston**: **Fifty years in the making: a database of first records of British and Irish bryophytes**. This statistical journey through records of species new to Britain and Ireland over the best part of half a millennium revealed some interesting trends. New records of bryophytes were slow to get off the ground compared to vascular plants until the end of the 17th century, but increased rapidly thereafter despite being punctuated by a 'Great Trough' around 1750 and a 'Second Trough' in about 1930. The first records were from the south of England, with little activity in Scotland or Ireland until 1790.

David Bell kicked off the **Bryophyte Research at RBGE** talks with a presentation on **The Darwin Tree of Life**. This hugely ambitious initiative led by the Wellcome Sanger Institute with RBGE as a partner aims to sequence the genomes of all eukaryotic organisms in Britain and Ireland. RBGE has a particular responsibility for bryophytes within the project and David told us about progress so far, as well as the difficulties encountered in collecting and preparing material from small organisms such as mosses and liverworts for reliable whole genome sequencing.

David Chamberlain continued the RBGE talks with an entertaining and informative retrospective, **The Bryophytes of Auld Reekie**. Detailing his many surveys of bryophyte habitats in the Edinburgh area over several decades, he told us about the history of the discovery of a number of rarities, as well as some of the perils of being a bryologist in an urban area. These include the suspicions sometimes aroused by a mature gentleman taking an intense interest in the walls surrounding primary schools. I have myself occasionally been questioned by the well-to-do residents of Canonmills and Stockbridge when bryologising in the area!

I (**Neil Bell**) presented a talk entitled **What is *Adelanthus lindenbergianus* in Ireland and Scotland?** This rare representative of the Oceanic-Montane Liverwort Heath community in Scotland and Ireland is apparently disjunct between these islands and tropical America, temperate South America and sub-Saharan Africa (including South Africa, where the type originates). However, new molecular data unambiguously identifies two clades, each of which is more closely related to another species entirely. It is likely that the British, Irish and tropical American populations will need to be called *Adelanthus dugortiensis* in future, an existing name based on an Irish type. Nonetheless, finding consistent morphological characters to separate the geographically defined entities continues to be challenging.

Diego Sánchez-Ganfornina finished off the talks on bryophyte research at RBGE with a presentation on his research on the order Hypnodendrales entitled **Addressing unresolved taxonomy in Australasian dendroid mosses**. We were told how molecular phylogenetic analysis shows that the distinctive New Zealand endemic *Hypnodendron marginatum* is nested within a clade of Austral exemplars of another species, *H. vitiense*, and how the latter in turn is highly phylogeographically structured. A dated phylogeny provides clues about the evolution and geographical diversification of this species. Two distinct entities correspond to previously described subspecies and could be recognised at the species level (this being compatible with retaining *H. marginatum* as a species), although other taxonomic solutions are also feasible.

Isabel Draper provided the keynote presentation to finish off the session: **Diversity and evolutionary patterns in Orthotrichaceae: How can we unveil the true diversity of this family?** BBS members will be familiar with the revolution in Orthotrichaceous taxonomy that has taken place over the last few years, much of it coming from Isabel and her colleagues in Spain. We were treated to a thorough deconstruction showing how this has been based on rigorous 'integrative taxononomy', with methods from molecular sequencing, traditional morphology and ecology used together to arrive at robust conclusions. As well as the generic-level changes that many will be familiar with, this has led Isabel's team to describe many new species worldwide and to reconstruct ancestral character states, sometimes revealing morphological parallelisms associated with adaptation to extreme habitats.

10 September: Alva Glen

Previous field trips associated with Edinburgh-based AGMs have headed to the rich coastal habitats and igneous outcrops of East Lothian, so for a change this time we headed north, to the Ochil Hills in Clackmannanshire. Alva Glen (vc 87) is a dramatic, steep-sided wooded gorge on the southern side of the Ochils that opens out onto grazed heathland and grassland higher up (Fig. 3). The tributary cleuch of the Glenwinnel burn meets the glen at a cascade called the Spout of Craighorn (not "the Sprout of Craighorn" as it is labelled on at least one online map!), while the Smuggler's Cave, a dramatic rock formation in the valley floor, can be reached by a winding path that descends from the main route above the glen. Two paths ascend from the car park at Alva to eventually meet just before the Smuggler's Cave, one closely following the burn and the other, the Pate Road (Fig. 4), heading up the western slopes of the glen to skirt rock outcrops on the eastern side of Wee Torry hill.

In the early 19th century there were several mills along the length of the glen and the remains of dams and other old industrial structures can still be seen at various points, while in the 18th century there was a silver mine, as well as a cobalt mine. The latter reflect the partially metalliferous

▽ Figure 3. Gordon Rothero in action in the upper part of Alva Glen. *Jo Denyer*

▽ Figure 4. A bank by Pate Road covered in *Braunia* and *Hedwigia*. *Andrew Branson*

geology, with a mixture of Carboniferous and Devonian sedimentary and (mostly) igneous rocks (quartz-dolerite, andesite, basalt and volcaniclastic rocks) providing significant base enrichment. The southern edge of the Ochils is defined by a major fault (the Ochil Fault), and Alva Glen itself follows a subsidiary fault line. The glen didn't appear to have been surveyed for bryophytes in the recent past, although the Alva Glen Heritage Trust maintains lists of other species groups and was keen to obtain one for bryophytes.

A coach was arranged to take attendees from RBGE to Alva on the Sunday morning, returning in the early evening. The weather on the day was near perfect for bryologising, dry until immediately before we left to go home but with some moisture still present from previous rain. We split into three groups, one heading rapidly up the main path along the glen to focus on the higher slopes, the Smuggler's Cave (Fig. 5) and the Glenwinnel Burn in NS8898, a second taking the Pate Road to look at the outcrops on the slopes of Wee Torry, and a rather loosely defined third group concentrating on the lower, wooded part of the glen, mainly in NS8897.

The base-enriched nature of the site was immediately apparent from the abundant wefts of *Neckera complanata* and *Porella* species on the rocks (*P. platyphylla, P. cordaeana* and *P. arboris-vitae* were all recorded). Higher up, sheltered crevices hosted *Marchantia quadrata*. A notable find was *M. polymorpha* subsp. *polymorpha*, a new vc record. Other attractive plants found included *Frullania fragilifolia* (by David Long) on rocks beside the path in the upper part of the glen, *Calliergonella lindbergii*, noted in this area by David Long and by Lyn Jones and others lower down (Fig. 6), and *Nogopterium gracile*, spotted and photographed by Jo Denyer (Fig. 7).

The outcrops along the Pate Road proved

△ Figure 5. The Smuggler's Cave, Alva Glen. Rory Hodd

▽ Figure 6. *Calliergonella lindbergii* from a wooden footbridge in the lower section. *Lyn Jones*

△ Figure 7. *Nogopterium gracile* in its dramatically different wet and dry forms. *Jo Denyer*

to be particularly rich for Grimmiaceae, with Seán O'Leary and Pete Martin finding *Grimmia laevigata* (a new vc record), Pete also finding *G. lisae* (another new vc record) and Seán noting *Braunia imberbis*, a 'debracket'. As well as abundant *Hedwigia stellata*, the less common *H. ciliata* was present, although sadly not *H. striata*, for which there is an old 19th century record.

Meanwhile the upper glen group (Fig. 8) were exploring the rich gorge flora of the Glenwinnel Burn, which proved to be highly rewarding. In addition to typical species of base-rich upland gorges such as *Metzgeria conjugata* and *Tortella tortuosa*, Tom Blockeel found *Trichostomum*

▽ Figure 8. *Rhytidium rugosum* on slopes above the Glenwinnel Burn. *Jo Denyer*

△ Figure 8. The upper glen group stop for lunch. Left to right: Lyn Jones, David Bell, Chris Preston, Liz Kungu, Clare Streeter, Rory Hodd, Neil Bell, Tom Blockeel, David Long. *Jo Denyer*

littorale, a species only recently separated from *T. brachydontium* and not in the latest checklist or census catalogue. The highlight for many, however, was a small patch of *Rhytidium rugosum* spotted by Clare Streeter (née Rickerby) on the northern slopes of the burn (Fig. 9), a species recorded from a very few sites in the south of Scotland in recent decades.

In total, around 172 species were recorded from NS8897 and NS8898 taken together.

References

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