BBS Annual Meeting and Conference

7-9 September 2012

Jo Denyer reports on last year's Autumn Meeting held at the National Botanic Gardens, Dublin

Nearly 40 people attended the 2012 Autumn Meeting at the National Botanic Gardens (NBG), Dublin, Ireland. These were mainly BBS members from Ireland and the UK, but we were also pleased to welcome Heike Hofmann from the University of Zurich, Switzerland and Beáta Papp from the Hungarian Natural History Museum, Budapest. Council, Publications and Conservation Committee meetings were held on Friday evening in the herbarium at NBG. The main programme of talks was held in the NBG lecture theatre on the Saturday, with a wide range of interesting talks as listed below:

Bryophyte conservation in Ireland

Nick Hodgetts - *Rare and threatened bryophytes of Ireland*

Christina Campbell - *In situ & ex situ conservation of rare and threatened bryophyte species*

Maurice Eakin - *Bog Wars and Bryophytes - has Ireland done enough to safeguard a future for our raised bog species?*

Bryophyte ecology

Rory Hodd - *The potential response of oceanic montane bryophytes in Ireland to future climate change*

Melinda Lyons - *Petrifying bryophytes - the ecology of lime rich springs*

Jeff Bates - *Early results from the BBS Bryophyte Ecology project (BRECOG)*

Bryology in Europe

Beáta Papp - *Balkan collection in the Bryophyte Herbarium of the Hungarian Natural History Museum*

Heike Hofmann - *Bryophytes online - a new Swiss Bryophyte Flora*

Tom Blockeel - *Mountains and islands: in search of bryophytes in Greece*

There was a tour of the NBG bryophyte herbarium after lunch and the AGM was held at 4.30pm in the lecture theatre. The meeting continued after the AGM with a conversazione and was followed by dinner at a nearby restaurant.

On Sunday, 19 people attended the field excursion to Glendalough in the Wicklow Mountains National Park. This valley has a range

△Above left: Lead mine spoil, Glendalough. Jo Denyer. △Above right: Lunch in the boulder field. Katharine Duff

of interesting habitats including oak woodland, a 6th Century monastic settlement, north-facing crags and boulders, lead mine spoil, two glacial lakes and a waterfall. Despite this being one of the most well-recorded sites in Wicklow, the group recorded 52 new species to the site. The star find of the day was a fourth Irish site for the RDB species *Ditrichum plumbicola*, found by David Bell on the lead mine spoil at the head of the upper lake, in Glenealo Valley. One group spent the afternoon exploring the boulder field in Glenealo Valley and recorded many new species including *Anastrophyllum minutum, Frullania fragilifolia*, *Frullania teneriffae*, *Grimmia donniana*, *Gymnomitrion crenulatum*, *Mylia taylorii*, *Plagiochila bifaria* and *Plagiochila punctata.* At the end of the afternoon we reached some interesting crags with calcareous seepage where *Aphanolejeunea microscopica*, *Harpalejeunea molleri*, *Palustriella falcata, Hymenostylium recurvirostrum* var. *recurvirostrum* and *Neckera crispa* were added to the site list. Unfortunately we had to return to the coach before exploring this area thoroughly. However, Rory Hodd returned in early 2013 (with Philip Perrin) and found *Bartramia halleriana,* which was last recorded in Ireland in 1967 (and in Wicklow in 1804) and which had never been recorded from Glendalough. There were five New Vice County records for H20: *Racomitrium ericoides* (Peter Martin), *Conocephalum salebrosum* (David Long) and *Marsupella emarginata* var *pearsonii* (Tom Blockeel), *Bartramia halleriana* and *Trichocolea tomentella* (Rory Hodd and Philip Perrin).

I would like to thank all of the speakers; Matthew Jebb and Noeleen Smyth from the National Botanic Gardens, Dublin for all of their help in organizing the meeting; David Bell, George Smith and Katharine Duff for chairing talk sessions and all those who attended.

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RARE AND THREATENED BRYOPHYTES OF IRELAND

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Following an initial idea for a Red Data Book in the early 1990s, Neil Lockhart of the National Parks and Wildlife Department contracted David Holyoak and Nick Hodgetts to review existing records and to undertake county-by-county surveys in the Republic from 1999 until 2010. Further work was done by David in Northern Ireland.

A list of 'target species' was compiled on the basis of those taxa with 12 or fewer post-1950 records, and fieldwork concentrated on revisiting their localities and seeking out new likely localities for interesting bryophytes. The project culminated in the publication of *Rare and Threatened Bryophytes of Ireland* (Lockhart, Hodgetts & Holyoak, 2012), which was launched at Glasnevin, with high-ranking ministers from the Irish and Northern Irish administrations in attendance.

As a result of this project, many species once considered rare in Ireland are now known to be relatively frequent (e.g. *Bryum donianum, Didymodon nicholsonii, Epipterygium tozeri*), while other have been shown actually to be rare (e.g. *Leiocolea heterocolpos, Dicranodontium asperulum, Pseudocalliergon trifarium*). There are many species that are still undoubtedly overlooked (e.g. *Aneura mirabilis, Hygroamblystegium humile*), and others that were not included in the original target list but might have been with the benefit of hindsight (e.g. *Metzgeria leptoneura, Scapania subalpina*). 32 taxa have been recorded new to Ireland either as part of the survey or in recent fieldwork by others. Several species are probably genuinely extinct in Ireland (e.g. *Pterygoneurum ovatum, Tortula vahliana*). Four species have been 'rescued' from apparent extinction since the pubication of the book, demonstrating just how much work still remains to be done in Ireland.

Important habitats in Ireland include bog, fen, Atlantic heath (Mixed Hepatic Mat), Atlantic woodland/ravines, coastal grassland and dune systems, old metal mine sites and the limestone of the Dartry Mountains.

There has clearly been much overgrazing and afforestation in the uplands, while the lowlands have been affected by large-scale agricultural abandonment, undergrazing and environmentally insensitive development (e.g. 'bungalow blight' in Co. Donegal and elsewhere). However, there is still an enormous amount of interest to be found in Ireland, with bryological gems occurring in almost every part of the island.

We had many memorable experiences travelling in Ireland over the decade or so of fieldwork. We met numerous interesting people, most of whom were very friendly and helpful, though some were indifferent to our endeavours, others baffled, and a few were hostile. We encountered all types of weather, from rain so fierce that it was disorientating in the Wicklow Mountains to long sunny days in the Galtees.

It is hoped that the book resulting from this project will (a) provide a benchmark for Irish bryophytes; (b) encourage field bryology in Ireland and (c) contribute to bringing Ireland's wild heritage into deserved parity with its cultural heritage.

IN SITU AND EX SITU CONSERVATION OF RARE AND THREATENED BRYOPHYTE SPECIES IN IRELAND - A study on the genetic distinctiveness of the Irish population of the globally red listed moss *Ditrichum cornubicum*

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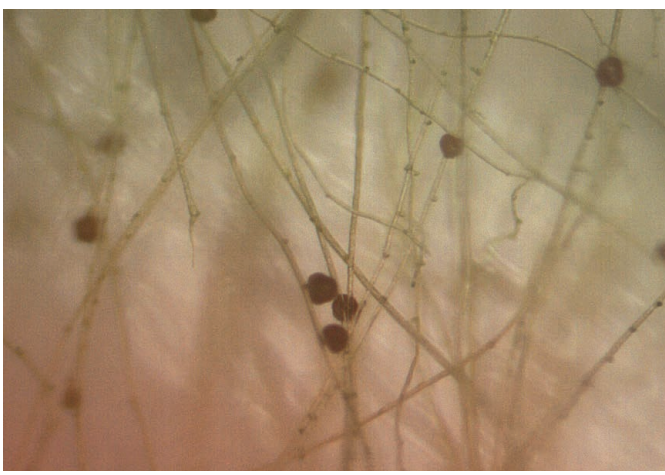
A PhD research project was carried out in Trinity College Dublin in collaboration with the National Botanic Gardens, Dublin (funded by the National Parks & Wildlife Service), which focussed on the conservation of ten rare and threatened bryophyte species in Ireland using three separate, but complementary conservation approaches to provide an integrated strategy to ensure their survival into the future. The research focussed on *in situ* conservation and monitoring, the creation of *ex situ* conservation collections and genetic fingerprinting analysis of selected species.

The talk focussed on the results of amplified fragment length polymorphism analysis (genetic fingerprinting) carried out on the globally Red Listed species *Ditrichum cornubicum*. This small acrocarpous moss is thought to reproduce solely by vegetative means as only male plants have been found. *D. cornubicum* is known only from the vicinity of disused copper mines at two sites in Cornwall and one site at Allihies Mountain Mine, Co. Cork, also a former copper mine. Two possible theories of introduction were put forward to explain its occurrence at Allihies. Firstly, there existed the possibility of accidental introduction of fragments or tubers of *D. cornubicum* from Cornwall in the 19th century when there was an influx of Cornish miners who established their own village nearby, from 1813 until 1884, while the mine was being worked. Secondly, a more recent introduction may have occurred when in 2002-2003 a Cornish stonemason company carried out repair work on the engine house at Allihies soon after working at one of the Cornish *D. cornubicum* sites. In fact, a photo exists of the stonemasons van parked at the spot where *D. cornubicum* was subsequently found. One of the conservation questions asked was whether or not the population of *D. cornubicum* in the Republic of Ireland was genetically different from the British populations and if so, how best to conserve the distinct population. Analysis revealed it does not exist as a monomorphic clone, as previously hypothesised, and a small amount of genetic variation is present, making the sole Irish population distinct from the only two other populations in Great Britain. Therefore the Irish population is highlighted as a conservation priority. The conservation of this species involves monitoring of the population,



△Above top: *Ditrichum cornubicum* in the field. C. Campbell

△Above bottom: Tubers of *Ditrichum cornubicum* growing in *in vitro* cultivation. C. Campbell

growth in *in vitro* culture and cryopreservation, the latter in collaboration with the Royal Botanic Gardens, Kew, London.

BOG WARS AND BRYOPHYTES - has Ireland done enough to safeguard a future for our raised bog species?

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Ireland's unique topography and post-glacial landscape rendered it ideal for the formation of raised bogs. The original area of raised bogs in the Republic of Ireland was c.310,000ha (Hammond, 1979) but recent estimates suggest that the remaining high bog of conservation interest accounts for c. 21,500ha (NPWS).

Since Raised Bog is an Annex I Priority Habitat within the Habitats Directive, Ireland had a special responsibility to safeguard a representative sample of the habitat type. Fifty three Special Areas of Conservation (SACs) were designated between 1997-2002 and a further seventy four were designated as Natural Heritage Areas (NHAs) in 2003. Industrial turf-cutting was banned from all designated raised bogs at the time of designation but, in recognition of the social, political and economic implications, a ten-year 'derogation' was issued allowing domestic cutting to continue on bogs with 'consent from the Minister'. This ten-year period was intended to allow turf-cutters to find alternatives (including the option of selling their turbary plots to the State) but, it also delayed any proper negotiations between the state authorities (National Parks and Wildlife Service) and the turf-cutters. Meanwhile, it has been calculated that the extent of active, peat-forming priority habitats (Active Raised Bog habitat and Bog Woodland) has declined by 36.80% (580.61ha) in the period 1995-2004/5 (Valverde *et al.*, 2006). The report also found that peat-cutting was found at 40 of the 48 sites surveyed and high-bog drainage was recorded in 46 out of 48 raised bogs surveyed.

In June 2011, a Reasoned Opinion was issued by the European Commission directed to Ireland which outlined the Commission's concerns. On 12 July 2011, the Irish Government responded to the Reasoned Opinion making a number of key commitments to the Commission promising future actions in relation to the restriction of turf cutting in the designated raised bogs. As a result of this Opinion, Irish authorities began a process of implementing a cessation of turf-cutting on the 53 SAC raised bogs in 2011. This was met with considerable opposition which included the formation of the Turf Cutters and Contractors Association (TCCA), an umbrella group for those opposed to implementation of the cessation. This opposition continued into the 2012 turf-cutting season when organised protests were established on many of the SAC bogs.

To date in 2012, 385 plots have been cut illegally on the 53 SAC bogs. While this is a dramatic reduction on 2011 and reflects the fact that 75% of turf-cutters have refrained from cutting, it is still clear that substantial resistance to the cessation persists, despite intensive administrative and political outreach to the communities involved.

On a more positive note, a 2011 survey of a selection of 12 designated raised bogs, where restoration works had taken place, revealed that whilst their conservation status was judged to be Unfavourable Bad, an overall habitat trend was assessed as Improving at 7 raised bogs, Stable at 3 raised bogs and Declining at 2 raised bogs. Other good news includes efforts by the semi-state agency, Bord Na Mona (the main peat development company), who produced a Bioversity Plan in 2011 with commitments to

retain extant peatland habitat of conservation value. They have also carried out comprehensive restoration measures on two large sites which had been intended for industrial peat harvesting. Also, they have potentially 80,000ha of former raised bog on which the production has ceased or will cease over the following 20/30 years; most of this will revert to wetland habitat.

Under EU LIFE-funded projects, Coillte (the semi-state forestry company) have removed conifers and blocked drains from 571 hectares of raised bog sites on 14 midland sites in 2004-8 and have started work on a further 636ha on 17 sites in 2011-2015.

Finally, Maurice Eakin speculated on what implications the preceding discussion would have on bryophytes. The first category comprised those species that had a geographical range beyond raised bog habitats and thus not of conservation concern (eg. *Racomitrium lanuginosum, Sphagnum capillifolium, Odontoschisma sphagni, Pleurozia purpurea, Leucobryum glaucum)*; secondly, there is a group of species which, although more loyal to raised bog habitats, seems to tolerate conditions in a degraded raised bog (*Sphagnum fuscum, Sphagum austinii, Sphagnum magellanicum, Kurzia pauciflora)*; third, there is a group of species dependent on the more hydrologically-intact raised bog sites which would lose ground if the raised bog resource continued to deteriorate (including *Sphagnum pulchrum* and *Cladopodiella fluitans*); finally, and referring to the recently published 'Rare and Threatened Bryophytes of Ireland', there are some species which are considered regionally extinct (*Dicranum undulatum*) and others which are 'data deficient' and/or 'threatened' due to loss of raised bog habitat *(Cephaloziella elachista* and *Cephalozia macrostachys* var. *spiniflora*).

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THE ECOLOGY AND POTENTIAL CLIMATE CHANGE RESPONSE OF MIXED NORTHERN HEPATIC MAT IN IRELAND

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The mixed northern hepatic mat is a community of large leafy liverwort species that are restricted in distribution primarily to north-facing slopes in the mountains of western Ireland and Scotland. This community has very specific microclimatic requirements, including high humidity, moderate temperatures, frequent rainfall and low exposure, conditions that are only met in north-facing corries in oceanic montane areas. These species also have a low capacity to disperse. Therefore, they are highly vulnerable to changes in their environment.

One of the greatest threats to the future survival of this community is climate change. Potential effects of climate change may include drying out of mats of liverworts at key times of the year, an increase in erosion of hepatic mats resulting from a higher frequency of extreme weather events and increased competition due to increased temperatures and less stability of climatic conditions. In order to assess how hepatic mat species may change their distribution in response to climate change, species distribution models

were constructed for six species of hepatic mat vegetation, as well as a range of other montane bryophyte and vascular plant species. These models were constructed using the known distribution of these species and climatic and topographic variables, and species distributions were projected under future climate change scenarios for 2055.

If it is assumed that hepatic mat species can disperse to any area that may become suitable for their growth in the future, then there is little or no decrease in their range between current and future projections, with some species even showing an increase, albeit minor, in their range. However, if it is assumed that these species would not be able to disperse and colonise new areas that may become suitable for their growth in the future - an assumption more likely to reflect their true dispersal capacity - all species are projected to experience a significant reduction in their future suitable range. When the geographical change in range of hepatic mat and other oceanic bryophyte species in Ireland is considered, a clear pattern emerges. Under future climate change scenarios, areas in the south of their present range are projected to become unsuitable for their growth, while areas further north than their current uppermost northern limit, which are not currently suitable for the growth of hepatic mat species, may well become suitable in the future. However, if these species lack the capacity to disperse to these newly available areas, then their range will inevitably shrink, as they lose ground in the south but are unable to colonise potentially suitable new areas in the north of the country. Therefore, climate change may pose a great threat to the survival of this unique assemblage of species in the future, particularly at the southern margin of the occurrence of hepatic mat vegetation in Ireland. It is essential that future conservation efforts for these and other oceanic bryophytes take into account the potential impacts of climate change on their distribution and survival.

PETRIFYING BRYOPHYTES - THE ECOLOGY OF LIME RICH SPRINGS

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Petrifying springs with tufa formation are listed as a Priority Habitat in Annex I of the Habitats Directive in recognition of their specialised ecology, the small land area they occupy and their vulnerability to alteration of the flow or chemistry of spring water. Research being conducted in the Department of Botany, Trinity College Dublin aims to investigate the flora and conservation status of petrifying springs throughout Ireland, the role of environmental variables and rates of tufa accumulation.

The flora of petrifying springs is typically dominated by bryophytes, in particular *Palustriella commutata*, along with *P. falcata, Cratoneuron filicinum, Eucladium verticillatum, Hymenostylium recurvirostrum, Philonotis calcarea, Scorpidium cossonii* and *Bryum pseudotriquetrum.* Vascular plants may include *Saxifraga aizoides* and *Pinguicula vulgaris* (Commission of the European Communities 2007).

Analysis of preliminary relevé data by Non-metric Multidimensional Scaling indicates the presence of three distinct groups of petrifying springs in Ireland: (1) springs dominated by *Palustriella commutata*, (2) paludal (fen & marsh) springs and (3) coastal springs.

In the first group, *Palustriella commutata* often attains high cover values, sometimes up

◁Top: *Catoscopium nigritum.* M. Lyons

◁Centre. Petrifying spring on the coast of north Co. Dublin with *Palustriella commutata* and *Eucladium verticillatum.* M. Lyons

◁Bottom. *Palustriella commutata* encrusted with tufa, showing increasing density of tufa deposits with depth and age. Dislodged from stream bank during flooding in Camcor River valley, Slieve Bloom Mountains, Co. Offaly. M. Lyons

to 70-80% of surface area. Associated species are usually few, but highly characteristic. They include *Eucladium verticillatum*, *Cratoneuron filicinum, Palustriella falcata, Platyhypnidium riparioides, Pellia endiviifolia* and *Conocephalum conicum*. These springs tend to have well-developed tufa deposits and usually occur on steeply sloping ground. A particularly interesting subset of these springs, of limited geographical distribution contains a range of rare species: *Seligeria oelandica* and *S. patula* occur on the Benbulbin range, on north-facing flushed cliffs along with *Saxifraga aizoides*; *Orthothecium rufescens* is found in the same springs and also occurs on north-facing cliffs in the Burren near Black Head.

Typical species of paludal springs are *Campylium stellatum, Scorpidium cossonii, S. scorpioides, Fissidens adianthoides, Plagiomnium elatum, Bryum pseudotriquetrum, Aneura pinguis* and *Jungermannia atrovirens* along with the vascular plant *Pinguicula vulgaris*. Rare species in this habitat include *Tomentypnum nitens* and *Catoscopium nigritum*. These springs usually contain sparse or weakly consolidated tufa deposits coupled with high species diversity. They occur in fens and calcareous marshes on relatively flat ground.

Coastal springs typically contain *Palustriella commutata, Eucladium verticillatum, Didymodon tophaceus* and *Hymenostylium recurvirostrum*. Cyanobacteria (*Rivularia* spp.) often form

a conspicuous element of the biota. The proximity of these springs to the upper reaches of the tides prevents the formation of soil or the development of flush vegetation; spring water often issues from cliffs of glacial till onto exposed bedrock and such conditions favour salt-tolerant bryophytes and algae rather than vascular plants.

Preliminary measurements on rates of tufa accumulation show that in the period March 2011 to March 2012 there was a mean increase in the height of tufa surfaces of 2.1 cm.

Acknowledgements

Many thanks to Dr Daniel Kelly, TCD, for supervising this project and to National Parks and Wildlife Service and the Irish Research Council who are kindly funding this research.

Reference

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EARLY RESULTS FROM THE BBS BRYOPHYTE ECOLOGY PROJECT (BRECOG)

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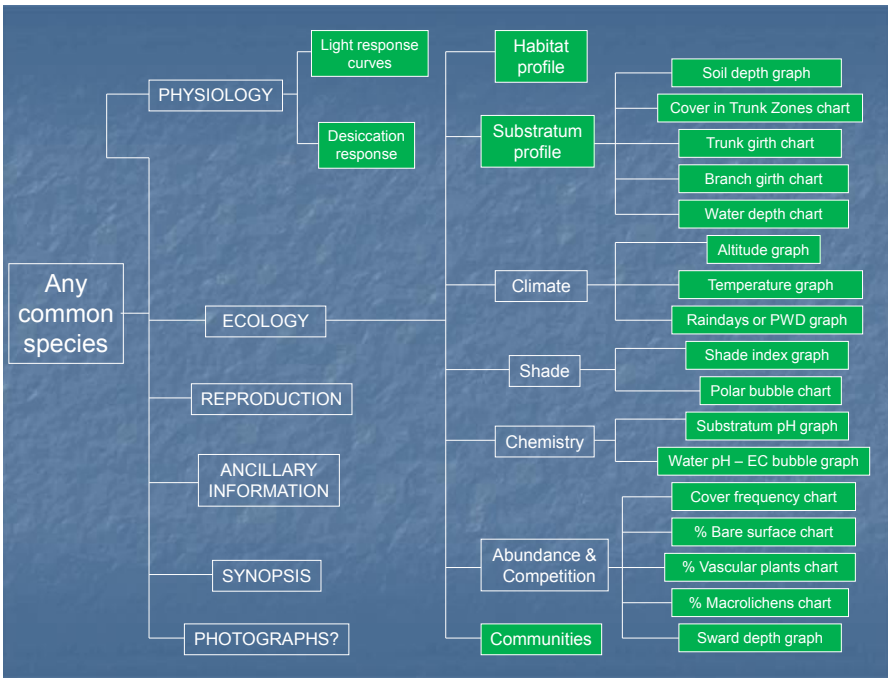
A BBS project was launched in 2006 to describe, in simple but objective fashion, the habitats of common bryophytes in Britain and Ireland. The methodology, based around quadrat (relevé) sampling of bryophyte habitats (Fig. 1) is described in detail on the BBS website. Initially, progress was slow, but the tiny band of enthusiasts responsible for most of the work is now starting to see a significant body of data accrue. An outline plan for eventual publication of the information and some preliminary results formed the body of the talk. It is envisaged that the resultant 'Ecological Atlas', which will focus on the 250-300 most frequently encountered species, will be in two parts. First, a book will explain the background, methodology and general conclusions, and include an analysis of bryophyte associations. Second, the specific results for each common species will be supplied in a digital format (e.g. CDROM) with access via menus (Fig. 2). Many of the results will take the form of simple XY scatter graphs in which the abundance (mean

◁Below left, Fig. 1: The author sampling rock-face bryophytes in Atlantic oakwood at Pontoon, Co. Mayo during the Summer Meeting, July 2012. Joyce Bates

▷Right, Fig. 2: Menu tree showing the graphical results (green boxes) and other information that will be available for common bryophytes from the BRECOG project.



percentage cover) of a selected species is plotted with respect to one or other of the environmental factors included in the study. It was explained how the plum-pudding-shaped scatters of data points obtained in this way relate to theoretical ideas of the ecological 'niche'. Although simple in execution, the project permits graphs to be drawn for a wide range of factors under the general headings of 'substratum', 'climate', 'shade', 'chemistry' and 'competition'. Examples were given showing the responses of different bryophytes to altitude, degree of shading, substratum pH and, for wetland species, water pH and electrical conductivity. Polar bubble charts are a simple but powerful way of displaying the strong aspect and slope preferences of many bryophytes, particularly when plotted separately for 'shaded' versus 'unshaded' and 'northern' versus 'southern' records. To gain insight into the competitive challenges facing each species, a frequency graph of the plant's abundance is constructed and compared with similar graphs for vascular plants, macrolichens, litter, sward depth and bare surface in the same subset of samples. The approach was demonstrated using the example of *Amblystegium serpens*, a small moss that occurs predominantly at low abundance in habitats with low cover of other organisms, low swards, sparse litter and much bare surface. Other graphics (Fig. 2) will show for each species, a numerical breakdown (or profile) of the range of habitats occupied and the range of different substrata colonised. Physiological data, consisting of light response curves and the degree of recovery from a standard set of desiccation regimes, will also be available for many species. Further menu choices include 'reproduction', providing information from the survey about timing and frequency of sexual and asexual processes, and 'ancillary information', where other relevant data from the literature (e.g. life forms, NVC communities) will be gathered together. A synopsis will pull together all the relevant information about the ecology of each common species and suitably knowledgeable volunteers will be invited to write these accounts. The digital part could also include photographs of each species and its habitats if contributors are forthcoming.

It is intended that the fieldwork will continue to the end of 2016 to ensure a reasonably comprehensive dataset. The talk ended with a plea for more BBS members to become actively involved in gathering data for what is likely to be an important publication with much significance for conservation of British and Irish bryophytes.

THE BALKAN COLLECTION IN THE BRYOPHYTE HERBARIUM OF THE HUNGARIAN NATURAL HISTORY MUSEUM

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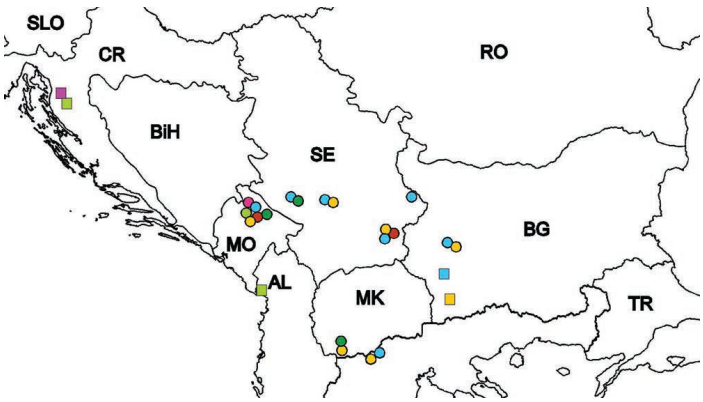
The Balkan peninsula is geographically defined as the territory south of the Krka, Sava and Danube rivers. With regard to our collection we consider the Balkans in its political sense, encompassing a somewhat larger area. The following countries are included: Slovenia, Croatia, Bosnia-Herzegovina, Serbia, Montenegro, the Former Yugoslav Republic of Macedonia, Albania, Greece, Bulgaria, the European part of Turkey (Turkish Trace) and Romania. Most of the Balkan peninsula is hilly, mountainous area, with plains only in the northern, northeastern parts. Five significant mountain ranges are in the Balkans: the Carpathians, the Rodopean, the Balkans, the Dinaric Alps and the Scardo-Pindean massive. Geologically these are dominated by Triassic and Jurassic limestones, but old volcanic granitic, metamorphic bedrocks and many transitional types can also be found in certain areas. Generally, the relief is extremely diverse, ranging from coastal zones and inner steppe-like areas to high mountains exceeding 2000 m a.s.l., with vegetation zones from Mediterranean maquies, open and closed deciduous forests, steppe-like formations to coniferous subalpine forests and high mountain alpine plant communities. Furthermore, the Balkans are affected by biogeographic influences from North Africa, West Asia, Central and Northern Europe (Sabovljević *et al.*, 2001).

Although the Balkan peninsula is regarded as one of the floristically richest areas of Europe, its bryophyte flora is rather poorly known when compared with other regions of Europe. This is mainly due to the lack of trained local bryologists (but is changing nowadays see Fig. 1), lack of well-maintained bryophyte herbaria and the inadequate funding of bryology as a science. Several bryophytes known from the Balkans only have one or very few records and many of these are older than 50-60 years. The recent bryophyte checklists of the Balkans (Sabovljević & Natcheva, 2006, Sabovljević *et al.*, 2008) include 5 hornworts, 267 liverworts (59.9 % of the total hepatic flora of Europe) and 899 moss species (69.45% of the total moss flora of Europe). In these checklists there are large differences in species numbers between the various countries (the number of hepatics ranging from 27 to 197 and that of the mosses from 217 to 749, respectively), which are more a reflection of the state of bryology in each country than of real differences in species diversity between the countries. Countries with low recorded species numbers are the European part of Turkey with 27 hepatics and 217 mosses, Albania with 91 hepatics and 219 mosses and the Former Yugoslav Republic of Macedonia with 69 hepatics and 345 mosses.

◁Left, Fig. 1: Bryologists on the 5th Balkan Botanical Conference, Belgrade, 2009. From left to right: Evdoxia Tsakiri (Greece), Snežana Dragićević (Montenegro), Marko Sabovljević (Serbia), Beáta Papp (Hungary).



◁Left, Fig. 2: Localities of rare wetland species in the Balkans according to our database. Square – data before 1970, dot – recent data; yellow – *Straminergon stramineum*, blue – *Palustriella decipiens*, red – *Hamatocaulis vernicosus* and *Tomentypnum nitens*, pink – *Calliergon giganteum*, bright green – *Campyliadelphus elodes*, dark green – *Rhizomnium magnifolium*.

The bryophyte collection of the Hungarian Natural History Museum, Budapest (BP) contains 17781 identified specimens from the Balkans excluding Romania. From the territory of Romania a huge amount of material is deposited in BP, collected during the early years of regional bryology by the renown botanists Ádám Boros and László Vajda, however this large collection is not available in database format. A major part of our Balkan collections (11890 specimens) has been acquired during numerous field trips in the last 10-12 years, with 5891 specimens deriving from historic collections. Most of the historic collections (more than 4000 specimens) belong to Árpád Degen's herbarium, an important collection containing voucher specimens of his comprehensive work on the flora of Velebit Mts (Degen, 1938). In the early years of the last century Degen collected extensively especially from the territory of Croatia. Most of the liverworts were identified by Victor Schiffner, while a large part of the mosses by Julius Baumgartner, who also collected at that time in Croatia, especially the Velebit Mts. In our collecting efforts we have targeted mainly the countries/areas of the former Yugoslav Republic. A wealth of specimens have been collected in Serbia (4046 specimens) and Montenegro (2375 specimens), while two years ago we have begun to explore the Former Yugoslav Republic of Macedonia and Croatia, which to date have yielded 567 and 1003 specimens respectively. We also have large collections from Bulgaria (2040 specimens), Greece (1176 specimens), and a smaller one from Albania (679 specimens). In total we have reported 409 species as new national records; the largest number from Serbia (125 species) followed by Albania (76), Montenegro (72), the Former Yugoslav Republic of Macedonia (56), Croatia (31), Greece (25) and Bulgaria (21).

Our recent explorations have also resulted in several important new records for European red listed and other rare species, as illustrated here for rare wetland species (Fig. 2). Taking into account all of the above facts, we consider that our Balkan collection represents a major data pool for national Red Lists of the Balkan countries and also for a comprehensive Balkan Red List. Furthermore, the recently collected specimens are already widely used by several European bryological laboratories for taxonomical and DNA analyses.

Our 49(50) publications on the bryophyte

flora of the Balkans and details of the collecting trips to build these collections are available on the website of the Hungarian Natural History Museum (http://www.nhmus.hu/hu/intezmeny/munkatarsak&op=reszletes&op2=77).

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BRYOPHYTES ONLINE – A NEW SWISS BRYOPHYTE FLORA

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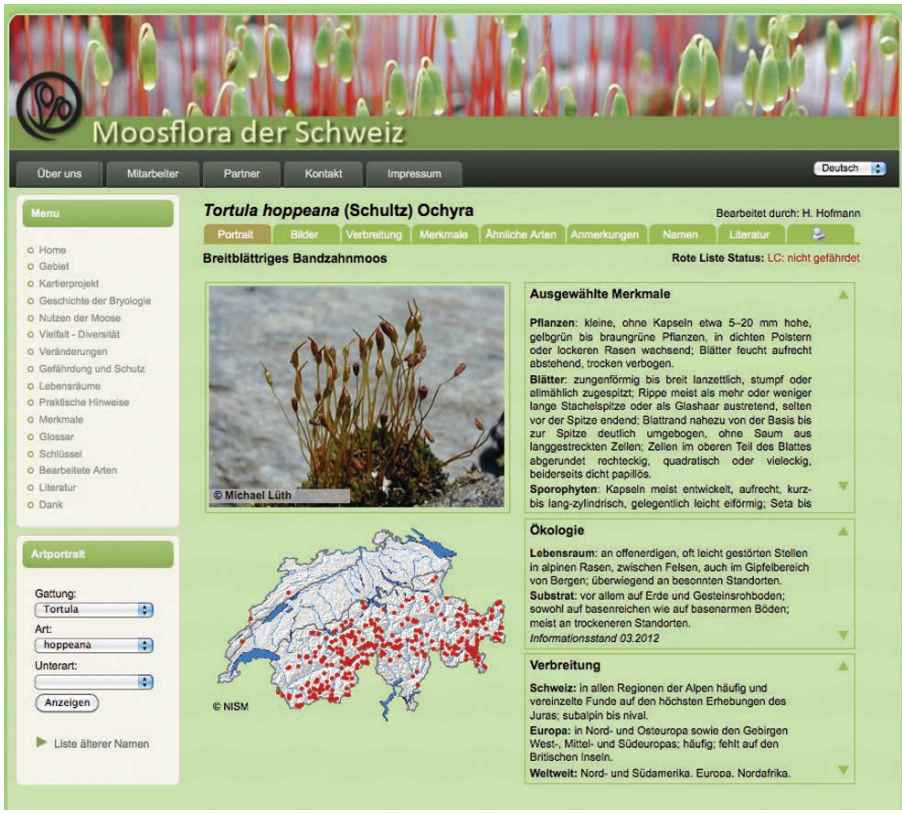
With nearly 1,100 species, Switzerland is particular rich in bryophytes. However, the only two bryophyte floras available are well out of date (Amann *et al.*, 1918, Meylan, 1924). Because Switzerland has Mediterranean species as well as Arctic ones, floras for other countries are of limited use, as they do not contain all the species known from Switzerland. Therefore, in 2009 we undertook the project of a new bryophyte flora of Switzerland. We quickly decided to publish the flora as a website, rather than a book, because of the many advantages of on-line publishing: articles can be published as soon as they are ready without any delays, there are far less restrictions on space, the information can be displayed flexibly, costs are minimal, and updates are possible at any time. However, as soon as we started the project we realized that web-publishing has also its disadvantages: the information exists only virtually and might be lost due to an update of the programme or small changes in the database linked to the website, there is little stability because the information can be changed at any time, articles are difficult to cite, and finally an expert in programming is vital for the success of the project.

Nevertheless, we persevered and the website on Swiss bryophytes went live in 2011 (www.swissbryophytes.ch). So far, it is available in German and parts of it also in French. An English version will be available in the future. The website provides information on various aspects of bryology in Switzerland. There are chapters on the area treated, the mapping project, the history of bryology, the use of bryophytes, diversity, changes in the bryoflora, threats and conservation, practical aspects, a glossary, and a list of about 3,000 references with search function. The chapter on the history of bryology in Switzerland contains a list of approximately 160 people who have contributed to the bryological exploration of Switzerland. For each person a short portrait with the most important data is available. Particularly useful are the illustrated species lists which include the most frequent and typical species for each of the 35 habitats recognized in Switzerland. The pictures can be enlarged while the species names are linked to the "species portraits", i.e. the treatments of the species. These are the most important part of the website (Fig. 1). A species portrait comprises the following elements: short description, macroscopic and microscopic photos, information on ecology and distribution, similar species and differentiating characters, keys, synonyms, and further literature. Although the website itself and the background chapters are nearly complete, the project is still in its



△Above: Website of the bryophyte flora of Switzerland: example of a species portrait (www.swissbryophytes.ch).

infancy with only 40 of the 1,100 species known from Switzerland described and illustrated. There is still some work to do!

An important advantage of web-publishing is the flexible display of information. We intend to take full advantage of this in the future and provide an interactive webpage where it will be possible to compare pictures of similar and non species. Choosing images to compare from a list of similar species will also display the main distinguishing characters of the species selected and highlight the main differences. The programming of this page is now underway and it might well be published by the time this article goes to press. Do check the flora at www.swissbryophytes.ch.

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Acknowledgements

The new bryophyte flora of Switzerland is a team effort. I thank my colleagues Edi Urmi, Norbert Schnyder, Ariane Cailliau, Michelle Price, Niklaus Müller, Markus Meier, Ariel Bergamini, Michael Lüth, Kim Lotterman, and Alex Bernhard (webmaster). Many other people have contributed in various ways. A complete list is available at www.swissbryophytes.ch. For financial support we are grateful to Dr. Katharina König, the Federal Office for the Environment, the "Stiftung zur Förderung der Pflanzenkenntnis", and Dr. Richard Dähler.

MOUNTAINS AND ISLANDS: IN SEARCH OF BRYOPHYTES IN GREECE

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See 'Bryophytes Abroad' article on pp. 16-25 of the May 2013 issue of *Field Bryology* (vol. 109).