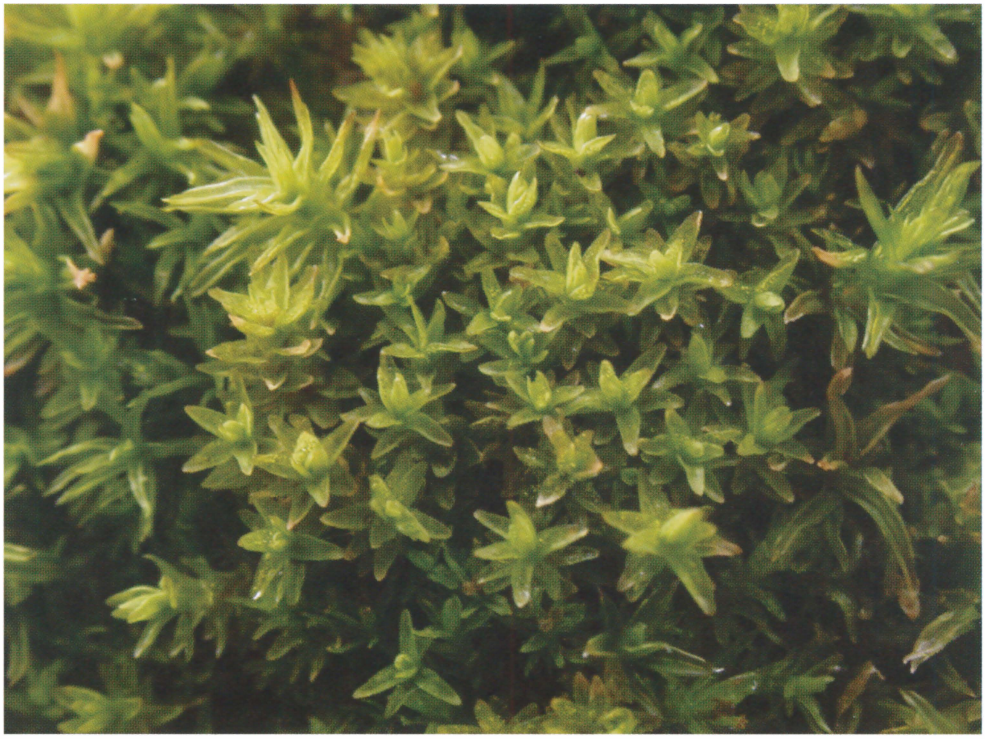

Figure 3. *Orthotrichum obtusifolium* at Fyvie Castle. Photo: Jonathan Sleath.

AGM and Bryological Symposium 2004, Preston Montford

CEH Monks Wood, Abbots Ripton, Huntingdon, PE28 2LS

The Annual General Meeting and Bryological Symposium were held in the Field Studies Council's station at Preston Montford near Shrewsbury, on 8-10 October, with Mark Hill (symposium) and Mark Lawley (excursions) as local secretaries. In November 2002, the BBS visited Preston Montford for the launch of the Survey of the Bryophytes of Arable Land (SBAL). In 2004 we continued the theme of bryological recording. About 50 people attended the meeting, of whom 40 stayed at Preston Montford, with others lodged nearby. At the suggestion of Mark Lawley, we experimented with an unusual meeting format, devoting the mornings to lectures and the afternoons to fieldwork.

Bryological Symposium

The symposium, with its theme of bryological recording, ranged from local Floras, including one for Geneva, to national bryophyte recording and monitoring schemes. It was a pleasure to see new members and old friends; several long-standing members who do not normally attend indoor meetings told us how much they had enjoyed the lectures. Abstracts from the symposium are presented on pp 19-33.

Monitoring change in single species of bryophyte

David Holyoak (Camborne, Cornwall)

Introduction

In Britain and Ireland we need to take care of populations of rare bryophytes because many are being lost, mainly through habitat changes or accidental destruction. Losses occur not only through changes in land use such as drainage and afforestation, but also from infilling of ditches and quarries, burning of heathland, widening of roads, felling of trees, and all too often merely from vegetation succession following cessation of grazing.

Detailed information on the location and strength of populations of rare bryophytes provides the essential basis for minimising future losses. An overview of a methodology developed for recording and monitoring populations is presented here, based on methods developed over the past ten years during almost full-time work on bryophyte surveys and conservation, mainly in Cornwall and Ireland. The three main processes involved are considered in turn: a) (re-)finding populations, b) documeting locations and sizes of populations as a basis for future monitoring, and c) detailed monitoring methods for individual populations.

(Re-)finding populations

The difficulty in refinding bryophyte populations known in the past varies greatly according to the age of the records and the precision of information available on localities. Unfortunately, recorded localities are often imprecise or even deliberately vague, especially with old records that merely indicate the nearest village or town. Use of all available data from literature and herbaria often helps, but direct contact with the bryologist involved in making the original record is invaluable when it is still possible. Experience of the species involved should allow searches to be made in the most likely places, and for some species searches at the correct season may be important. It has often been assumed that short-lived ephemeral species are highly mobile and non-persistent at individual localities, so that searching for them might appear pointless, but experience suggests that even *Acaulon triquetrum* usually recurs from year to year, and other species, such as *Weissia multicapsularis*, persist for decades. Plants of inundation-zones beside lakes and reservoirs can be found only in dry years, so that long-term planning is likely to be needed for effective regional surveys.

'Needle in a haystack' searches covering large areas in an attempt to refind a small bryophyte take patience, persistence and an optimistic approach. Success rates in refinding large numbers of old records in Irish counties in recent years have ranged from 10-45%, being highest where good habitats survive undamaged and the available bryophyte data are mainly recent (e.g. in Co. Leitrim). Success rates above 50% have been achieved using data from the past decade recorded by Dr David Long, but these have habitat notes and accurate grid references. Rather forlorn searches for poorly localised old records sometimes succeed, even if what is eventually found may not be the original site, but new records of other species are often made by scouring appropriate habitats.

Documenting populations as a basis for future monitoring

Careful documentation of locations is essential to maximise the chances of refinding populations for future monitoring and site protection. The recent development and wide availability of hand-held Global Positioning Systems (GPS) have revolutionised the accurate recording of locations. Suitable GPS equipment costs upwards from about £70 and allows locations to be recorded to within 10 m in open country. Unfortunately, the signals from navigation satellites used

by GPS are not available in deep ravines and they are often weak in woodland or on crags, so careful attention to signal strength is needed in using a GPS, and traditional map reading techniques will sometimes still be required. Altitudes obtained from hand-held GPS are often wildly inaccurate and so these should be obtained from 1:50,000 or 1:25,000 maps using the grid reference as a guide.

In addition to notes of the habitat and location in relation to local landmarks, photographs provide a valuable record and these are now very easy and cheap to record using small-format digital cameras. The most helpful photos for refinding locations show not only the exact position of the rare bryophyte (with a marker such as a knife or rucksack) and its habitat, but also some more distant and permanent landmarks. It is easy to label successive digital photos by using the next image to record notebook details, for example of the voucher specimen number, grid reference, date and time.

If return visits are planned and the site is not too public it usually helps to refind a rare bryophyte if the location is marked. The suitability of different kinds of markers varies widely according to the site. In remote bogs, sticks or bamboo canes (placed say 5 m from the bryophyte) may be appropriate, while in remote private woodland plastic supermarket bags tied to branches may provide the best hope of refinding part of a crag. At closer range, plastic-covered vehicle wiring wire (persistent for long periods and available in many colours), plant labels, cocktail sticks or hidden transponders may be suitable for different conditions.

So that identification of populations of rare bryophytes can be checked and if necessary revised it is advisable to collect a small voucher specimen if a) the population is large enough to withstand collecting, b) no recent voucher exists from the population, c) for species listed on Schedule 8 of the Wildlife and Countryside Act 1981 or on SSSIs an appropriate licence has been obtained from the national conservation agency (e.g. English Nature in England), and d) the landowner has given permission. The voucher specimen should be fully labelled with habitat and grid reference details (to 10 m accuracy if possible) and lodged in one of the national herbaria. Bryologists carrying out extensive surveys are encouraged to serially number all their field specimens as this avoids uncertainty about which specimen is the voucher for which record, and also to routinely record 8-figure grid references from the GPS so that even unexpected finds are well localised.

Detailed records of the locations and populations of rare bryophytes are of little or no value for conservation purposes unless they are shared with appropriate individuals and/or organisations. Accurate grid references (from the GPS) and digital photos are easily shared, both locally with site managers, conservation officers (e.g. of English Nature) and the BBS county recorder, and nationally with the Threatened Bryophyte Database.

Detailed monitoring methods for individual populations

Regularly repeated monitoring of individual bryophyte populations is time-consuming, rather dull and very expensive if travel costs or paid surveyors are involved. Persistent monitoring also uses up skilled bryological time that could be used for new surveys. Monitoring is therefore recommended only for the rarest and most vulnerable populations, and in these cases mainly as a way of informing the character and extent of concurrent work to manage the bryophyte habitat. For example, annual monitoring of *Ditrichum cornubicum* at Phoenix United Mine SSSI revealed the need to exclude sheep because their dung was eutrophicating ground on which the moss grows, leading to it becoming overgrown by *Rhytidiadelphus squarrosus*. Patches of ground were therefore scraped clear of competing *R. squarrosus* after fencing was erected by English Nature; ongoing monitoring has since recorded recovery of the populations of *D. cornubicum*.

When monitoring is undertaken, the repeat visits will benefit from use of GPS data and photos to relocate bryophyte populations. Overall habitat changes, such as those due to scrub growth, can be reassessed on repeat visits and recorded photographically, ideally with 'fixed-point photos' (taken from standardised locations, at the same season and using similar photographic equipment on each visit). Methods of measuring population sizes need to be developed separately for different species. For some species plants can be counted (e.g. thalli of *Petalophyllum ralfsii*), with others the patch dimensions can be measured using a ruler (e.g. *Leucodon sciuroides* var. *morensis* and some patches of *Weissia multicapsularis*), and with others it may be necessary to use a 1-cm gridded transparent overlay and count the squares occupied (e.g. *Lejeunea mandonii*).

Careful documentation of localities of rare bryophytes, the strength of their populations and the habitat characteristics provide the best guides for management intervention if the populations show serious declines or become threatened by habitat change. There are now many instances of responsible landowners co-operating in allowing monitoring and conservation management work to benefit bryophytes and other wildlife on their

land. Nevertheless, on rare occasions when habitats of rare bryophytes are deliberately or thoughtlessly damaged, detailed documentation should prove what has been lost. Indeed, notes, photos and voucher specimens have recently provided evidence allowing English Nature to prosecute landowners for damage on SSSIs, and the photos have provided a factual basis for reinstating the habitats under court orders.

Changes in the bryophyte flora of eastern England

Ken Adams (Loughton, Essex)

Introduction

In 1967, I began a systematic bryophyte survey of Essex on a 5-km square basis with records kept to either a 1-km square or 100-m square level. These data formed the basis of the bryophyte flora in the *Flora of Essex* (Jermyn, 1974). Having found that a considerable number of epiphytic and terrestrial species were either absent or only present as a handful of scattered occurrences, I proposed to the BBS at the 1989 Lincoln paper-reading meeting (Adams, 1990) that a systematic survey of the counties to the north and east of London be initiated on at least a 5-km square basis to see how far out this bryophyte semi-desert extended from the metropolis (the presumed source of the atmospheric pollution responsible). The Nature Conservancy Council was approached for support, and subsequently paid for a complete set of 1:25,000 maps covering Norfolk, Suffolk, Essex, Middlesex, Hertfordshire, Bedfordshire, Huntingdonshire and Cambridgeshire.

Originally intending to continue to co-ordinate this programme, with the aim of eventually producing a bryophyte Flora of eastern England, I became overwhelmed by the task of co-ordinating the 1-km square mapping of vascular plants in Essex. Meanwhile, Harold Whitehouse continued site recording in Cambridgeshire, and Jack Gardiner began detailed mapping in Middlesex, Richard Fisk and his local team began tetrad mapping in Suffolk, and Graeme Smith began mapping Hertfordshire. More recently, Robin Stevenson has been systematically (and bravely!) mapping the largest county in the area, Norfolk, and Mark Hill and Chris Preston have initiated systematic 5-km square mapping of Cambridgeshire. In Essex, Tim Pyner has provided the bulk of the records since about 1980, having systematically surveyed 396 churchyards as well as a wide range of other habitats. His records provide a direct comparison with my earlier data.

When Mark Hill asked me to give a presentation at the Preston Montford meeting on the changes that have occurred in eastern England, a three-week flurry of activity was initiated to map those species for which sufficient data had been gathered. Unfortunately, time was only available to consider data supplied by the co-ordinators for Suffolk, Essex and Cambridgeshire, and some elements of the flora of Middlesex and Hertfordshire. Nevertheless, some spectacular changes have been documented, and tentative distribution maps for 25 species[1] provide a snapshot in time of the recolonisation of eastern England by pollution-sensitive bryophytes, in the wake of the virtual demise of sulphur dioxide pollution from the London conurbations.

Losses and gains resulting from changing air quality

The return of SO_2-sensitive species has generated a number of surprises. As in the case of lichens, the sequence of return bears little relation to the sequence of extinction, and more to the availability of propagules. In 1992, I attempted to produce a SO_2-tolerance chart for epiphytic and terrestrial bryophytes, based on their UK distributions and that of atmospheric sulphur concentration, mirroring that of the Hawksworth & Rose scale for lichens (Adams & Preston, 1992). In hindsight, this list had a number of gaps and anomalies, not least the modulation effected by the presence of chalk and limestone, which serve to neutralise the effects of atmospheric acid, presumably by converting the sulphuric acid to insoluble calcium sulphate.

Remarkable differences have become evident between species of the same genus. *Rhytidiadelphus squarrosus* was present on a lawn near Tottenham Court Road in the centre of London during the 1970s, and was plentiful in old grassland habitats in eastern England throughout this period. In contrast, the mildly calcifuge *R. loreus*, growing luxuriantly in Epping Forest in 1912, was wiped out over the entire area, save for one site on the Hertfordshire-Buckinghamshire border, a couple of sites in Suffolk, and one in Cambridgeshire. *R. triquetrus*, on the other hand, also recorded as growing luxuriantly in Epping Forest in 1890, retreated to the chalk of north

[1] Available on CD from the author at 63 Wroths Path, Baldwins Hill, Loughton, Essex, IG10 1SH.

Essex, Suffolk, Cambridgeshire and Hertfordshire. *Radula complanata* similarly retreated to the chalk until after the 1980s, but, unlike *R. loreus* and *R. triquetrus*, has made a significant comeback, even returning to Epping Forest. The probable explanation here is that the *Radula* fruits readily, whereas neither of the sensitive *Rhytidiadelphus* species has been seen in fruit for many years. *Anomodon viticulosus* appears to have declined in the same way as *R. complanata*, but has not yet made a recovery, again presumably due to the lack of sporophytes. The survival of *Leucodon sciuroides* has been remarkable. It has persisted on a single ash pollard out in the open in Hatfield Forest, and on a scattering of trees elsewhere in the region, but luxuriant colonies have been unexpectedly discovered on the limestone of tombs and church buttresses and on the lime mortar of old walls. So far, however, it has not shown any sign of recolonising trees.

It is the epiphytes of tree trunks, branches and twigs that have exhibited the most spectacular changes. On Hampstead Heath in 1989, I had to look repeatedly at a specimen of *Orthotrichum striatum* found on a willow branch with *Frullania dilatata*, *Ulota bruchii* and, nearby, *U. phyllantha*, in case it really was the product of an optimistic dream. Then shortly afterwards Jeff Duckett added *Cryphaea heteromalla* to the list for the site. Essex responded more slowly to the post-1960 fall in atmospheric SO_2 concentration in the air of north London, presumably because it was directly downwind of the remaining pollution for most of the year. Not only have a number of species returned to eastern England that were known to have been exterminated in the late 19th and early 20th centuries, but several species have been found that had never been recorded in the region before. They were presumably eliminated prior to localised bryological recording. Of these, *Metzgeria fruticulosa* and *Ulota phyllantha* have seen the most spectacular spread. Of species known from herbarium records to have been exterminated early on, *Orthotrichum striatum*, although in the vanguard, has now been overtaken by *O. pulchellum*, *O. stramineum* and *O. tenellum*, and those species that just hung on in a few isolated pockets, such as *O. lyellii* and *C. heteromalla*, have rapidly recovered their former range.

To give some quantitative assessment of the relative rates of recovery, Table 1 shows the total number of records for several epiphytes in the five vice-counties that have been fairly well mapped since 1980. *Frullania dilatata* has been excluded because it survived in numerous isolated pockets, particularly further out from London.

During the worst phase of atmospheric pollution the species of *Orthodicranum* actually appear to have benefited from the pall of acid rain enveloping the region. *Dicranum tauricum* seems to have maintained a steady increase, gradually filling in its range, and apparently, at least in Essex, spreading from the east from leaf fragments dispersed by easterly winds presumably originating from across the Channel. *D. montanum* is similarly spreading, although less dramatically. *D. flagellare*, however, has had a chequered history, appearing on rotten chestnut stumps in Essex in the 1960s and then disappearing, but persisting in woods along the Hertfordshire-Middlesex border. All three species were slow to spread further out to the north-east, suggesting that the acidity of bark substrates was giving them a competitive edge closer in towards London.

Table 1. Number of post-1980 localities for SO_2-sensitive bryophytes in selected vice-counties.

	Vice-county					Total
	18	**19**	**25**	**26**	**29**	
Orthotrichum lyellii	13	36	35	19	22	**125**
Cryphaea heteromalla	9	20	32	19	32	**112**
Orthotrichum pulchellum	8	10	23	13	14	**68**
Metzgeria fruticulosa	4	10	16	17	18	**65**
Ulota phyllantha	4	13	16	12	12	**57**
Syntrichia papillosa	2	4	13	6	18	**43**
Zygodon conoideus	0	8	6	5	12	**31**
Orthotrichum tenellum	6	9	5	3	6	**29**
Orthotrichum stramineum	4	6	3	0	4	**17**
Orthotrichum striatum	1	4	1	0	1	**7**
Metzgeria temperata	1	0	1	0	0	**2**
Neckera pumila	0	0	1	0	0	**1**

Several other bryophyte species have undergone dramatic distributional changes in eastern England that may be linked to changes in atmospheric pollution. *Bartramia pomiformis* hung on in a few pockets until the 1970s, having a national distribution suggestive of control by acid rain, but it has now gone from Essex, and has not as yet staged a comeback. The mildly calcifuge *Calliergon cordifolium* and *Hylocomium splendens*, and the more strongly calcifuge *Pleurozium schreberi*, have also suddenly all but vanished from Essex, presumably because the fall in acidity has allowed them to be out-competed. *Pohlia nutans* appears to be another victim of a recent decrease in acidity, and has virtually disappeared from the region. More subtle changes seem to be influencing the relative abundance of *Leucobryum* and *Dicranum* species. In Epping Forest, *D. scoparium* and

D. majus are increasing at the expense of the two *Leucobryum* species. Whether this is due to a change in acidity or to a recent increase in rainfall will be difficult to unravel.

Other changes

It is has become obvious that some of our eastern England bryophytes are ephemeral and constantly replenished by spores from the continent. Such 'spore rain sporadics' include *Ptilidium pulcherrimum*, which fruits copiously in Scandinavia, but seldom persists for long here, and *Herzogiella seligeri*, which occasionally takes advantage of a rotting chestnut stump. *Neckera pumila* (one record in Suffolk) and *Microlejeunea ulicina* (one record in Essex and one record in Hertfordshire) might be initiating a late post-SO_2 comeback, but *Orthotrichum obtusifolium* (one record in Suffolk) and *Cololejeunea minutissima* (one record in Suffolk) seem likely to be two more spore rain sporadics.

The relatively recent adoption of tarmac surfaces for low-attrition-level footpaths in parks and churchyards, private drives and public car parks, has provided a surrogate surface for species normally associated with silt-covered trees by rivers. Silt becomes trapped in the labyrinthine interstices, and water penetrating the porous surface only evaporates slowly after rain. *Didymodon nicholsonii* in particular has taken to this habitat, having turned up in 17 sites in Essex, nine in Cambridgeshire, four in Suffolk, and one in Middlesex, having previously been unknown in the region. *Syntrichia virescens* (73 records from churchyard tarmac in Essex, and 28 records from trees), *S. latifolia* and *Bryum argenteum* have also exploited this new substrate, as, more recently, has *S. ruralis*, a species sensitive to SO_2.

We now have good evidence that New Zealand Pigmyweed (*Crassula helmsii*) has indirectly affected *Riccia fluitans* and *Ricciocarpos natans*, which have been exterminated from several ponds as an indirect result of dredging them completely, in what is usually a failed attempt to remove the *Crassula*. Further human impacts in eastern England are the trampling and metalling of muddy woodland rides as more and more people visit the countryside, which are increasingly eliminating such species as *Fossombronia pusilla*, *F. wondraczekii*, *Scapania irrigua* and *S. nemorea*.

Acknowledgements

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References

Adams KJ. 1990. Proposals for a 5km^2 mapping scheme for eastern England. *Bulletin of the British Bryological Society* **55:** 14-17.

Adams KJ, Preston CD. 1992. Evidence for the effects of atmospheric pollution on bryophytes from national and local recording. In: Harding PT, ed. *Biological recording of changes in British wildlife.* London: HMSO, 31-43.

Jermyn ST. 1974. *Flora of Essex.* Colchester: Essex Naturalists' Trust.

Shropshire's changing bryoflora … changes? what changes?

Mark Lawley (Ludlow, Shropshire)

Introduction

The generic title of this symposium is 'recording bryological change', but natural historians often talk about 'change' casually and imprecisely. We usually mean changes in species' abundance or distribution or both. But we seldom stop to wonder what caused these changes, and only very rarely does anyone investigate why they may have occurred.

There may be a number of reasons why a bryoflora seems to be changing. Evolution is one possibility – some species may be evolving or have recently evolved. Or ecological succession may have taken place. Or abiotic environmental conditions may have changed, favouring some species while causing others to decline. However, variations in the kind or quantity of bryological recording may lead us to erroneously suppose that a bryoflora is changing. The manner in and extent to which individual bryologists record plants greatly influence how we interpret the occurrences and distributions of species. In my opinion, by far the greater part of what we like to regard as 'change' in a local bryoflora is attributable to changes in the activities of local bryologists, rather than in the bryoflora itself.

Bias in recording species, habitats and localities

Even in Britain (one of the best-recorded parts of the planet), recorder bias is particularly significant in

bryology because no district is over-run by actively recording field bryologists. The individual recording foibles of each field bryologist therefore become likely to distort our understanding of a district's bryoflora. Where a bryologist lives, the localities and habitats that he favours exploring, and his accuracy, experience and reliability (as well as his blind spots and unreliability) in finding and identifying species all influence what he records, fails to record, and misrecords.

In Shropshire, since I became recorder in 2000, nearly all the records that I have forwarded for the national database at Monks Wood have been my own. So our picture of Shropshire's bryoflora is becoming increasingly skewed according to my personal recording preferences and weaknesses. Regarding weaknesses, I have at least as many blind spots for recognising and identifying species as other botanists, and quail to think what I must fail to notice and record when exploring a locality. For instance, I often vacate eminently suitable habitat without having recorded *Rhynchostegium confertum*. Was it really not there, or had I overlooked this unostentatious pleurocarp? Or worse, did I record it in error as another species? I further fear that neither *Orthotrichums* nor *Sphagnums* can yet be counted among my strengths, and as for *Grimmias* and *Syntrichias* …

What I see and what I fail to notice have also changed with time, and will continue to do so. I am familiar with more species now than ten years ago at the start of my bryological career, and it pleases me to suppose that I overlook and misidentify fewer species now than formerly. But in years to come, when I am old, my eyesight and ability to explore rough terrain will deteriorate, so my recording will again become less reliable and thorough.

My preferences for exploring particular districts and habitats could also considerably influence our corporate knowledge of Shropshire's bryoflora. I live at the county's southern extremity, and mainly record in the beautiful pastoral landscape near my home. I make bee-lines for rocky outcrops and flushes in the hills, outcrops of limestone, wooded dingles and riverbanks. I avoid poo-laden parks, *Lolium*-leys, and verges of main roads with high volumes of noise and traffic, and will only enter the arable northern half of Shropshire when in masochistic mood or if told to do so by an arabologist.

Fluctuations in the amount of recording

Another reason why bryologists may confuse changes in their view of the bryoflora with real events in the environment is time itself. The quality and amount of recording in many districts fluctuate wildly down the years, according to the changing distribution and activity of local bryologists, rather than of bryophytes.

In common with many other counties, Shropshire enjoyed a golden age of bryological recording at the end of the 19th and start of the 20th centuries, when William Phillips Hamilton, Richard de Gylpyn Benson, Arthur William Weyman and William Hunt Painter greatly advanced what was known of the county's bryoflora. But three of this gang of four were dead by the outbreak of war in 1914, whereafter no bryologists took on the task of local recording. Instead, peoples' thoughts turned from investigating the beauties of nature to their own evermore pressing social and economic exigencies. John Bishop Duncan continued to make occasional sorties into Shropshire from his home in Worcestershire until he retired to the north country in the mid-1920s, but thereafter an era of negligible bryological recording in Shropshire lasted until after the Second World War. Then prosperity replaced austerity, bringing more leisure and triggering renewed interest in natural history. As it happens, sustained bryological recording did not resume in Shropshire until late in the 20th century, and the Border Bryologists did not start up until the mid-1990s. The BBS had met at Oswestry in 1960, Ludlow in 1979, and Ellesmere in 1992, but their excursions amounted to only a few days of exploration amidst long years of void and neglect.

Since the meeting at Ellesmere in 1992, Shropshire has seen an increase in bryological recording, with numerous species recorded new to the county, or seen for the first time since before 1950. But are these new and rediscovered species evidence of changes in Shropshire's bryoflora, or merely of changes in the kind or amount of recording, consequences of the surge, lapse, and recent resurgence of interest and activity? I suspect that much of what has appeared anew or reappeared lurked in the county all along, just waiting to be discovered, while much of what Hamilton and his henchmen found and has yet to be rediscovered is merely playing hard to get.

Since becoming recorder for Shropshire in 2000, I have tried to refind many of the species bracketed in the 1998 *Census Catalogue* (i.e. not vouched from the vice-county since before 1950). Species such as *Scapania gracilis*, *Campylophyllum calcareum*, *Cryphaea heteromalla*, *Leucodon sciuroides*, *Racomitrium affine*, *R. aquaticum*, *R. ericoides* and *Tortula marginata* may not be particularly common in the county, but neither do I suspect them of being rare. Yet none of them were vouched from Shropshire during the second half of the 20th century. Nevertheless, I am confident they were present throughout that period.

Other species certainly are rare in the county now and probably always have been. Augustin Ley and A.W. Weyman found *Tetraplodon mnioides* on Titterstone Clee Hill in 1893, as did J.B. Duncan a decade later, but that was the last sighting of this moss in the county for exactly 100 years, when it was refound in the same place. Yet I have no reason to suppose that *Tetraplodon* left Shropshire at any time during the intervening century. It was merely that no one looked. Probably the only 'change' was in the carcase it grew upon. A few yards from the *Tetraplodon*, in Titterstone's scree, Duncan found *Rhabdoweisia crispata* new to Shropshire in 1904, and that moss too was not re-recorded there for nearly a century. So far from being evidence of change, these records are evidence of no change.

Another of J.B. Duncan's records from the early years of the 20th century is of *Seligeria donniana*, which he found on mildly basic sandstone outcrops at two sites in the Severn valley below Bridgnorth. Last year I refound this moss in Bowhills Dingle (one of Duncan's sites) and as with the mosses on Titterstone, do not doubt that the *Seligeria* had lived quietly in its dingle throughout the 20th century.

So which (if any) species are becoming more or less widespread in Shropshire?

During my day in Bowhills Dingle, I noticed the frequency of *Platygyrium repens* on trunks and branches of many trees near the stream. Duncan was much too good a bryologist to have missed this moss, had it been there a century ago, and so I am just as confident that *Platygyrium* was not in Bowhills Dingle in 1904 as I am that the *Seligeria* has been there continuously ever since. *P. repens* was not recorded in Britain until the mid-20th century, and although it was first found in Shropshire as long ago as 1976, we shall never know when it arrived in the county because so few people looked. Over the last few years, this species seems to have been spreading on the English side of the Welsh border, and since 1997 I have found it at six sites in Shropshire, and several more in Herefordshire and Worcestershire. The change in *Platygyrium*'s local distribution seems to be real.

Other species that seem to genuinely be spreading in Shropshire include the epiphytes *Dicranum montanum*, *D. tauricum* and *Ulota phyllantha*. J.B. Duncan twice recorded *D. montanum* in south-east Shropshire early in the 20th century, but *D. tauricum* and *Ulota phyllantha* were not recorded from the county until 1979.

Two liverworts, *Diplophyllum obtusifolium* and *Nowellia curvifolia*, have also probably become more common. The *Diplophyllum* is a fairly frequent early colonist on banks of bare soil beside forestry tracks, where it eventually gives way to *D. albicans* unless the ground is disturbed afresh. Commercial forestry did not become widespread until the Forestry Commission was established after the First World War, but even so, *D. obtusifolium* was not recorded in Shropshire until the close of the 20th century.

However, Hamilton, Benson, Weyman and Painter laboured without the benefit of Macvicar's *Handbook*, and paid much more attention to mosses than liverworts. Therefore liverworts that have been added to the list of species known from Shropshire only in the last four years (including *Barbilophozia atlantica*, *Cladopodiella francisci*, *Gymnomitrion obtusum*, *Lejeunea lamacerina*, *Lepidozia cupressina*, *Metzgeria temperata* and *Saccogyna viticulosa*) were very probably present long before then.

Other species that have only been distinguished fairly recently and added to the county's flora include some of the bulbiliferous and tuberous *Bryums* and *Pohlias*, *Didymodon tomaculosus* and *Fissidens celticus*, none of which were recognised as distinct species a century ago. We cannot claim that their geographical distributions are changing. Many of these species are extremely similar to some of their congeners, a similarity that may explain why they were overlooked (assuming that they were!). Other bryophytes, such as *Amblystegium confervoides*, *Didymodon australasiae* var. *umbrosus* (*D. umbrosus*), *Ephemerum recurvifolium*, *Leptobarbula berica*, *Pottiopsis caespitosa*, *Tetrodontium brownianum* and *Weissia longifolia* var. *longifolia*, are easily overlooked because of their diminutive size. These species too may not be spreading in Shropshire.

Other species seem to have been lost from Shropshire. Practically all the *Orthodontium* is now *O. lineare*, not *O. gracile*. Nor can I find *Antitrichia curtipendula* or *Splachnum ampullaceum*.

Grid-based recording and local bryofloras

Many local bryofloras now include dot-distribution maps for species, so authors make a point of recording in as many grid squares in their chosen district as possible. This has the merit of prompting visits to sites that might not otherwise be explored, so that discoveries are made which otherwise would not have been.

Furthermore, smaller-scale dot-maps showing the geographical distributions of species by hectad over hundreds of square kilometres of country (as in the *Atlas of Bryophytes of Britain and Ireland*) are valuable in

showing where species have been found, and interesting for indicating where they may be expected to occur. Grid-recording therefore does have some merit, even though these national maps incorporate local recorder bias. However, distribution maps mislead whenever we cannot be confident that white gaps are as significant as black spots, for absence of evidence does not constitute evidence of absence. Many blank 10-km squares in the distribution maps of the three-volume *Atlas* do not indicate boundaries or gaps in occurrence, but gaps in our understanding of the distribution of species – markers of ignorance rather than absence.

This ineradicable fault in distribution maps becomes much more apparent at the larger-scale of county grid maps, rather in the manner that a photograph dissolves into a meaningless mass of tiny dots when one looks at it too closely. With field bryologists so thin on the ground, and the objects of our affection so small and inconspicuous, many dot maps purporting to show the distributions of species at county rather than country-level are likely to be unreliable and misleading. A small handful of bryologists cannot comprehensively quarter several hundred tetrads in a county, and therefore cannot expect to produce accurate distribution maps. And unless superhuman, a lone bryologist can reasonably expect only to produce an annotated list of records from his home county, collated from databases, publications, herbaria, and his own contemporary recording.

Summary

I am the only bryologist now regularly recording Shropshire's bryoflora and sending in records for the database at Monks Wood. So our impression of what occurs where and the distributional status of each species in the county depend on my individual foibles as a field bryologist. Where I explore in the county, which habitats I prefer to record in, and my strengths and weaknesses in identifying different species, all colour what we think we know of Shropshire's bryoflora. Furthermore, in trying to assess changes in the local bryoflora, my strengths and weaknesses have to be measured against those of bryologists who were formerly active in Shropshire. Such a comparison is virtually impossible, so I counsel against drawing facile conclusions about many apparent changes in the county's bryoflora, which may not be changes at all.

Nevertheless, we are justified in presuming that Britain's bryoflora has changed as some habitats have become rare and others have replaced them. Much deciduous woodland was felled during the First World War and later replaced by softwood plantations. Mires were drained, water-courses altered, and towns and villages have spread. Hedges have been uprooted, arable fields replaced many pastures, and changing techniques of husbandry further altered the floras of both arable and pastoral land. Botanists therefore suppose that the frequency and distribution of most (if not all) species have changed, at least to some small extent, and will continue to do so, either qualitatively in terms of their distribution or quantitatively in terms of abundance. But without evidence we are not entitled to replace this supposition with unequivocal statements of fact. On a national scale, the reappearance of numerous epiphytic species in districts where they had not been seen for many years is indeed unequivocal, but for the most part we will never know, and can only speculate, how much bryofloras have changed.

Changes in dotty maps do not necessarily constitute evidence of changes in our bryoflora. Judicious interpretation of records suggests that some species have indeed spread in Shropshire over the last century, and that others have become rarer. But clear-cut evidence of substantial successional changes exists for only a minority of species in Shropshire, while no evidence of any kind exists for contemporary evolutionary changes in Shropshire's bryoflora.

Bibliography

For the full text of this article, go to www.britishbryologicalsociety.org.uk, follow links to UK bryodiversity and the vice-county map, and then click on v.-c. 40. Further details of Shropshire's bryoflora can also be found here.

For a more detailed discussion of the differences between succession and evolution, and how they are identified, studied, and often confused, see *The History of Nature* at http://ralph.cs.cf.ac.uk/HON/Hon.html. *The History of Nature* also relates how interest in natural history has waxed and waned down the years, in response to fluctuating economic and social conditions.

For further discussion of the history of bryological exploration, and fluctuations in the extent of interest in bryological recording in Britain, see *A Social and Biographical History of British and Irish Field-bryologists* at http://ralph.cs.cf.ac.uk/HOB/HOBBintro.htm.

The changing bryophyte flora of south Wales

Sam D.S. Bosanquet (Countryside Council for Wales, Pembroke)

Introduction

The bryophyte flora of south Wales, comprising Pembrokeshire, Carmarthenshire, Glamorgan, Monmouthshire and the southern part of Breconshire, has been less well known than that of many parts of Britain, at least until recently. The lack of continuous recording in any one vice-county during the 20th century means that changes in bryophyte distribution and frequency are difficult to observe. However, differences are clearly visible between the flora documented by early 20th century bryologists, notably H.H. Knight in Carmarthenshire, and the flora now. This change can be examined in a similar way to that in which Jones (1991) examined the changing bryophyte flora of Oxfordshire.

Declining species

Many declines seem to be on a regional level, although each vice-county has lost a different array of species. Six of the ten species that have not been recorded in Pembrokeshire since the early 20th century grew on coastal slopes, a habitat that has deteriorated due to scrub encroachment in the intervening period; these species include *Antitrichia curtipendula*, *Tortula canescens* and *T. cuneifolia*. Sand dunes have been the focus of loss in Carmarthenshire, with five of the 16 lost species coming from that habitat, including *Bryum intermedium*, *B. warneum* and *Abietinella abietina* (*Thuidium abietinum*). Several decades without grazing and the coniferisation of one dune system are probably the causes. The apparent disappearance of *Splachnum ampullaceum* from Carmarthenshire is remarkable as Knight recorded it at five localities. At its extant sites elsewhere in the region, this species grows on cattle dung, and cattle grazing in the Carmarthenshire uplands has almost ceased. Knight's sites are now either sheep-grazed or, in two cases, have been drained and coniferised. The loss of *Dicranella cerviculata* from Pembrokeshire and Monmouthshire is also due to a change in the management of acidic wetlands: the cessation of peat cutting during the 20th century.

Other species have not been lost altogether, but comments by early recorders suggest that they used to be more common than they are now. For example, in his Carmarthenshire Flora, Knight mentions two sites for *Rhodobryum roseum* followed by 'etc.' suggesting regular encounters; there are also five other pre-1950 records from the county, all from hedge-banks. Only one of the three recent records is from a hedge-bank despite much searching of this habitat. The change to mechanical mowing of hedge-banks may have affected the growth of vascular plants at the expense of *Rhodobryum*. *Grimmia laevigata*, *G. ovalis* and *Hedwigia ciliata*, which grow on stone-tiled roofs in Monmouthshire, have surely declined dramatically as their habitat has been replaced with slate or artificial tiles. At one time every church and many barns in the county would have had locally quarried tiles, whereas now only about one third of churches are tiled and only 16 retain their moss assemblage.

Increasing species

Despite these declines, many more species are now known from south Wales than in Knight's time. This is primarily because of an increase in recording but is partly because some species have spread into the area. There have also been increases in the abundance of certain species.

In his account of the changing bryophyte flora of Oxfordshire, Jones describes an 'increasing acidophile element' comprising the naturalised exotics *Campylopus introflexus* and *Orthodontium lineare*, three species of *Dicranum*, *Dicranoweisia cirrata*, six more mosses and two liverworts. Most of these species were unknown in south Wales in the early 20th century, with only *Plagiothecium undulatum* widespread and *Dicranoweisia cirrata* present at low abundance. With the addition of *Herzogiella seligeri* in 2004, all members of this acidophile element now grow in the region. Most show clear east-west decreases in abundance, exemplified by *Aulacomnium androgynum*, which is frequent in Monmouthshire, occasional in Glamorgan and rare in Carmarthenshire. *O. lineare* is also uncommon in west Wales, with only 17 Carmarthenshire records, all from the county's lowlands.

Nowellia curvifolia was unknown in south Wales in the early 20th century but is now widespread and is often abundant in humid valleys in the uplands. Knight did not find it at a number of sites where it now carpets logs. Jones (1991) suggests that conifer plantations and neglected silviculture aided the spread of *Nowellia*; this may well be the case, but in south Wales it is only irregularly encountered in plantations, favouring humid semi-natural woodland instead. A change in reproductive strategy is an alternative potential explanation (T. Blackstock, pers. comm.). Both

explanations may also account for the spread of *Colura calyptrifolia*, which favours young trees in conifer plantations and disused quarries, and seems suddenly to have become widespread in south Wales.

Other acidophiles have changed their behaviour slightly in response to changing environmental conditions: the saxicolous mosses *Ptychomitrium polyphyllum*, *Racomitrium fasciculare* and *R. heterostichum* now grow as epiphytes near the Ebbw Vale Steel Works in Monmouthshire. This is especially remarkable because they grow on the same poplar trunks as more typical epiphytes such as *Orthotrichum affine* and *Ulota bruchii*.

Other species we now consider commonplace have increased because of man's activities. For example, Knight described *Grimmia pulvinata* as 'not common', and only mentioned two Carmarthenshire sites for *Syntrichia intermedia* and one for *Orthotrichum anomalum*. These mosses are typical of limestone, hard cement and concrete, and appear to have increased as the latter has replaced lime mortar as the primary wall mortar in the region. *Didymodon rigidulus*, which grows on both concrete and lime mortar, was 'frequent on walls' in Knight's time and remains so. *Aloina aloides*, which favours soft lime mortar and was listed with an 'etc.' in Knight's Flora, is now found on very few walls in the county and has clearly declined.

The Survey of the Bryophytes of Arable Land has provided a good picture of the state of arable bryophytes in south Wales. Knight described *Anthoceros* as 'fairly common in fallow fields' in Carmarthenshire, and this continues to be the case in the region, with *A. agrestis* present in over half of surveyed fields in Monmouthshire, at least after a wet summer as in 2004. *Riccia glauca* and *R. sorocarpa* vary in abundance but are almost constant in stubble fields. In contrast, Jones suggested that *Riccia* species had declined dramatically in Oxfordshire and hornworts had almost vanished. The picture is not uniform across south Wales. In the intensively farmed Vale of Glamorgan, arable fields are ploughed very soon after harvest and most hold only common mosses; maize and root crops, both of which have very poor bryophyte assemblages, have largely replaced cereal in the dairying heartlands of central Pembrokeshire and Carmarthenshire; it is in the marginal arable areas, such as Monmouthshire and coastal Pembrokeshire, that many cereal fields remain as stubbles through the winter and the flora remains rich. Thus there have been changes in the arable flora, but these are less dramatic than in some parts of Britain.

Summary

The bryophyte flora of south Wales has changed in similar ways to the floras of other well-studied regions in Britain. Some habitats, notably coastal slopes and dune systems, have changed dramatically, and their bryophyte floras have declined as commonplace species replace specialists. It is likely that the overall bryo-mass in the countryside has declined as moss-less Rye-grass fields now cover large areas of south Wales. However, many habitats remain much the same as they did in the past and retain a good range of species. Acidophile invaders from both the east and the north-west have augmented the flora that Knight knew, and certain calcicoles that he considered scarce have now become common. Nevertheless, many species that he was familiar with remain in roughly the same abundance as in his time.

Reference

Jones EW. 1991. The changing bryophyte flora of Oxfordshire. *Journal of Bryology* **16:** 513-549.

Recording schemes for special habitats, especially churchyards, urban habitats and orchards

Robin Stevenson (King's Lynn, Norfolk)

The detailed examination of specific habitats (which need not be 'special'), offers a change from the hurly-burly of general recording. Focussing on a particular habitat always raises questions of how and why plants are growing where they are, and suggests interesting lines of enquiry, from which one can start to formulate hypotheses.

Having decided on something to study, primary research in the literature will help to identify useful recording techniques and areas of particular ignorance, although once you start trying to find information about specific habitats, you may find that there is remarkably little (if any) information available.

Whether starting from scratch, or seeking to augment previously collected data, time needs to be spent devising (and field testing) data collection sheets; hard figures will be needed to back up your conclusions. If you want to publish your results at a later date, then you

may be faced with the ghastly prospect of statistics. It is probably a good idea to talk to someone numerate before you start, rather than finding out later that some vital data were not collected. Having said that, however much data you collect, you may be sure that, halfway through, you will find something you wish you had recorded.

Although most bryologists probably live in towns, urban bryophytes seem to have been neglected by British bryologists, apart from the classic studies made by Oliver Gilbert in the late 1960s, who correlated bryophyte communities in the Newcastle area with increasing levels of sulphur dioxide pollution. Continental bryologists, on the other hand, have done a lot of work on urban bryofloras, as a result of which a number of 'urban myths' seem to have developed. One, for instance, is that urban bryofloras are impoverished. A study of King's Lynn shows that, compared with areas of equal size over most of Norfolk, its bryoflora is actually quite rich. The concept of urban impoverishment (and a number of other assertions) appears to be distinctly suspect – but more work, on more urban areas, is needed.

The eastern counties of England have virtually no natural rock outcrops, and so churchyards and ecclesiastical buildings (which are often made from a rich variety of imported rock types) are important habitats for epilithic (and other) bryophytes. Detailed examination of data from churchyards in Norfolk seems to show that they possess a markedly thermophilic bryoflora. They are also major refuges for a series of plants that, although common in the county as a whole, are only common because there are so many churchyards; species such as *Didymodon vinealis* and *Rhynchostegiella tenella* are quite rare outside consecrated ground. Casual observations elsewhere in Britain suggest that other areas, with differing geology and socio-economic histories, may have very different churchyard floras.

Orchards are the new hedgerows: many of them have been destroyed in recent years, and conservationists are just beginning to wake up to their potential as refuges for biodiversity. However, if one is to make a convincing case for the preservation of orchards, information is needed – and there is very little of that, apart from a pilot study initiated by English Nature. Data collected so far indicate that orchards may be quite rich in epiphytic species, but this raises a number of interesting questions. For example, in attempting to assess their richness, what does one compare them with? The obvious answer is woodland, but woodlands, whether ancient or more recent, differ profoundly in structure and management from orchards – factors that will, in turn, have a major influence on micro-climate, etc. Comparing orchards and ancient woodland may not be quite as bad as comparing chalk and cheese, but is certainly rather like comparing Brie and Stilton. Orchard trees are usually low-growing, to aid fruit harvesting; one is therefore able to sample the canopy directly. Is the mossiness of orchards real? Or, if we had more data about canopy bryofloras from other habitats, would their significance dwindle? The number and range of species present may vary wildly between adjacent trees – and even adjacent branches. What does this tell us about colonisation patterns?

If anyone is interested in any of these topics I will be happy to supply them with copies of my recording sheets, and to point them towards such literature as is available.

The Survey of the Bryophytes of Arable Land: an update

Jonathan Sleath (Kingstone, Hereford)

The Survey of the Bryophytes of Arable Land (SBAL) project has completed two years of recording and is now embarking on its final season. It was launched at Preston Montford in the autumn of 2002, and at the last count 369 fields had been visited and surveyed, from 203 10-km squares. This is a project to which any bryologist can contribute, and 70 names have found their way onto the cards, with some members being particularly enthusiastic.

One arm of the study involves visiting fields in tetrads selected randomly in areas believed to be rich in arable fields from satellite imaging.. This has generated 100 tetrads. All but a handful of these have either been recorded already, or a commitment has been made to record before the project finishes. The other arm consists of visits to any field felt to be in a suitable condition for recording. For each field a survey card is completed containing general information about the field as well as a list of species found, their relative abundance and fertility. Three soil samples are taken for pH measurement, and the completed cards are returned to Chris Preston at Monks Wood where the information is transcribed onto a database for subsequent analysis.

A lot of new vice-county records have been made. These include common species, such as *Bryum violaceum*, as well as rarities. Particular excitements include *Fossombronia caespitiformis*, *Phaeoceros carolinianus*, *Didymodon tomaculosus*, *Leptophascum leptophyllum* (*Chenia leptophylla*) and *Weissia squarrosa*. The 2003/04 season was rather disappointing, as a dry autumn meant that many bryophytes were very slow to come into growth. This coming winter promises a bumper crop of arable bryophytes, with many species already having made good growth following an exceptionally wet August. It is hoped that this will stimulate SBAL participants to make a final push to complete recording in the random tetrads and in as many other fields as possible.

Should we have a recording scheme for autecological attributes?

Dr Jeffrey W. Bates (Department of Biology, Imperial College at Silwood Park)

Background

The aim of this talk is to suggest some future activities of the BBS that depart from the current vogue for distribution mapping and instead focus upon the day-to-day lives or ecologies of British bryophytes.

The discipline of bryology has long been the product of university-based research and the activities of the various national bryological societies among which the BBS holds a paramount position. Indeed, it is often reflected that the mixture of amateur and professional members in the Society has worked to the considerable advantage of both parties. However, we are faced with a situation where, within a decade, there will probably be no person recognisable as a bryologist in post at a British university, although a certain amount of taxonomic work may continue at botanical gardens, the larger museums and conservation organisations. This has come about because the limited government funds for research are nowadays focused on issues perceived as being of strategic importance and, specifically in biology, on socially beneficial advances in molecular biology and biomedical science. The situation is quite similar in the USA and some other developed countries. We must face the fact that, increasingly, the various specialist botanical and zoological societies are becoming the last bastions of endeavour for the traditional disciplines they represent.

It is proposed that the BBS should prepare for this significant change in status by accepting responsibility for a wider range of bryological activities than hitherto. In particular, greater use could be made of its members' talents and its relatively strong financial position to help carry bryological science forward, where this is a practical possibility. Direct funding of university research is probably not going to be a cost-effective or satisfying option for our relatively small Society. However, capitalising on its in-house expertise by fostering individual members' projects and organising larger scale co-operative projects on aspects of the general biology, ecology and even physiology of bryophytes should be perfectly feasible aspirations. Over the years, the Society has had considerable success in complementing, if not leading, bryological research in Britain. It has raised identification skills to remarkable heights among British bryologists by establishing the moss exchange, putting in place referees, arranging excursions, and producing the regularly updated census catalogues. It had the forethought and courage to run the 30-year project that led eventually to the publication of the *Atlas of the Bryophytes of Britain and Ireland* (with its many spin-offs in county mapping projects). More recently, the BBS has supported two rather more specialised surveys: the fairly small-scale epiphyte survey (which, nonetheless, has resulted in two scientific publications) and the somewhat grander (in scope if not in beauty of the subjects) survey of arable field bryophytes. Each of these triumphs represents a significant milestone. They remind us what can be achieved if we pull together and invite us to search for new collective challenges.

Bryophyte Profiles

What should we be doing next? I am sure that a range of general and more focused mapping and re-mapping projects will continue for some years to come. However, we know so little about the everyday lives of even our commonest bryophytes that some kind of concerted effort to improve our knowledge of their basic biology, including seasonal growth and reproductive patterns, responses to common abiotic stresses (light, temperature, desiccation, nutrients), types of niches and habitats occupied, relative growth rates and competitive abilities, and life strategies, should be a high priority. Successful conservation of rare species is increasingly dependent on scientific knowledge of these basic processes and requirements. We have already taken a modest first step in the right direction. A scheme for studying the biology of individual bryophyte species was

introduced, through the *Journal of Bryology*, in the 1990s, but so far only two accounts have been submitted for publication (as *Bryophyte Profiles*). We need to find ways of easing some of the technical constraints that undoubtedly discourage potential authors from contributing accounts of their favourite bryophytes.

Autecological attributes

It would be a great second step if more members could be encouraged to take on *Bryophyte Profiles* studies, but a more adventurous project altogether would be for us to organise ourselves to gather data on a selection of the more important ecological attributes listed above for a significant set of common British bryophytes. This might be attempted for the 100 commonest bryophytes, or for the approximately 250 'main' species that form the backbone to E.V. Watson's classic *British mosses and liverworts*. Such an endeavour might rather nicely complement projects within the *Bryophyte Profiles* scheme, especially if the latter focused mainly on the rarer bryophytes. Would it be beyond the bounds of possibility to gather together a small but enthusiastic group of BBS members with contrasting skills to tackle, over several years, the widely varying aspects of such a project? This type of information could eventually be published in an attractive 'ecological atlas' format that would undoubtedly become a standard reference work for bryologists, conservationists and ecologists. An admirable vascular plant forerunner, but one on which we could no doubt improve, is Grime, Hodgson & Hunt's (1988) *Comparative plant ecology*. Of course, we would also want the work to include an interactive database supplied in a convenient computer-readable format and this might even include photographic images of the plants as well as of communities and habitats.

A project of this complexity would pose many challenges and it would probably also only interest a portion of the Society's membership. The problems and challenges could probably best be met within the supportive framework of a BBS Bryophyte Ecology Group. This might be based to some extent upon the model of the highly successful Tropical Bryology Group (TBG). Like the TBG it would be open to all interested BBS members. Once established, such a group might be expected to operate predominantly by running annual workshops on techniques (the group might accumulate its own equipment) and undertaking data gathering in both field and laboratory.

If you are interested in the projects described above, see 'Invitation to Join the BBS Bryophyte Ecology Group' on pages 47-48 of this issue of *Field Bryology*.

Reference

Grime JP, Hodgson JG, Hunt R. 1988. *Comparative plant ecology: a functional approach to common British plants*. London: Unwin Hyman.

Inventory of hepatics and mosses in Geneva, Switzerland

Michelle J. Price, Ariane Cailliau & Laurent Burgisser (Conservatory and Botanical Garden of Geneva)

Switzerland and the Swiss plateau

Switzerland, nestled between France, Germany, Austria and Italy in central Europe, is about twice the size of Wales. Renowned for its Alpine heritage and scenery it is in fact divided into three geologically and floristically different regions: the Alps, the Swiss plateau, and the Jura. These regions constitute 60%, 30% and 10% of the country respectively. It is on the Swiss plateau, between Lake Constance in the north-east and Lake Geneva (Lac Léman) in the south-west, that the majority of the population live, and where agriculture and industry are concentrated. The plateau consists of rolling hills, lakes and river valleys, and covers all or part of the following cantons: Schaffhausen, Thurgau and Zürich, at the north-eastern end; Aargau, Bern, Luzern and Fribourg, in the central plateau; and Vaud and Geneva, at the south-western end. With its population pressures and high percentage of land under cultivation, the plateau is perhaps the least bryologically visited region of the country.

Geneva: a city and a canton

Geneva, a city famous for its international organisations, is situated at the south-western end of Lac Léman and is at the heart of the canton of Geneva. The canton comprises 282 km² of land which, apart from a short border with the Swiss canton of Vaud, is completely surrounded by France. It is divided in half by the Rhône river and consists of a network of villages, cultivated land (cereal and vegetable crops, sunflowers, vineyards and orchards) and more natural habitats along the Rhône, Versoix, Allondon and Laire rivers. Despite its

small size, Geneva has a number of interesting urban and non-urban habitats, including some of national importance, such as the Allondon river valley and the Moulin-de-Vert.

Bryology in Switzerland and Geneva

The tradition of bryological study is relatively well-established in Switzerland. The first catalogue of bryophytes for the country was published by Albert von Haller in 1742 as part of his work *Enumeratio Methodica Stirpium Indigenarum Helvetiae*. A second, dealing only with mosses, was published by Lesquereux in 1845. The third significant publication on bryophytes for Switzerland, *Flore des mousses de la Suisse*, came in 1918 (Amann, Meylan & Culmann, 1918), and this was followed by *Les hépatiques de la Suisse* in 1924 (Meylan, 1924).

A period of bryological activity between the late 1880s and early 1900s, based around the Conservatory and Botanical Garden of the city of Geneva and its herbarium (G), included bryological collecting excursions and the publication of catalogues for hepatics (Bernet, 1888) and mosses (Guinet, 1888) for the Geneva region. During this peak of activity, a collection of around 6,000 bryophyte specimens from Geneva was built up at G, making this herbarium a valuable resource for the study of local bryophytes. Following publication of his catalogue of mosses, Auguste Guinet continued his collecting activities around the region (Guinet, 1889, 1891, 1894, 1896, 1901, 1905, 1908, 1909, 1912, 1916, 1922) often in association with Henri Bernet, Josef-Bernhard Jack, Vénance Payot and Georges-François Reuter who were distinguished Geneva-based botanists/collectors at that time (Briquet, 1940). Bernet, who was more interested in hepatics, also made an enormous contribution to the understanding of the bryophyte flora. The collections deposited in G and the publications of Guinet and Bernet form the foundation of the current project.

Despite the peak of bryological activity from the 1880s to 1930s in Geneva, this canton appears to be among the least studied cantons in Switzerland (NISM, 2003).

The inventory

Our cantonal inventory, begun in early 2004 in collaboration with the Service des Forêts, de la Protection de la Nature et du Paysage (SFPNP) of Geneva, marks the revival of interest in the moss and hepatic flora of Geneva. After the activities of Guinet and Bernet, there was a long lull in bryological research at the cantonal level, and today we are faced with a gap of over 70 years in our understanding of the presence and distribution of bryophytes within the canton. This is particularly significant since the canton has undergone an enormous amount of development in both its urban and rural landscapes during the 20th century. The two main factors affecting the habitats of the canton are the expansion of the city of Geneva, and surrounding villages, to accommodate the ever-growing population of the canton, and the modification of agricultural and land management practices.

Our efforts to complete a bryophyte inventory of the canton started with the compilation of literature-based listings of hepatics (49 species (Cailliau & Price, 2005)) and mosses (201 species (Burgisser & Price, 2005)). During preliminary collecting and recording excursions we discovered a number of bryophytes that were new to the canton (Burgisser *et al.*, 2004; Price & Burgisser, 2005), including one species, *Cryphaea heteromalla*, that is of rare status within Switzerland (Price, 2003). The next phase of the project will encompass the databasing of all available bryophyte collections and records from Geneva, the continuation of collecting and recording efforts in the canton, and finally the production of a collections-based inventory of the bryophytes of the canton. The final inventory will support the provision of data on the distribution and ecology of different species within the canton, the assessment of bryological change, and the preparation of site-specific information on bryologically significant areas for use by the conservation department of the canton. On a national scale, data from our Geneva inventory will contribute towards the national bryophyte mapping project, *Naturräumliches Inventar der Schweizer Moosflora* (NISM), that is currently underway at the Institute for Systematic Botany in Zürich (Bisang *et al.*, 1998; Urmi, Schnyder & Geissler, 1990; NISM, 2003), and to future bryophyte red list data for Switzerland (Schnyder *et al.*, 2004).

References

Amann J, Meylan C, Culmann P. 1918. *Flore des mousses de la Suisse. Bryogéographie de la Suisse.* Genève: Herbier Boissier.

Bernet H. 1888. *Catalogue des hépatiques du sud-ouest de la Suisse et de la Haute-Savoie.* Genève: H. Georg Librairie-Editeur.

Bisang I, Geissler P, Müller N, Schnyder N, Schubiger-Bossard C, Urmi E. 1998. Die Verbreitung von Moosen in der Schweiz und in Lichtenstein. 1. Ein erster Einblick. *Botanica Helvetica* **108:** 197-216.

Briquet J. 1940. Biographies des botanistes à Genève de 1500 à 1931. *Berichte der Schweizerischen Botanischen Gesellschaft* **50a:** 1-494.

Burgisser L, Habashi C, Clerc P, Price MJ. 2004. Inventaire des lichens et des bryophytes de Bois de la Grille. *Saussurea* **34:** 111-129.

Burgisser L, Price MJ. 2005. Inventaire des mousses du canton de Genève. 1. Catalogue bibliographique (1791-2001). *Candollea* (in press).

Cailliau A, Price MJ. 2005. Inventaire des hépatiques du canton de Genève. 1. Catalogue bibliographique (1888-2001). *Candollea* (in press).

Guinet A. 1888. *Catalogue des mousses des environs de Genève.* Genève.

Guinet A. 1889. Additions et corrections au Catalogue des Mousses des environs de Genève. *Bulletin de la Société Botanique de Genève* **5:** 12-19.

Guinet A. 1891. Mousses rare ou nouvelles pour la florule des environs de Genève. *Revue Bryologique* **18**: 20.

Guinet A. 1894. Récoltes bryologiques aux environs de Genève. *Revue Bryologique* **21:** 68-71.

Guinet A. 1896. Récoltes bryologiques aux environs de Genève. *Revue Bryologique* **23:** 91-92.

Guinet A. 1901. Récoltes bryologiques aux environs de Genève. *Revue Bryologique* **28**: 97-100.

Guinet A. 1905. Récoltes sphagnologiques aux environs de Genève. *Revue Bryologique* **32:** 85-86.

Guinet A. 1908. Récoltes hépaticologiques aux environs de Genève. *Annuaire du Conservatoire et Jardin Botanique de Genève* **11-12:** 170-174.

Guinet A. 1909. Herborisation bryologiques à la montagne de Veyrier et au Roc de Chère Alpes d'Annecy. *Annuaire du Conservatoire et Jardin Botanique de Genève* **13:** 52-65.

Guinet A. 1912. Nouvelles récoltes bryologiques aux environs de Genève. *Annuaire du Conservatoire et Jardin Botanique de Genève* **15-16:** 288-296.

Guinet A. 1916. Nouvelles récoltes bryologiques dans les environs de Genève. *Annuaire du Conservatoire et Jardin Botanique de Genève* **20:** 18-24.

Guinet A. 1922. Quelques sphaignes des environs de Genève. *Revue Bryologique* **49:** 9-11.

Meylan C. 1924. Les hépatiques de la Suisse. *Beiträge zur Kryptogamenflora der Schweiz.* **6:** 1-318.

NISM. 2003. *Die Moose der Schweiz und Liechtensteins. Provisorischer Verbreitungsatlas.* Unpublished manuscript.

Price MJ. 2003. The moss *Cryphaea heteromalla* (Hedw.) D. Mohr. (Cryphaeaceae) new for the canton of Geneva, Switzerland. *Meylania* **27:** 7-11.

Price MJ, Burgisser L. 2005. Hepatics and mosses of Geneva. 1. New and interesting moss records. *Candollea* (in press).

Schnyder N, Bergamini A, Hofmann H, Müller N, Schubiger-Bossard C, Urmi E. 2004. *Liste Rouge des bryophytes menacées en Suisse.* Suisse: Office fédéral de l'environnement, des forêts et du paysage (OFEFP).

Urmi E, Schnyder N, Geissler P. 1990. A new method in floristic mapping as applied to an inventory of Swiss bryophytes. In: Bohn U, Neuhäusel R, eds. *Vegetation and flora of temperate zones.* The Hague: SPB Academic Publishing, 21-32.

Field excursions during the 2004 autumn meeting

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The theme of the weekend was 'recording bryological change', with excursions to habitats that had been much altered by human activities.

Saturday 9 October

Members entertained themselves in mild, dry and bright conditions during the Saturday afternoon in four fields of wheat stubble at **Pim Hill** (SJ4821), north of Shrewsbury, and enthusiastically recorded their discoveries on SBAL cards for the national survey of arable bryophytes. The farm had been 'organic' (i.e. without use of herbicides, insecticides or inorganic fertiliser) for at least 50 years, which lent additional interest to our investigations, for little seems to be known of the extent to which (or even whether) chemical treatments affect arable bryofloras.

We recorded totals of 14, 18, 21 and 28 species from the four fields, our choicest finds being modest quantities of *Anthoceros agrestis* and *Acaulon muticum* from two fields, and *Phascum cuspidatum* var. *schreberianum* (*Tortula acaulon* var. *schreberiana*) from one field. *Fossombronia wondraczekii*, *Pleuridium subulatum* and *Pseudephemerum nitidum* were also of interest, as these species are not normally rounded up among the usual suspects from arable fields in Shropshire.

We await the conclusions from the SBAL survey to see whether organic arable fields contain bryofloras which differ from those of 'inorganic' farms, but meanwhile feel satisfied with the bryodiversity we found at Pim Hill. The kindness of John Gwilliam, the farm manager, was very significant in the success of our afternoon, for he had considerately postponed ploughing the four fields which he made available to us.

Sunday 10 October

Spoil around abandoned lead mines provided a different kind of disturbed habitat for Sunday afternoon's excursions. Members explored three sites: **The Bog** (SO3597), **Gravels** (SJ3360) and **Snailbeach** (SJ3702). The Bog and Snailbeach are owned or managed by Shropshire County Council, and are open to the public. The Gravels was thrown open to us by kind permission of the owners, Mr and Mrs Gough.

The Snailbeach contingent found *Cephaloziella hampeana*, while spoil and other ground surrounding abandoned lead mines at Gravels yielded *Barbilophozia barbata*, *B. floerkei*, *Archidium alternifolium*, *Bryum pallescens* and *Racomitrium elongatum* but none of the rarities that are restricted to substrates containing large amounts of lead.

By popular demand, an addendum to the weekend's *al fresco* activities became necessary following Dan Wrench's wonderful discovery of *Jamesoniella undulifolia* a couple of weeks previously on **Hopesay Hill** (SO3983), west of Craven Arms. This Red Data Book species is classified as Endangered in Britain, with only three other post-1970 records, so is a most welcome addition to Shropshire's bryoflora. Members met with mixed success in their attempts to relocate the colony of this liverwort, which looks much like *Odontoschisma sphagni* in the field, save perhaps for a touch more green to its leaves. But for those whose search was crowned with success, while a westering sun ensanguined the skies and cast long shadows over the hills around Hopesay, these few peaceful moments drew a veil of contentment over a weekend that had been full of bustle and interest.

SBAL meeting at Turriff, North Aberdeenshire, October 2004

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Eight bryologists converged on Turriff on 29-31 October 2004 for this special BBS meeting. In the current Survey of the Bryophytes of Arable Land (SBAL), 100 'random' tetrads have been selected for study in Britain, and our primary aim was to record two arable fields in each of the nine tetrads in north-east Scotland (v.-c. 90-94). We also hoped to survey as many other fields as possible, both for SBAL and to complement the records from other habitats made on the summer meeting in v.-c. 93.

Mark Hill, Ron Porley and Chris Preston travelled to Turriff via Fife. When leaving Fife on Friday morning we were delayed by local flooding, following heavy overnight rain. As we drove north in a continued downpour our subconscious doubts about the wisdom of