



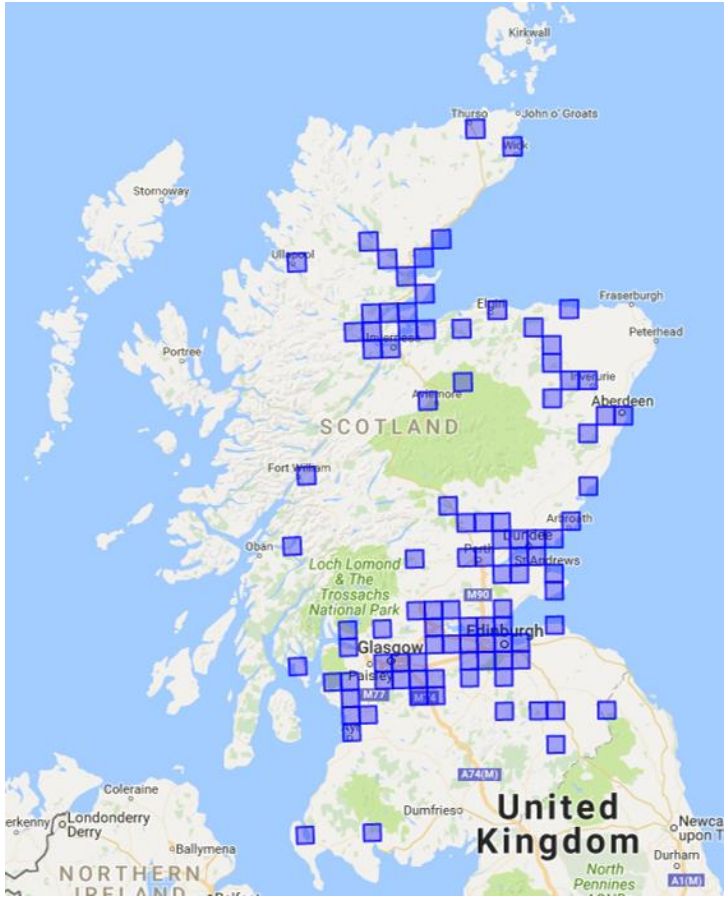
BSS News

The Newsletter of the
Botanical Society of Scotland

No. 108

March 2017







The Botanical Society of Scotland is a Scottish Charitable Incorporated Organisation (SCIO) (No. SC016283)

Front cover pictures

Outside *Linnaea borealis* (Twinflower) in a pine plantation at Wester Culbo on the Black Isle. Image by Brian Ballinger. See article on page 27

Inside

Top left: Locations of Urban Flora records so far. Image by John Grace. See article on page 10.

Top right: *Linnaea borealis* (Twinflower) site at Drove Stance, Easter Ross. Image by Brian Ballinger. See article on page 27.

Bottom left: Studying the species-rich grassland on the Cam Chreag. Image by Lyn Jones. See article on page 24.

Bottom right: *Tofieldia pusilla* (Scottish Asphodel) on the Cam Chreag. Image by Alan Walker. See article on page 24.

Botanical Society of Scotland

c/o Royal Botanic Garden Edinburgh

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Website: <http://www.botanical-society-scotland.org.uk>

You can follow the BSS on Facebook and Twitter via the website.

Founded in 1836 as the Botanical Society of Edinburgh, the Society became the Botanical Society of Scotland in 1991. Meetings are held in Edinburgh, Glasgow, Aberdeen, Dundee, St. Andrews and Inverness. The Society encourages the study of flowering and non-flowering plants. Activities of the Society include lectures, field meetings, symposia, surveys, and an annual exhibition meeting for the exchange of information on all aspects of Scottish botany. All botanical enthusiasts are welcome to be members of the Society, including gardeners, professional plant scientists, amateur field botanists and students. All members receive information about the events of the Society, including programmes of lectures and field meetings, as well as a twice-yearly newsletter, *BSS News*. Standard membership also includes the scientific journal: *Plant Ecology & Diversity*, published by Taylor & Francis on behalf of the Botanical Society of Scotland.

Applications for membership of the Botanical Society of Scotland should be made to the Hon. General Secretary at the address at the top of this page. Please ask for a Banker's Order form if required.

Subscriptions fall due on 1st October each year:

Standard rate (with the Journal <i>Plant Ecology and Diversity</i>)	£40.00
Standard rate for undergraduate students (with the journal)	£30.00
Basic rate (without the journal)	£20.00
Basic undergraduate student rate (without the journal)	£5.00

Subscriptions can be paid by cash, cheque (payable to the Botanical Society of Scotland), or Banker's Order. Alternatively, you can pay by PayPal via the BSS website membership page:

<http://www.botanical-society-scotland.org.uk/content/bss-membership>

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Botanical Society of Scotland

EDITORIAL

At the BSS News we rely on our contributors to provide images for the four colour covers of each issue. Usually the images illustrate one of the articles, as all do in the current issue. However, this need not be the case and we welcome good quality images on any botanical theme: photographic, digital, drawings or paintings.

Geoffrey Halliday added further details on the life of Duncan Poore, whose obituary was in BSS News 107. A major outcome of Poore's work on the phytosociology of Scottish mountain vegetation was the paper he wrote with Donald McVean: A new approach to Scottish mountain vegetation (1957. *J. Ecology*, **45**:401-43). The authors related patterns of variation in the vegetation of the Scottish Highlands to geographical and environmental factors, particularly altitudinal variation, oceanicity, snow cover, base status and moisture. They showed how their methods could be applied to the analysis of vegetation and the distribution of communities on a regional scale.

We are delighted to welcome the five new BSS Council members shown on the inside back cover. Brief CVs are on page 54. As the following article about the AGM explains, many of our Council members will be required to stand down at this year's AGM on 18th May. They may stand for re-election but this is also an opportunity for BSS members to propose and vote for new Council members. Please note the deadlines below for nominations and for postal or proxy voting. The AGM will follow Professor Lynne Boddy's talk on Fungus Wars at 6pm – don't miss it!.

Jane MacKintosh and Jill Thompson

ANNUAL GENERAL MEETING 2017

The 2017 Annual General meeting of BSS SCIO will take place on Thursday 18th May immediately following the lecture in the RBGE lecture theatre.

Timeline Summary

- 20th April: Deadline for nominations to Council
- 1st May: Voting papers published on BSS Website
- 11th May: Deadline for requests for voting papers and proxy forms to be posted out.
- 18th May noon: Deadline for receipt of postal and email votes
- 18th May: AGM following the lecture.

Provisional Agenda

1. Apologies for absence
2. Draft Minutes of AGM 2016 for approval
3. Election/re-election of Council members
4. President's Report
5. Treasurer's Report
6. Determination of subscription rates
7. Any Other Business

Membership of Council

Since 15th April 2014 our Constitution requires all those members of Council who have served for three years to step down at the AGM. They are then eligible to stand for re-election in competition with any new candidates who have been proposed by the Members. Since BSS SCIO will be three years old on 15th April 2017, a large proportion of our Council will be required to stand down at this year's AGM. This process is intended to allow members to have a say on the recruitment of new blood onto Council while retaining the balance of experience of those members who have already served.

Members are therefore invited to nominate another member of the Society to stand for election to Council. Council is particularly keen to hear from younger members who would like to participate in running the Society. The candidate's permission must be obtained in advance. Each nomination shall be accompanied by the name of the proposer and a seconder, both of whom shall also be members of the Society, and a brief (2 sentence) résumé of the interests and experience of the

proposed candidate. Nominations should be sent to the General Secretary of the Society (address below), by email or post, to be received **no later than 20th April**. The list of candidates for Council will be published by email and on the BSS web site during the last week of April.

Voting at the AGM

Voting at the AGM will *either* be in person *or* by proxy, email or postal vote.

Any member of the Society is entitled to nominate a proxy to vote on his/her behalf at the AGM. The proxy need not be a member of the Society. A Member who wishes to appoint a proxy must lodge with the Society, prior to the commencement of the AGM, a written proxy form, signed by him/her. Proxy forms will be available from the web site or may be requested from the General Secretary **no later than 11th May**.

Votes may also be cast by email or by postal vote. Votes by email must be submitted on a copy of the voting paper that will be available for downloading from the Member's area of the web site. Voting papers will be available on the website from **1st May**. The completed voting slip must be submitted from the email address registered with the Society no later than mid-day on the day of the AGM (**18th May**).

Voting papers will only be distributed by post to those who request them in writing or by email to the General Secretary. Members who wish to vote by post may request voting papers to be sent to them (please make requests as soon as possible, and no later than 11th May), or may download them from the Member's area of the BSS web site from 1st May onwards. Postal votes must be received by the General Secretary of the Society no later than mid-day on **18th May**.

Note

If you do not receive our monthly emails about events then we do not have your current email address, and you will need to update this before you can vote by email. This can either be done by logging onto the website, or by contacting the Membership Secretary.

Links

To log into your membership record (to check or amend your postal and email address) go to: <http://www.botanical-society-scotland.org.uk/user>

You may contact the Membership Secretary by email at: membership.secretary@botanical-society-scotland.org.uk

You may contact the General Secretary by email at:
general.secretary@botanical-society-scotland.org.uk

You may contact the BSS by post at:

General Secretary
Botanical Society of Scotland
Royal Botanic Garden Edinburgh
20A Inverleith Row
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NEWS FROM THE FORESTRY COMMISSION: BUMPER ACORN CROP HELPS NATIVE WOODLANDS

Around 1.2 million acorns have been collected in Galloway Forest Park as part of a project to expand and link native Ancient Oakwoods which will create semi natural habitats from the hill tops to the coast. The project involves restoring Protected Ancient Woodlands sites and linking the woodlands through forest restructuring via natural regeneration and planting of local provenance native species.

Oakwood is the dominant native woodland type in Galloway, ranging from fertile Lowland Oakwood sites along the coast and the Cree Valley to less fertile Upland Oakwood sites around Loch Trool.

Gareth Ventress, Environment Forester in Galloway Forest District, said: "On inspection during the early autumn (of 2016) we noticed that we were in for a bumper acorn crop and the Environment and Forest Management teams began planning acorn collections.

Once collected the acorns are sorted before being sown into cells. Many of the acorns will be graded out as infertile and many more seedlings will be lost during the initial growth phase in the nurseys as they compete with each other for light, but the collection should result in approximately 600,000 new native oak saplings for planting over the next 3 – 4 years, helping to restore and link ancient woodland remnants and create new native Oakwoods and enrich habitats throughout the Forest Park long into the future.

From: <http://scotland.forestry.gov.uk/news/1661-bumper-acorn-crop-helps-native-woodlands>

.A PERSPECTIVE ON OUR PUBLISHER'S REPORT DECEMBER 2016

It has been nine years since our journal *Plant Ecology and Evolution* was launched. The idea for the journal came when several of us were having dinner together during a British Ecological Society conference. Conversation turned to the availability of journals for ecologists. After airing the subject at some length, we decided a new one was needed. As we were mostly all members of the Botanical Society of Scotland we thought it would be a good idea if the new one could come from the BSS. Discussions took place within the Society, a publisher was found and the journal was launched shortly afterwards. Now the journal is in its tenth year.

I was highly gratified to read the 2016 publisher's report, showing that the impact factor had increased yet again (now 2.34) and pleased to discuss the report's content at some length with the publishers (we had lunch with them at the RBGE in January). In these days of electronic publishing, data on the performance of any journal is automatically logged, and scrutinised by publisher and editors. The report itself is 'confidential' because scientific publishing is a commercial business, but here I will discuss some of the main points that are not regarded as sensitive. One of the most interesting pieces of information to show up is the number of times each paper has been downloaded. From this data one can see which papers are the most popular (Table 1). All of the papers in the top ten have been downloaded hundreds of times.

The paper most downloaded in 2016 was *Alpines, Trees, and Refugia in Europe* by John Birks and Kathy Willis, which was published in 2008. This one had caught my eye because the authors had used the term 'Cryptic Refugia' to discuss the small sheltered areas of favourable microclimate where trees may have survived during the Late Glacial Maximum. Without such refugia it is hard to account for the rapid rate at which tree species spread north after deglaciation (sometimes the apparent rate of spread, judged from pollen deposits, exceeds 500-1000 m per year).

The second most downloaded paper was our first *Grubb Review*. This first review was written by Peter Grubb himself and published in 2016: *Trade-offs in interspecific comparisons in plant ecology and how plants overcome proposed constraints*. Grubb tackles an issue that comes up frequently in plant and animal ecology, succinctly stated as

this hypothesis: when one feature (trait) is accentuated, another is necessarily diminished. If it were not for trade-offs, demon species would evolve, those that breed fast, live long and are both good competitors and dispersers. Trade-offs can be demonstrated using various graphical methods, and the essence of the paper was to discuss how this may be done.

Another set of data from the publishers is the ranking of institutions that have downloaded papers from our journal. This ranking presumably reflects the number of research-active ecologists at global universities and institutes, although I fear that a few countries and institutes download once and distribute widely. This is not legal. Top of the list is the University of Colorado with 475 downloads. Next comes the German Research Foundation, DFG Germany, followed by the National Library of Finland. Then comes a string of Universities in this order: Calcutta, California (Berkeley), Edinburgh, Monash, Wageningen, California (San Diego), Florida.

Of course, the journal is not seen by all of our members. Its content is research orientated and may not appeal to everyone (although three authors in the 'top ten' are long-standing members). In fact, only 40% of the members take the journal as part of their annual subscription. Some of the members do not need to subscribe, as download is available through their University or Institutional Library.

The BSS history of publishing a journal is a very long one:

1844-1990 *Transactions of the Botanical Society of Scotland*

1991-2007 *Botanical Journal of Scotland*

2008-2017 *Plant Ecology and Diversity*

We have moved readership and content from local to global. This raises the question that we have sometimes considered: should the BSS also have a local publication, perhaps on-line only, to record local botany? Is there someone reading this who would like to be involved in the launch of such a publication?

Plant Ecology and Diversity is edited by Laszlo Nagy, and published six times a year by Taylor and Francis.

John Grace
President of the Botanical Society of Scotland

Table 1. The top ten downloads from *Plant Ecology and Diversity* in 2016.

Year	Authors	Title
2008	H. John B. Birks and Katherine J. Willis	Alpines, trees, and refugia in Europe
2016	Peter J. Grubb	Trade-offs in interspecific comparisons in plant ecology and how plants overcome proposed constraints
2016	David M. Wilkinson and Thomas N. Sherratt	Why is the world green? The interactions of top–down and bottom–up processes in terrestrial vegetation ecology
2016	André Rodrigo Rech et al.	The macroecology of animal versus wind pollination: ecological factors are more important than historical climate stability
2008	Robert M.M. Crawford	Cold climate plants in a warmer world
2016	Fernando Valladares et al.	Shedding light on shade: ecological perspectives of understorey plant life
2015	Katharine N. Suding et al.	Vegetation change at high elevation: scale dependence and interactive effects on Niwot Ridge
2009	John Beardall et al.	Living in a high CO ₂ world: impacts of global climate change on marine phytoplankton
2015	Andrew J. Lowe and Richard J. Abbott	Hybrid swarms: catalysts for multiple evolutionary events in <i>Senecio</i> in the British Isles
2015	Øystein H. Opedal et al.	Linking small-scale topography with microclimate, plant species diversity and intra-specific trait variation in an alpine landscape

URBAN FLORA REPORT, 2016

The Urban Flora Project aims to catalogue the plant species growing wild in Scottish towns and cities. It is a long term project and it will take several years to collect sufficient data. We are not sure how many years exactly as that depends on the number of recorders we recruit, and how active they are. So far, we have 19 registered recorders, but many more are taking part through group excursions. Of course we would like more. So far, after one full recording season, we have about 19,000 records, mostly from towns and cities on the east of Scotland (Fig 1). We have achieved this partly by collaboration with natural history societies, notably the Dundee Naturalists' Society and the Perthshire Society of Natural Science, to whom thanks are due. In many cases, it has been possible to share data with other groups, especially with BSBI recorders, and in one case with a university project on bees as pollinators. How many records do we need if we are to demonstrate regional patterns and the relative abundances of the species? There is some recent science on this subject that we may be able to use (Chao *et al.* 2015), but in the meantime, as a rule of thumb, we are reminded that for the *Flora of the Lothians* 300 people recorded in 557 tetrads and provided 149,398 records (Cochrane *et al.* 2002).

What have we found so far? It has been especially interesting to find a number of 'southern' species, which occur in towns and cities in Scotland as a result of the urban heat island effect, or possibly simply because urban areas have a greater heterogeneity of habitat than elsewhere. It is always a joy to find unexpected species, and a few of these are highlighted in Table 1.

The Narrow-leaved Ragwort, *Senecio inaequidens* (see inside back cover) is a very conspicuous species and one of the first we noticed on arrival in the car park by wasteland in Granton, and one of several 'strange' *Senecio* plants that we spent time trying to identify that evening. There are only a few records of *Atropa belladonna* anywhere north of Newcastle. It loves the calcareous substrates that are common in the built environment and it may have been under-recorded in the past by recorders who eschew towns and cities. The distribution of the Canadian Fleabane *Conyza canadensis* is somewhat similar: it is common south of the Wash and also likes urban rubble. The Shaggy Soldier *Galinsoga quadriradiata* is a southern species found sporadically in Scotland, but it seems to be increasing in Edinburgh especially along city pavements. Mick Crawley tells me that in London the two related

species *Galinsoga quadriradiata* and the less common *G. parviflora* have different habitats there, one growing by pavements and the other as a weed in gardens. They are not easy to tell apart, and we will look more carefully at our specimens in 2017. Water Bent, *Polypogon viridis*, has hardly ever been recorded in Scotland but we found it at Granton. We ventured onto Cramond Island on one summer's evening where some of our party saw *Saxifraga granulata*. It is southern also, but it does extend far north in Scotland on the east coast, and so this was not a great surprise. Likewise, *Epipactis helleborine* is a southerner, but is widely established in the central Belt of Scotland, especially around Glasgow, and so it should not have been a big surprise to find it in a wood near the shore at Bo'ness. A small population of the stately *Lilium martagon* (Martagon Lily) was found along the river at Blairgowrie. It may have escaped from someone's garden, but we looked over fences nearby and could not find it as a cultivated plant. The Daisy Bush, *Olearia avicenniifolia* x *moschata*, a New Zealand plant, is commonly recorded around London and Liverpool, but it forms a large population on the citadel in Ayr. It is grown as a garden species, appearing in gardening books and catalogues as *O. x haastii*. According to one source (Cox and Curtis-Machin, 2015) it is found naturalised on the walls of Edinburgh Castle, but we have not yet looked there. The fleshy Hottentot-fig, *Carpobrotus edulis* is a native to South Africa, and is scattered around the south coast of England and on the west coast of Wales. It appears on south-west facing cliffs at Portpatrick in Dumfries and Galloway. That seems to be its only Scottish station.

What else have we been doing? We have tried hard to engage with Schools, but with limited success. We must try harder, and we may need help from our colleagues at the RBGE. Where possible, we have been out with community groups, including allotment people and neighbours, trying to kindle interest in plant recording. For 2017 we hope to be more active in the west of Scotland, especially in North Lanarkshire, and we want to take a look at Border towns. We have also been thinking about publications, inspired by David Goode's *Nature in Towns and Cities* (Goode 2014) and by the recent *Flora of Lanarkshire* (MacPherson 2016).

I hope some of you can join us at weekends, and in the evenings, and if you are taking holidays in the Western Isles, please consider doing some recording for the project. Remember our working definition of 'town' is a settlement of at least 1000 people. Please let us know how

we can help you get involved in plant recording - would you like to join organised walks, or have a drop in session at a public library to look at puzzling plants? We will publicise planned excursions on the Botanical Society web site, and will advertise monthly to members by email and facebook page.

John Grace

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- Chao, A. et al. (2015) Unveiling the species-rank abundance distribution by generalizing the Good-Turing sample coverage theory. *Ecology* 96, 1189-1201.
- Cochrane, MP. Dixon, ROD. Muscott, J. & Smith, PM. (2002) The Botany of the Lothians project and the compilation of a flora of the Lothians. Pages 180-199 in *Plant Life of Edinburgh and the Lothians* (eds PM Smith, ROD Dixon and MP Cochrane). Edinburgh University Press.
- Cox, KNE. & Curtis-Machin, R. (2015) Garden Plants for Scotland. Frances Lincoln.
- Good, D. (2014) *Nature in Towns and Cities*. Collins.
- MacPherson, P. (2016) The Flora of Lanarkshire. Pisces.

Table 1.

Species with a southern distribution found in Scotland in 2016.

SPECIES	LOCATION
<i>Senecio inaequidens</i>	Granton
<i>Atropa belladonna</i>	Edinburgh
<i>Conyza canadensis</i>	Leith
<i>Galinsoga quadriradiata</i>	Edinburgh
<i>Polypogon viridis</i>	Granton
<i>Saxifraga granulata</i>	Cramond
<i>Allium carinatum</i>	Dundee
<i>Epipactis helleborine</i>	Bo'ness
<i>Lilium martagon</i>	Blairgowrie
<i>Olearia avicenniifolia x moschata</i>	Ayr
<i>Carpobrotus edulis</i>	Portpatrick

Fig 1. See the map of Urban Flora records so far on the inside front cover.

SHORT OR LONG VISITS – WHICH ARE BETTER FOR BOTANICAL RECORDING?

Many opinions are expressed about the best strategy for botanical recording and there is probably no single answer, as it will depend upon the aim of the exercise. It may also vary from recorder to recorder and between different locations and habitats. For many of us, time is short during the brief summer months, when vascular plant recording is optimum and there are often many other demands on our energies.

The present, very limited study, looked at the best length of recording session for one recorder and whether 2 shorter visits or one long visit yielded more within the same total amount of time.

Four linear sites of approximately 400 metres were visited on three occasions starting at the middle point. All were in Easter Ross and two were coastal: Saltburn by Invergordon and Kiltearn by Evanton. Another was the village of Portmahomack and one was a forestry plantation at Hill of Tain.

For each site one visit was 1 hour long and 2 visits were half an hour each. The order of visits for the sites was varied and all vascular plant species noted. All sessions took place within September 2016, although all locations were visited on 3 different days. Similar routes were followed, although only half the site was usually assessed on each short visit.

On the four 1 hour assessments 231 species records were made, and on the eight short half hour visits 277 (the same species was not counted twice on the two short visits). The long visits, therefore, only yielded 84% of the short visit total.

46 long visit species were not seen on the short visits to the same site and 92 short visits records were not repeated on long visits. There were no obvious trends in species groups detected, or not detected, by the two methods.

This is a very limited survey and extreme caution must be exercised in drawing any firm conclusions. As vegetation may change, even in a short period, the study may just be demonstrating the advantages of repeat visits at different times. Also different corners of the sites were explored and fewer differences may have been evident with longer sessions.

This study also takes no account of travelling time, a major factor with distant sites, although several tetrads can often be visited at the same time.

Many of us may become jaded during long recording sessions, but the time spans here were hardly lengthy.

I suggest we should all look carefully at our recording strategies – it may not be the same for every recorder.

Brian Ballinger

BRYOPHYTE WORKSHOP: DUNDEE NATURALISTS' SOCIETY AND BOTANICAL SOCIETY OF SCOTLAND: MOSSES AND LIVERWORTS

Led by Dr. David Chamberlain: 7th December 2016 in the Dundee Museum Barrack Street

David Chamberlain of the Royal Botanic Gardens Edinburgh had kindly offered to conduct a moss workshop in Dundee as a local event and it proved possible to hold it in the collections unit of the museum, thanks to the help of Mike Sedakat. This was an educational exercise but also aimed to contribute information for the Botanical Society of Scotland's urban flora project.

Mosses and liverworts are present all year round, so it was quite appropriate to hold it in December.

The morning session was spent indoors and began with a talk from David describing the structure, life cycle, classification and ecological characteristics of mosses, liverworts and hornworts (Bryophytes). We then settled down with microscopes, hand lenses and field guides to try to identify some species, with a lot of help from our tutor. Much practice is needed but we felt we made a useful start. David had brought some specimens from Edinburgh and some of those attending had also brought material.

We adjourned to the museum cafe for lunch, where we had reserved a table to keep a place amongst all the Christmas shoppers.

In the afternoon we walked slowly up to Dudhope Park, entering a different recording square from our previous moss outing held last year.

There were some good old walls with typical species such as *Tortula muralis*, *Grimmia pulvinata* and *Schistidium crassipilum*.

Pavements yielded more, including the liverwort *Marchantia polymorpha*. At Dudhope Park the cobbles were rewarding and some walls were coated in mosses.

Walking down the steep path to the main road, we passed *Fissidens bryoides* and going through the industrial area there were some damp walls and pavements coated in green. Finally the short winter afternoon was coming to an end but by this time we had found 25 species.

We thanked David Chamberlain for an instructive and enjoyable day.

Brian Ballinger

BOTANICAL SOCIETY OF SCOTLAND AND BOTANICAL SOCIETY OF BRITAIN AND IRELAND SCOTTISH ANNUAL MEETING NOVEMBER 2016

John Faulkner, BSBI President, welcomed participants to this joint meeting. Reporting on BSBI, he said that the Society was in good heart. More than 50 field meetings had been held this year, generating more than a million records for the BSBI database, and publications are flowing from members with many new local floras. However, improvement is always possible and structural changes previously made have now been in place for 3 years. A comprehensive review of the Society has been launched. Emerging issues include:

- contrasting views among BSBI membership as to the importance of training and encouraging beginners and improvers vs. fulfilling the needs of the expert botanists
- the emphasis of the BSBI on recording vs. botanical science vs. education vs. appreciation of plants
- the need to protect the independence of the Society.

Funding is very important. The government would like the BSBI to make all of its data available for free, but the updating and support of the database with all the ramifications of file storage and back up, do cost money and financial support is essential.

Robin Payne, BSBI Scottish Chairman, formally opened the AGM of the BSBI in Scotland. He apologised for the absence of formal minutes from the 2015 AGM, although an account had been published in the BSBI Scottish Newsletter (Spring 2016). As no comments or corrections had been received, he asked members present if the account could be accepted as the correct record.

Jim McIntosh, BSBI Scottish Officer, then presented his report. Two one-day conferences were held in April with major sessions on Atlas 2020, Mapmate and the BSBI database. Half the attendees were county recorders, others were potential recorders or interested members. Kindrogan has been booked for a recording conference next year, on 10 – 12 March 2017. Mark your diaries!

2016 was the fourth year of the Plant Family training initiative. We held three one day Plant Family Workshops and 55 beginners attended. They were mainly young adults working, studying or volunteering in plant-related activities. Thanks are due to volunteers: Faith Anstey the main organiser and tutor, and 12 leaders and tutors and to our partners this year - Plantlife, the National Trust for Scotland & Dundee Botanic Garden.

A Scottish recording week was held in Lanarkshire and over 4,000 records were collected, with 274 new hectad records. A second recording week was held on Shetland, where over 100 monads were surveyed across the mainland and small islands to the east. We will continue with two Recording Weeks per year in the final three years of Atlas 2020 fieldwork. Site condition monitoring was conducted by BSBI volunteers on 6 sites in 2016, and BSBI members Ian Strachan & Dan Watson helped SNH with surveys on the north face of Ben Nevis again. There were also many field meetings and workshops, which will be reported upon in the 2017 yearbook, and plans for next year's meetings will be publicised in January.

Rare plant registers were published for Ayrshire and Dumfriesshire, and The Flora of Lanarkshire was published by the late Peter Macpherson.

Recorder vacancies have been filled in Lanarkshire (Michael Philip), Caithness (Margaret and Francis Higgins) & Shetland (Paul Harvey and Alex Prendergast). Michael Braithwaite is proving to be irreplaceable in Berwickshire, and we are still looking for someone to

help Pam Murdoch in Dunbarton. Sadly, Jackie Muscott (West Lothian) has just tendered her resignation.

Results of a survey on the future format of the BSBI Scottish newsletter showed a strong preference for the option to publish online and make hard copies available to those that wish.

Finally, Jim thanked all recorders and volunteers for their hard work over the year, and SNH and BSBI for their funding of his post, and the RBGE for their support in kind.

John Grace, BSS President. The BSS held nine lectures in Edinburgh and 15 field meetings/workshops (some joint with other societies), including some on bryophytes, lichens and fungi. Several *ad hoc* meetings were also run in support of the BSS Urban Flora project. The Society is trying to develop better engagement with schools and several initiatives were launched, but we are still trying to work out the best way to do it.

Our Urban Flora project has achieved about 19000 records so far. We have recorded several species which tend to have more southerly distributions. As towns and cities tend to have warmer climates, these species may be indicators of the urban heat island effect.

Our academic journal Plant Ecology and Diversity is on the rise. Under the editorship of Lazlo Nagy, its Impact factor has increased from 1.7 to 2.3.

Atlas 2020 – Progress Report – Jim McIntosh, BSBI Scottish Officer

By the time Atlas 2020 is published it will have been 20 years since the last Atlas – and there have been many changes in that time. Like previous Atlases, the next one will produce comprehensive maps for both native and introduced taxa (vascular plants and stoneworts) occurring in Britain and Ireland and analyse and report on the changes that have occurred in recent decades. In addition, it will also provide interactive maps online that can display frequency and distribution at a variety of scales and produce maps for infraspecific taxa, rare aliens, hybrids, etc. Unlike previous atlases we want to record at tetrad (or better) resolution for a sample of squares in every hectad, aiming for a minimum of 5 tetrads per hectad, surveying each twice.

Recorders have been extremely busy across Scotland and there are now 2.3 million records. Many older datasets have been uploaded this year and recorders are making a great effort to digitise their results.

There is an increasing spatial precision in recording data and 67% of all Scottish hectads are now well or moderately well recorded. A good start, but the focus is not spread evenly across locations, and there are still records stuck in the system or on paper.

You can help by joining local botany groups or going on recording meetings, and consulting Jim and local recorders as to what help would be most effective. You can also find 'missing species' that have not been recorded since 2000 by searching the BSBI database.

Atlas Recording in the Cairngorm National Park - Andy Amphlett, BSBI Recorder Banff

Andy highlighted the large size and access difficulties to many parts of this Park, with an area of 4528km², comprising 65 hectads, 1700+ taxa, including 125 species endemic to Great Britain and 146 GB Red List species. A travel grant from the Cairngorms National Park Authority (CNPA) has been used to target data collection with the prime objectives to:

- improve tetrad scale coverage of the CNP by targeted recording in tetrads with few or no records in any date class, or with few or no records post 1987
- demonstrate the ability of BSBI to collect and collate high quality botanical records from the CNP area, so as to benefit plant conservation in the CNP.

Many people have contributed records, with 13 lead recorders, of whom three have each contributed > 10000 records. The recording effort is greatly increasing the number of taxa recorded per tetrad and many new records of species on the Cairngorms Rare Plants Register have been made.

Challenges include the remoteness and difficult access to much of the area, and the tendency of botanists to visit the base rich and botanically interesting locations rather than botanically boring acid soils, especially muir burn. Notable finds include *Deschampsia setacea* in an ephemeral pool on moorland, *Centunculus minimus* and *Juncus balticus* on roadsides, and *Cystopteris dickieana* and *C. fragilis* on bridges and rocky outcrops.

A year in the life of a Scottish Recorder, Stephen Bungard, BSBI Recorder North Ebeudes

See Stephen Bungard's article on page 28.

How I became a botanist - Michael Braithwaite, BSBI Recorder Emeritus

Childhood influences were important – a rural upbringing and education led to an interest in wildlife in general, encouraged by school wild-flower rambles and pressing of flowers. The presentation of a wild flower book as a prize (Wild Flowers at a Glance, by MC Carey and Dorothy Fitchew) provided an interested schoolboy with easy to understand descriptions and drawings. Interest lapsed for a while, but revived as an adult, when joining the Scottish Wildlife Trust and other societies, and going on outings with botanists made a great difference. We used to use botany all the time as hunter-gatherers! Introduce people to plants when young and hope that they will come back to them as adults may be the best approach to fostering an interest.

The sunny sides of summits: influence of aspect on diversity, distribution and leaf size of plant species in an alpine environment- Jay Mackinnon, Lecturer, Edinburgh Napier University (Patricia Monterde Vitoria, Dan Watson & Jay Mackinnon)

Following Global Observation Research Initiative in Alpine Environments (GLORIA) protocols, summit vegetation was surveyed in the Ben Lawers NNR to understand how different microclimates and other factors can influence plant diversity. Vegetation was categorised according to National Vegetation Classification groupings; U8 (*Carex bigelowii*-*Polytrichum alpinum* sedge heath) was found on all summit faces, but only north and east were predominantly U8. South was predominantly U7 (*Nardus stricta*-*Carex bigelowii* grass heath), while west was predominantly U10 (*Carex bigelowii*-*Rhacomitrium lanuginosum* moss heath). However, it was relative abundance of species rather than presence/absence which differentiated the communities. Data were further analysed using ordination techniques that enabled examination of the similarities and differences between species composition at different sites in relation to parameters such as radiation and grazing.

The biggest problems in European fern taxonomy? - Fred Rumsey, NHM & BPS President

Fred Rumsey described work in progress on the fern *Cystopteris fragilis* agg. This is a widely distributed polyploid complex, with 2x – 8x cytotypes, and no diploids in Europe. With at least three diploid progenitors there are many potential origins for each cytotype.

Spore size increases with ploidy, so can be used as a proxy, but as sizes overlap, they are not fool proof. As well as size, spore shape and ornamentation are also important.

Another plant causing taxonomic problems is the clubmoss *Huperzia selago* agg., which is also polyploid. In North America there are nine subspecies, of which four (*H. appressa*, *H. actica*, *H. continentalis* and *H. selago*) occur in the UK. The gemmae provide important distinguishing characters and hybrids are frequent.

Main talk: Alien Plants in Scotland - Professor Mick Crawley

Alien plants are those moved by people, and ‘alien’ does not necessarily mean ‘bad’. Early introductions are termed archaeophytes and later ones (since Christopher Columbus) are neophytes. They can be naturalised and form self-replacing populations, or casual – depending on repeated introduction, and are of interest to biologists because they represent large-scale unplanned experiments in ecology and evolution, interacting with native and other alien species with which they share no evolutionary history.

The number of native species declines with latitude in Britain as do neophytes. The latter are particularly prominent in cities and on southern coasts, and mostly occur in disturbed habitats such as waste ground, built and cultivated environments. Very few occur in semi-natural habitats. The ‘top’ neophyte (occurring in 91% of hectads) is *Matricaria discoidea* – pineapple weed. While there is extensive data on species distribution, we lack data on abundance and there is no agreement on how to measure impact.

Successful aliens must be able to cope with herbivores and pathogens in their new environment, but they may well have left behind their specialist natural enemies. They become ‘invasive’ when they have an appreciable impact on local ecosystem processes, and their control becomes necessary. The costs of controlling alien species can be enormous - £70,000,000 was spent on clearing *Fallopia japonica* from the Olympics site at Stratford, including cleaning its roots by hand from 137,500 tons of soil.

Many of Scotland’s alien species arrived in the 1800s, or early 1900’s. Historically, land around the wool mills of the River Tweed was a good hunting ground for alien species, but botanists struggled to identify them because they did not know where they came from. Bings and coups are also good locations for finding alien species.

Neo natives – new species, can arise as a result of introductions (as with *Mimulus* spp. first introduced as horticultural species but now hybridising and forming new polyploid species in Scotland). The allocation of ‘native’ or ‘alien’ status to plants can have a major impact on their conservation status. *Fritillaria meleagris* for instance, was long thought to be native, but is now thought to have been introduced in the 1700’s.

Julia Wilson

HONESTLY!

The stems of *Lunaria annua*, when in seed, have a remarkably propensity to get tangled up when one is trying to separate them for display, as I discovered when gathering some for uses in a nursing home. I am ever ready to whinge in verse, so...

Oh what a tangled plant we breed
When we grow Honesty from seed.
No task will make a plantsman warier
Than gathering lunettes of *Lunaria*.
In tanglement nought can exceed
The seedheads of this handsome weed.
In September it’s my doom
To source them for the common room
Of an old folks home I know.
There they will be put on show
In vases on the mantelpiece,
Engendering a sense of peace,
Contentment, calm; you will agree
Such are the fruits of Honesty.
But honestly I must insist
They drive *me* round the ruddy twist.

Roger West

STUDENT THESIS

A PHENOTYPIC AND GENOTYPIC ANALYSIS OF *PLANTAGO ROBUSTA* AND *PELARGONIUM COTYLEDONIS*

Alastair MacLaren was awarded the BSS Student Thesis prize

BSc Horticulture with Plantsmanship, 2016 (University of Glasgow, SRUC and Royal Botanic Garden Edinburgh).

Summary

Plantago robusta and *Pelargonium cotyledonis* are endemic to the south Atlantic island of St Helena, and are classified as 'rare' and 'vulnerable'. An investigation was carried out to understand why the morphology of each species differs depending on the population from which it originates.

Three populations of *Plantago robusta* and two populations of *Pelargonium cotyledonis* were studied, representing all known populations from the wild. Seed from each population was grown *ex-situ* and resulting plants measured for morphological differences between populations. DNA from the ITS and *trnL-F* regions were sequenced to determine variation and phylogenetic position.

The morphometric analysis showed significant differences in both seed and plant morphology between populations of both species under common garden conditions, indicating genotypic variation rather than phenotypic plasticity.

Genetic analysis of *Plantago robusta* showed heterozygosity of one population relative to the others. The species was also placed in its wider phylogenetic context.

Molecular analysis showed differences in both genetic regions between populations of the *Pelargonium cotyledonis*, with Bayesian analysis producing a phylogenetic tree that distinguished the populations. This, combined with the significant differences identified in morphology, indicates a strong likelihood that these populations contain different species and that one of them is previously unidentified.

Alastair Maclaren

JOINT BSS/BSBI ALPINE FIELD MEETING TO CAM CHREAG SSSI, NEAR TYNDRUM, PERTSHIRE (VC 88), 25TH JUNE 2016

The 2016 joint BSS/BSBI alpine field meeting was to Cam Chreag ("Crooked Ridge") an 884m high Corbett located at the head of Gleann a'Chlachain, approximately 6.0 kilometres north east of Tyndrum, in the north-west corner of the Loch Lomond and the Trossachs National Park. Cam Chreag forms part of the Beinn Heasgarnich Special Area of Conservation and is within the Kirkton and Auchtertyre estate. The estate is managed by Scotland's Rural College (SRUC) and is a centre for research and demonstration into sustainable land management in the uplands.

As the group of 16 gathered at the car park at Auchtertyre farm it was nice to see a mix of new and familiar faces. The morning weather was dry and bright with a light breeze, excellent weather for a walk in the hills. Three of the group led by Professor Roy Watling decided to concentrate their efforts on recording fungi in the woodland above the farm steading and on the lower hill ground, while the rest of us headed up on to the higher ground. The main group set-off from the car park and headed up the hill track and under the viaduct of the West Highland Railway.

The steep sided gorge of the Allt Auctertyre below the viaduct contained some remnant semi-natural ancient woodland. The main tree species was *Betula pubescens* (Downy Birch), but there were also scattered *Sorbus aucuparia* (Rowan), *Fraxinus excelsior* (Ash), *Corylus avellana* (Hazel) and clonal stands of *Populus tremula* (Aspen). The hillside above the track was dominated by *Nardus stricta* (Mat Grass) and *Juncus squarrosus* (Heath Rush) with *Festuca ovina* (Sheep's Fescue), *Festuca vivipara* (Viviparous Fescue), *Agrostis capillaris* (Common Bent), *Agrostis vinealis* (Brown Bent) and *Anthoxanthum odoratum* (Sweet Vernal Grass). *Potentilla erecta* (T tormentil), *Galium saxatile* (Heath Bedstraw), *Carex binervis* (Green-ribbed Sedge) and *Carex pilulifera* (Pill Sedge) were frequent throughout the sward. In the wetter areas there was abundant *Molinia caerulea* (Purple Moor-grass), *Trichophorum germanicum* (Deer Grass), *Eriophorum angustifolium* (Common Cotton-grass), *Carex echinata* (Star Sedge) and *Carex nigra* (Common Sedge).

On the poorly drained lower slopes of the hill, below about 350m, there were extensive patches of *Myrica gale* (Bog Myrtle), and on the drier knolls large patches of *Pteridium aquilinum* (Bracken). There were a number of flushes just above the track; some were acidic while others were more base-rich. The flushes contained *Carex panicea* (Carnation Sedge), *Carex demissa* (Common Yellow Sedge), *Saxifraga aizoides* (Yellow Mountain Saxifrage), *Carex hostiana* (Tawny Sedge), *Dactylorhiza incarnata* (Early Marsh Orchid), *Drosera rotundifolia* (Round-leaved Sundew), *Pinguicula vulgaris* (Common Butterwort) and *Pedicularis palustris* (Marsh Lousewort).

After about 500m we crossed over a stile and followed a path through an area of recently planted native woodland. This woodland, in the Gleann a'Chlachain gorge, was planted in 1998 with Downy Birch, Silver Birch, Grey Willow, Alder, Rowan, Sessile Oak, Ash, Scots Pine and Downy Willow. The ground vegetation within this un-grazed woodland block was dominated by *Molinia caerulea* (Purple Moor Grass) but there were also extensive patches of *Calluna vulgaris* (Heather), and tall herb species including *Filipendula ulmaria* (Meadowsweet), *Geranium sylvaticum* (Wood Crane's-bill), *Alchemilla glabra* (Smooth Lady's-Mantle), *Trollius europaeus* (Globeflower), *Angelica sylvestris* (Wild Angelica), *Cirsium heterophyllum* (Melancholy Thistle), *Valeriana officinalis* (Common Valerian) and *Galium boreale* (Northern Bedstraw).

We then crossed over the footbridge at a hydro-electric intake and returned to the hill track. After about 1.5 km we reached a large area of enclosed mountain woodland and scrub which had been planted in the bowl of Gleann a'Chlachain. More than 350,000 trees were planted in the woodland between 1999 and 2009, at an altitude of between 350 and 600m. Most of the trees were Downy Birch, with the other main species being Alder, Rowan, Scots Pine, Grey Willow, Eared Willow and Hazel. The trees were short in stature; however their low, prostrate, bushy growth form is what would be expected at these altitudes. The ground vegetation within the enclosed woodland had extensive patches of *Calluna vulgaris* (Heather), *Vaccinium myrtillus* (Bilberry), *Vaccinium vitis-idaea* (Cowberry) and *Molinia caerulea* (Purple Moor-grass), with abundant *Narthecium ossifragum* (Bog Asphodel) and *Dactylorhiza maculata* (Heath Spotted Orchid). A few *Neottia cordata* (Lesser Twayblades) were discovered growing under the heather. There were also some areas of blanket peat within the enclosure which had *Eriophorum vaginatum* (Hare's-tail Cotton-grass), *Erica tetralix* (Cross-

leaved Heath), *Carex rostrata* (Bottle Sedge) and *Carex pauciflora* (Few-flowered Sedge).

We headed through the un-grazed mountain woodland and on to the Cam Chreag, where there is outcropping of base-rich mica-schists at high altitude. The vegetation was dominated by species-rich *Nardus stricta* (Mat Grass) grassland with abundant *Festuca ovina* (Sheep's Fescue), *Agrostis capillaris* (Common Bent) and *Alchemilla alpina* (Alpine Lady's-mantle). Some of the many species we recorded in these grasslands included *Thymus polytrichus* (Wild Thyme), *Thalictrum alpinum* (Alpine Meadow-rue), *Persicaria vivipara* (Alpine Bistort), Hair Sedge (*Carex capillaris*) and cushions of *Silene acaulis* (Moss Champion). *Carex vaginata* (Sheathed Sedge) was present within the sward and there were a few scattered *Botrychium lunaria* (Moonwort).

We spotted a few Mountain Ringlet Butterflies as well as a Wood Tiger and a Green Carpet Moth. There were also a number of base-rich springs and flushes on the hill slope, containing species such as *Saxifraga aizoides* (Yellow Mountain Saxifrage), *Tofieldia pusilla* (Scottish Asphodel) and *Selaginella selaginoides* (Lesser Clubmoss).

We headed up the slope to an area of cliff and associated boulder talus at an altitude of about 720 m. This cliff supports a small population of the nationally rare *Bartsia alpina* (Alpine Bartsia), together with *Salix arbuscula* (Mountain Willow), *Saxifraga oppositifolia* (Purple Saxifrage), *Vaccinium uliginosum* (Bog Bilberry) and the tall-herb species *Trollius europaeus* (Globeflower), *Saussurea alpina* (Alpine Saw-wort), *Oxyria digyna* (Mountain Sorrel) and *Geranium sylvaticum* (Wood Crane's-bill). Unfortunately we didn't have time to further explore the delights of the Cam Chreag and had to make our way back down to Auchtertyre. Once we were back down some of the group came over to the neighbouring farm at Kirkton to have tea and cake; a good end to the day. The day was enjoyed by all and we managed to see 151 species of vascular plant as well as a number of interesting birds and invertebrates.

John Holland, BSS Alpine Secretary
john.holland@sac.ac.uk.

LOST AND FOUND –*LINNAEA BOREALIS* (TWINFLOWER) IN EASTER ROSS

Linnaea borealis (Twinflower) is a nationally scarce plant, mainly restricted to the pinewoods of north-east Scotland, although it may also occur under birch and in open sites. It is found in similar habitats around the globe in the northern hemisphere and I remember seeing it growing on the campsite at Anchorage in Alaska. In Scotland, its spread seems to be mainly by vegetative means and it can occur in quite large patches.

Ursula Duncan in her 1980 *Flora of East Ross-shire* (published by this society when it was the Botanical Society of Edinburgh) reported that it had not been seen for more than 20 years in the vice-county (VC106) and it was feared that it may have become extinct. Sites at Brahan had been destroyed by cultivation, although there were also old records for Novar. The last report was from Lady Caley in *The Field* in 1957 at Amat.

An experimental planting at Mount Eagle in 1988 in a Forestry Commission enclosure was unsuccessful.

And so it remained until March 2007, when my late wife and I had been asked for information about *Orthilia secunda* (Serrated Wintergreen) sites for a Northern Irish research project. We were directed to a possible location at Wester Culbo on the Black Isle in a Forestry Commission pine plantation. *Orthilia* was indeed to be seen by the path, but another plant caught my eye close by and, on closer inspection, there was little doubt that it was *Linnaea*. This was a fairly large patch extending for around 40 metres and visits in the summer confirmed that it flowers well here.

There had been unconfirmed reports from estate staff of a site at Strath Vaich, but repeated visits by groups of botanists had failed to find anything. However, in March 2012, Ian Green was doing a woodland survey in the area and came across *Linnaea* growing under birch amongst *Vaccinium myrtillus* (Blaeberry). The plants are scattered here but a subsequent summer visit with the Inverness Botany Group managed to find a couple of flowers.

In September 2015 I was looking at some under-recorded squares north of Alness for the Botanical Society of Britain and Ireland's Atlas 2020. In a Forestry commission pine plantation at Cnoc Navie I ventured

off the path for a short distance and to my surprise came across a large patch of *Linnaea* creeping along in the vegetation. Again it proved to flower well on a summer visit in 2016. I alerted the forestry staff to this site and the appearance of this plant.

In August 2016 Derek Gunn of the northern forestry area contacted me to say that they had found two more *Linnaea* patches just east of Drove Stance, in a pine plantation about 3 kilometres north of the Cnoc Navie site. This makes four known current locations in Easter Ross (VC106) and one wonders how many more await discovery. New sites have also been reported recently in Fife and West Sutherland.

It is interesting to speculate about how *Linnaea* came to be in these locations, three of which are pine plantations. Perhaps they came with the tree seedlings or maybe they were already present.

I would encourage visitors to northern pinewoods to keep an eye open for this beautiful plant. It is wintergreen and once one is familiar with it, *Linnaea* has a very characteristic growth pattern, so it can be seen in winter when other vegetation may have died back.

Brian Ballinger

ON BEING BSBI RECORDER FOR VC 104: SKYE, RAASAY & THE SMALL ISLES

It is my privilege to be the BSBI Recorder for Vice-county 104, North Ebeudes which covers Skye, Raasay and The Small Isles. At a little under 2000 km² it is a medium-sized vice-county with quite a few islands, quite a few mountains and quite a bit of land a long way from roads.

Daylight in midwinter lasts a little over 6.6 h but in midsummer exceeds 18 h, leading to a short season of rapid plant growth. The hills only begin to green in May, which marks the start of the serious field botany season.

Over the past five years an average of 13,000 vascular plant records have been made each year in VC104 (i.e. three for every hour of daylight!) and Nick Hodgetts, the county bryophyte recorder, tells me that there have been about 20,000 bryophyte records made in the last 5

years, the total boosted tremendously by a week-long BBS visit to Raasay.

Skye accounts for 86% of the land area but many islands have no ferry access e.g. the 5th, 7th & 8th largest: Scalpay, Soay and Rona.

Living on Raasay means that almost every botanical excursion starts with a ferry journey to Skye. To visit Canna, Rum, Eigg or Muck for a day takes three ferries and two nights away. Being of a certain age, a Highland Travelcard makes the ferries free for me, though not for my car.

As well as the usual walking boots, microscope etc., a small boat and a camper van have proved useful tools for an island-based Recorder.

This part of the world is one of high rainfall and has the added delights of midges and clegs during much of the field season. However, the views on fine days, the potential for solitude and, of course the plants make it all worthwhile.

There are 709 whole or partial tetrads (2 x 2 km squares) listed for VC104. A few of these are entirely below MHWS and thus unlikely to contain vascular plants, with the possible exceptions of *Zostera spp.* (Eelgrasses) and *Ruppia cirrhosa* (Spiral Tasselweed).

During 2016 I visited the last tetrad with 100% land that had no previous vascular plant records. However, there remain four tetrads with 20-80% land and no records, nine with 100% land but no records from the year 2000 onwards and quite a lot more with very few records. I intend to visit most of these before 2020 as part of the current effort towards the new Atlas 2020 of plant distributions across the British Isles.

Most years see additions to the flora of VC104 of which the majority are not native locally. One of the most unexpected in recent years was the blue, garden form of *Phyteuma spicatum* (Spiked Rampion) sometimes called *subsp. coeruleum*, in the middle of the main path to Coire Lagan.

In 2012 a single specimen of *Heracleum mantegazzianum* (Giant Hogweed) was found in Portree but comprehensively destroyed before shedding seeds. *Senecio inaequidens* (Narrow-leaved Ragwort) has appeared in the gravel around the Edinbane Wind Farm turbines; it is also known in Orkney from around wind farm turbines.

However, new natives do turn up, most commonly new hybrids or subspecies, but also things like *Saxifraga tridactylites* (Rue-leaved Saxifrage) in the Kilmory Dunes in 2015 and *Spiranthes romanzoffiana* (Irish Lady's-tresses) at Kinloch in 2014, both on Rum. Since 2000 Gordon Rothero has found two exciting additions to the flora of VC104 on the Trotternish Ridge: *Woodsia alpina* (Alpine Woodsia) in 2001 and then, just round the corner, *Saxifraga cespitosa* (Tufted Saxifrage) in 2014. Both of these sites are new low altitude records for these plants in the British Isles.

Also new was *Ononis repens* (Restharrow), found beside the A863 in 2013. The single plant continues to flourish despite the best efforts of the verge cutters – it can perhaps do more than just wrest a harrow.

There is also fun to be had with plants that are not quite new to the vice-county: *Raphanus raphanistrum* subsp. *maritimus* (Sea Radish) was recorded from Eigg in the 1890s but not seen again until 2015 when I re-found it on Eigg and John Hawell made the first Skye record.

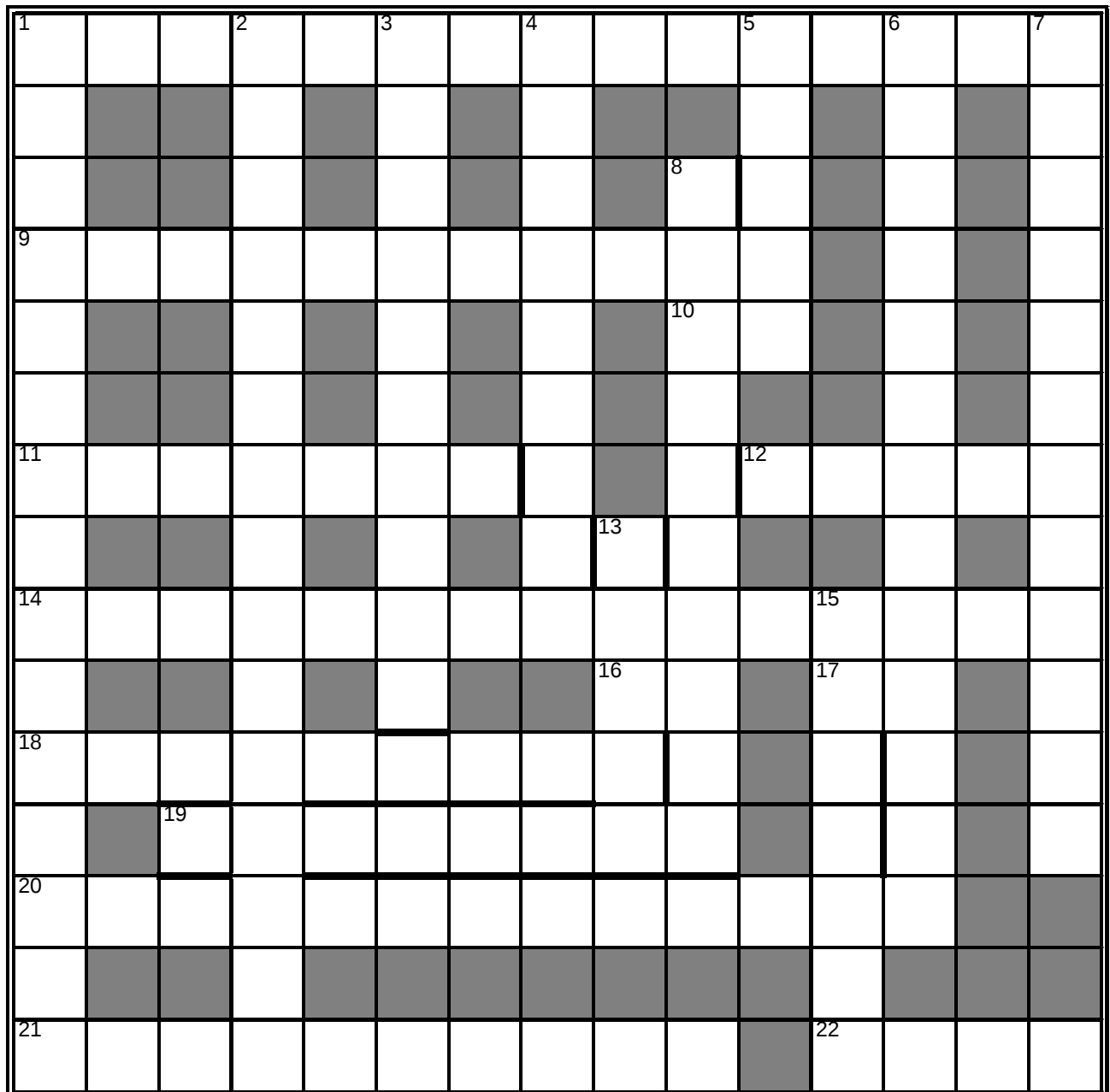
Over the past decade visits have been made to almost all the smaller islands in the vice-county excluding the very smallest: Eilean nan Each (Horse Island) off the northwest of Muck remains to be visited, but I hope to get there this year. Small islands can hold unexpected plant populations. For example, good populations of *Ophioglossum vulgatum* (Adder's-tongue) are to be found on Oigh-Sgeir (Hyskeir) which marks the southern end of the Minch and on Fladaigh Chuain between Skye and Harris, despite being apparently absent from large areas of northern and western Skye.

The Skye Botany Group been running since 2013 and makes about five field excursions per year. Overall the vice-county is now quite well recorded but there is still plenty to do. Visitors have made important contributions in recent years and are always welcome. There are resources on my website, including distribution maps and a flora of Raasay and Rona (<http://tinyurl.com/Raasayflora> or <http://bit.ly/Raasay>), and you can follow local botanical activities on my blog at <http://skyeraasayplants.wordpress.com/>.

Stephen J Bungard
BSBI Recorder for VC104
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PHYTOLEXICON CRUCIFORMIS B.S.SCOT EX WORD

XWord 16. The solutions to clues are mostly botanical names of families, genera or species and including some cryptogams. There are also words from botanical glossaries and some non-botanical English words, marked (English). Two-letter chemical elements are given as clues where they happen to occur. Solutions do not enter grey squares or cross thick lines. Further guidance is to be found at <http://www.botanical-society-scotland.org.uk/xwordhelp>



ACROSS

- 1 A sane pH, then nerves as I lose energy finding parsley-piert (Rosaceae). (7,8)
- 9 Symbolically scandium soda? I pity confused genus in its own family, whose relationships are obscure but possibly to Cephalotaxaceae. Long-lived monoecious resinous evergreen monopodial trees with simple erect columnar trunks. Endemic to mountains of central and southern Japan. (11)
- 10 Gas that is a sign of the times? (2)
- 11 Doom Sun to grow a freshwater raphidophyte. Its cells are solitary, asymmetrical, usually rounded at one pole and pointed at the other. It has one or more parietal plastids, with or without pyrenoids. Reproduction is by autospores and zoospores; aplanospores and cysts may also occur. Planktonic, living in the littoral zone of ponds of various nutrient status. It produces omega-3 unsaturated fatty acids. (Pleurochloridaceae) (7)
- 12 Boggy area where plants grow in flowing water, hot at first perhaps. (5)
- 14 A carapace, coat he put together for Snake Eyes family. (15)
- 16 A moon of Jupiter, two thirds of promissory note (English). (2)
- 17 Element 76 buried in mossy ground. (2)
- 18 Pict, MacLio, reproduced without sex. (9)
- 19 Praises a genus in Orchidaceae with tongue in cheek? (8)
- 20 C.E.O.s in Florence gain spray of flowers with no abandon. (13)
- 21 EU calpso? Trades Union initially retorts 'O no!' but gets trees from Pacific (Myrtaceae). (10)
- 22 Murltia holds back genus in a different family. (4)

DOWN

- 1 Asylums precede a textile as E.T. flies away (Brassicaceae). (7,8)
- 2 From Bridge of Allan to Parma, taking in an Old Testament priest. A genus of 3 species of slow-growing foliose lichens with short, dark sausage-like lobes. On rocks in arctic-boreal or temperate montane areas of northern hemisphere. (Parmeliaceae). (15)
- 3 Erica, with confused loon and Uranium, almost worth pipe. (10)
- 4 Grim NH₃ abandons 2000 Romans when uncovering a genus in Rosaceae. (9)
- 5 Hero seems to have been gnawed within. (5)
- 6 Mud esoterically holds back rut, peers into reflexed stonecrop (Crassulaceae). (5,8)
- 7 Schismus + Zea? Cher gets confused after loss of manuscripts, but finds Rannoch rush. (12)
- 8 Pussy acorn, a fruit with joined carpels (*adj.*) (10)
- 13 Shrubs are back in charge inside their own family. (5)
- 15 Coincidentally a cabbage if not tallied, not northern (Brassicaceae). (7)

ILLUSTRATIONS OF NON-NATIVE INVADERS - 5

***RHODODENDRON PONTICUM* L. (ERICACEAE)**

The Common or Pontic Rhododendron is perhaps the most familiar example of an attractive plant that has been introduced from abroad into British gardens and then escaped to become a serious weed. It is now the most damaging and most widespread non-native terrestrial plant in Britain and is still actively spreading. The generic name derives from the Greek for Rose Tree. The specific name refers to an area on the shores of the Black Sea and reflects the fact that, as a native, this species is mostly distributed around the Black Sea coasts, ranging from Bulgaria, across northern Turkey to the adjacent Caucasus. There is a small population in Lebanon. It is also found in small pockets within a disjunct area in Portugal, Gibraltar and south-west Spain; this material is sometimes separated taxonomically as subspecies *baeticum*. It occurs in forests in the Pontic Mountains of Turkey, in pine woods of Lebanon, and in sheltered valleys or occasionally on open hillsides in the Algarve, Portugal. Rhododendron pollen is distinctive and analysis of peat cores reveals that it was native in Great Britain and Ireland in an interglacial period around 3-400,000 years ago but the evidence indicates that it did not re-colonise Britain naturally after the end of the last Ice Age (about 10,000 years ago) from the tiny populations in the Iberian Peninsula. Pollen from a few colonising individuals might not have been picked up in peat cores but there is no record of *R. ponticum* in early (pre-1760) floras of Britain. Any proposal that colonisation, however unlikely, had occurred and rare native individuals had been missed despite their conspicuous size would have to explain why *R. ponticum* suddenly became invasive during the last 200 years.

The first Rhododendron in cultivation was *R. hirsutum* (Alpenrose), discovered by Clusius and introduced to Britain in 1656. *R. ponticum* is said to have been discovered by Claes Alstroemer near Cadiz, Spain around 1750 and first introduced to Britain by Conrad Lodiges in 1763. There have been several later introductions, in some cases of distinct varieties, including *R. ponticum* var. *heterophyllum*, newly recorded in 2000. By 1800 it was being sold in London markets as a pot plant and was already established in the estates of stately homes where it was planted as shelter belts and cover for game birds as well as in decorative shrubberies. A *ponticum* hybrid was recorded at Royal Botanic Garden Edinburgh in 1814.

For many years, *R. ponticum* has been grown to provide rootstocks onto which ornamental cultivars and hybrids could be grafted for clonal propagation, although now some nurseries are using the non-invasive *ponticum* hybrid Cunningham's White. By 1894 there were records of it growing naturalised in the wild in Britain (in Lincolnshire). Molecular studies indicate that all naturalised *R. ponticum* now growing in Britain is of Iberian origin, i.e. *R. ponticum* subsp. *baeticum*. *R. ponticum* subsp. *ponticum*, collected in Turkey in 1962 and grown in the garden at Glendoick, near Perth, has not spread.



R. ponticum is now very widespread in Britain though not common in Orkney and Shetland. It is most vigorous and abundant in the west of Britain because it grows best on acid soils in areas of mild winters and high humidity. It can tolerate deep shade. Most often found in mixed or deciduous woodland, moorland or heathland on sandy or peaty soils, it also commonly occurs along the margins of rivers and ponds and along shaded roadsides.

R. ponticum is a diploid, $2n=2x=26$. It is a much branched shrub with several major axes up to 8m in height. Shrubs grow all year round, spreading horizontally in shade but more compact in open sites. The mycorrhizal roots form a dense mat in the top 2-15cm of soil, enabling it to establish in shallow soils. An individual plant can spread vegetatively to form a congested, almost impenetrable, thicket by layering - rooting of branches that are in contact with the soil. The glossy leathery leaves, borne on red stems, are up to 20cm long, evergreen, elliptic or oblong, entire and glabrous. They are dark green above, paler green below. The zygomorphic flowers are in a dense terminal raceme, protected by bracts when in bud. They open in late Spring to late Summer, depending on local climatic conditions. The five green sepals are small and partially fused. The five pink to mauvish-purple petals are fused for half their length to form a bell-shaped corolla up to 6cm across. The largest petal is spotted with brown and orange. There are 10 dark purplish-pink stamens with curved filaments and anthers that dehisce by terminal pores; in common with other *Rhododendrons*, they are buzz-pollinated, i.e. the pollen is ejected from the stamens in response to vibrations from visiting insects. The pollen grains are released in tetrads held together in masses by microscopic viscin threads. Pollination is by bees, wasps, hoverflies and butterflies, with bumblebees perhaps the most effective, even though the nectar is said to be toxic to bees. The long glabrous but glandular superior ovary contains five locules, each containing many ovules with axile placentation. There is a single style ending in a capitate stigma.

After pollination, the ovary develops into a stalked woody brown capsule, which releases large numbers of very small (1-2mm), winged, seeds which are adapted for wind-dispersal and can travel up to 1000m from source in the open, but sometimes as little as 10m in woodland. A 2m high plant produces more than 1 million seeds each year. There are reports that the seeds are short-lived and do not persist in the soil. Germination requires light and temperatures of 10⁰C-15⁰C. About 12 years after germination, plants begin flowering.

Rhododendron species are notoriously promiscuous, and all members of subgenus *Hymenanthus* (which includes *R. ponticum*) appear to be interfertile with one another. In northern Turkey, wild *R. ponticum* hybridises naturally with the three other sympatric species of subgenus *Hymenanthus*, especially *R. caucasicum*. In cultivation, *R. ponticum* hybridises also with other species introduced from different

parts of the world. All these hybrids appear to be highly fertile, though ecological mechanisms appear to prevent seed from *R. x sochadzeae*, the hybrid with *R. caucasicum*, from establishing.

Dispersal of seed by wind and water, on machinery, during disposal of cleared vegetation, or on animal fur, allows colonisation of new sites. Germination requires moist conditions such as those created by a thin layer of moss or litter. Logs, wind-blown trees and stumps covered with moss are a favoured substrate so a felled, thinned or burnt woodland site is therefore highly susceptible to *Rhododendron* colonisation. Germination in moss can also occur on rock faces and in disturbed sites along tracks and watercourses, and in over-grazed areas. Establishment can even occur on moss within existing ground cover and in this way *R. ponticum* can invade grazing land. Once *R. ponticum* becomes a shrub, all other plants are suppressed by the deep shade, accumulation of toxic leaf litter, root competition and perhaps also by allelopathy, the inhibition of other plants by exuded chemicals. This eliminates ground layer plants and inhibits regeneration of trees and other shrubs. The vegetative spread of several adjacent *ponticum* individuals then creates a continuous monoculture with reduced diversity of flora and accompanying fauna. In this way *R. ponticum* can be invasive, even in its native habitat in Turkey.

After introduction to Britain, Ireland and parts of continental Europe, plants identified as *R. ponticum* have spread to natural habitats by seed dispersal, particularly since large estates and gardens have become less intensively managed and the spread of *R. ponticum* has not been checked. Even ornamental cultivars and hybrids of other species can become a source of *ponticum* seeds if suckers from the *ponticum* rootstock are allowed to grow and eventually flower. At the same time, untended gardens can be 'lost' under a tsunami of *Rhododendron*. Some of the plants that have invaded natural habitats in Britain may not be pure *R. ponticum*. The presence of hairs on the ovary, absent in pure *R. ponticum* but seen in some naturalised plants especially in eastern Scotland, is taken as evidence that they are the result of hybridisation in cultivation with other species including *R. maximum* and *R. catawbiense*. As discussed recently by Parrott and Mackenzie (2013) amongst others, it is thought that these Appalachian species might have given the hybrids greater cold hardiness. It has even been suggested that the spread of pure *R. ponticum* is relatively slow

and restricted and that much of the invasion of native plant communities has been by the more vigorous hybrids.

However, it is far from certain that all British plants of "*R. ponticum*" have a hybrid origin, and some plants in western Ireland may well be pure *ponticum*. Furthermore, disruption of natural plant communities in the ways described above is probably more significant than hybridisation in promoting invasion. This invasion has accelerated over the last 50 years and *R. ponticum* and its hybrids are now a serious pest over large areas. More than 4,000 hectares in mainland Argyll alone are affected.

The impact of invasion by *R. ponticum* is considerable and varied. It reduces biodiversity, not only among the plants, including cryptogams, but also the accompanying animals including insects, earthworms, birds and mammals. It can change the ecology of watercourses. It interferes with agricultural and forest management by restricting access of machinery and can inhibit public access by blocking paths. The leaves are toxic to dogs, and to livestock if grazed; the nectar is toxic to man and domestic pets as well as bees. The shrub provides an intermediate host for the oomycete *Phytophthora ramosum*, the causal agent of Sudden Oak Death. Identified in the USA as a new species, *P. ramosum* has been spreading in Britain since the 1990s and is a serious threat to several cultivated genera including *Rhododendron*, *Viburnum* and *Larch*.

Control of *R. ponticum* is difficult, laborious and expensive. As early as 1930 attempts to remove it were initiated in Stapleford Wood, Lincolnshire, and still continue there. Several herbivorous insects and fungal infections have been identified on *R. ponticum* but the toxicity of the leaves leads to herbivore avoidance and no natural enemies have been identified that have a significant controlling effect even in natural habitats. Biological control would in any case be inherently risky because of all the other *Rhododendron* species being grown throughout Britain. Chemical control by application of foliar herbicides is not always effective, in part because of the waxy surface of the leaves and the sticky exudate that protects the young buds, but has been used successfully to treat young re-growth from stumps. An alternative treatment with herbicides is by stem injection. When successful, this approach has the merit of inducing gradual degeneration of the shrub, thus avoiding the impact on the habitat of the abrupt change in conditions following complete removal. Nevertheless, eradication by mechanical methods is frequently attempted. Seedlings and small bushes can be pulled by hand. Branches of large bushes can be

removed by 'levering' (breaking off at the base), or hand-cutting at ground level. The brash can then be chipped into mulch or burnt and the stump treated with herbicide. If access with heavy machinery is possible, mechanical flailing and removal of stumps can be employed. Follow-up treatments are essential to prevent regeneration from untreated stumps and re-colonisation by any on-site *ponticum* seeds or by seeds entering from a local source. The site should then be monitored for about 5 years to ensure complete eradication has been achieved, unless there is a seed source within a few hundred metres, perhaps on land under different management, in which case re-colonisation is almost assured. No control programme has achieved and maintained 100% eradication on a landscape scale; the chances of success are greatest for small populations under single ownership.

For these reasons, control is expensive in time and money but has to be employed where a rare habitat or species is threatened in the wild, or a garden is being restored. For example, considerable efforts have been made to control *R. ponticum* in the Atlantic temperate rain forest of western Scotland. Among the sessile oaks are several rare cryptogams whose survival is threatened by *ponticum* encroachment. Conservation interest is often greatest on the steep side of cliffs and ravines, but it is there that *Rhododendron* control is most challenging, requiring rope work. Cutting and removal can cost several thousand £s per hectare, ten times that if ropework is required. The Forestry Commission Scotland costed at £15 million a 15-year programme of eradication of *ponticum* from the National Forest Estate in which more than 35,000 hectares are affected. More than that has been spent controlling *R. ponticum* in Snowdonia National Park. On the small Hebridean island of Colonsay, where *ponticum* has increased in area by 1km² in 5 years, the cost of a 16-year eradication programme has recently been calculated as about £2 million. On Lundy Island, *ponticum* has been spreading for more than 100 years over the rocky coastal slopes on which grows the endemic Lundy Cabbage, *Coinceya wrightii*, creating the major threat to its survival. *R. ponticum* was still spreading on Lundy in 2004. After intensive work by up to 140 volunteers for several months each year, the last large bush was removed from Lundy in 2013 but it is estimated that eradication will not be completed until 2025.

Rhododendron ponticum is still offered for sale by some nurseries and garden centres in Britain, including Dobies of Paignton (not to be confused with the well-known Dobbies chain) and Sutton Seeds, and

there are few legal restrictions. Some nurserymen have recently argued that banning its sale is pointless given that it is already so widespread, and that it still serves a useful purpose when planted as a windbreak. However, in 2010, *R. ponticum* was added to Schedule 9 of the Wildlife & Countryside Act 1981, and it is covered in Scotland by the 2011 amendment to the 1981 Act, the Wildlife and Natural Environment (Scotland) Act, which makes it an offence "to plant or cause any non-native plant species to grow in the wild". In New Zealand, where *R. ponticum* is also naturalised, its sale, propagation and distribution has been banned.

Acknowledgement: I am grateful to David Chamberlain for helpful comments and Richard Milne for suggested alterations to a previous draft. Richard's book "Rhododendron" is due to be published by Reaktion Books next autumn.

Adrian Dyer

Reference:

Parrott, J. and Mackenzie, N. (2013). A critical review of work undertaken to control invasive rhododendron in Scotland: a report commissioned by Forestry Commission Scotland and Scottish Natural Heritage. Pub. Coille Alba.

BOTANICAL ACCOUNT- THE CENTRAL HIGH ATLAS MOUNTAINS OF MORROCO

Morocco boasts a remarkable plant diversity, counting around 3,900 vascular plant taxa, of which 22% are endemic, making it the most diverse country of North Africa. Within Morocco, the High Atlas mountain range holds the record for floristic diversity. Along with having the highest peaks of North Africa, culminating at 4,167 m, it has been recognised as a Mediterranean plant "Hotspot" under general species and endemism levels. In the following account, I will share some of the botanical highlights that we saw during an expedition to the Moroccan Atlas Mountains, conducted by myself with the support of the Global Diversity Foundation, Reading University, and the University of Marrakesh.

The aim of the trip, in July 2016, was to collect distribution data and to record threats affecting the strict endemic vascular flora of the High Atlas, as part of a Masters in science. This work contributed

towards updating the national Red-list, as well as defining areas of high conservation value.

To reach our collecting areas, we travelled from Marrakesh, stopping off in urbanised areas and lowlands where it is always fascinating to observe the ruderal and weed communities. The invasive *Nicotiana glauca* Graham, the highly adapted narrow leaved and native *Retama sphaerocarpa* (L.) Boiss. as well as ubiquitous herbaceous species such as *Echinops spinosissimus* Turra, *Solanum elaeagnifolium* Cav., *Chenopodium vulvaria* L. and *Mantisalca salmantica* (L.) Briq. & Cavill to name but a few were common occurrences. However, the hundred or so strictly endemic vascular plants that occur in this mountain range are mostly found at high elevations. This led us to explore the habitats occurring between the oro and cryo-Mediterranean zones (approximately 1,200 to 4,000 m) in the central parts of the mountain range. The dominant plant “community” is a xerophytic suffrutescent (plants having a base that is somewhat woody and does not die down each year) scrubland, that tends to survive well beyond the elevation range of *Juniperus phoenicea* L., *Juniperus thurifera* L. and the endemic *Tetraclinis articulata* (Vahl) Mast. Despite looking very different from anything that can be seen in the United Kingdom, many of the hemispherical spiny cushion plants that form this community, belong to genera familiar to “western” botanists. *Bupleurum spinosum* Gouan, *Astragalus ibrahimianus* Maire, *Arenaria pungens* Clemente ex Lag. and the rare strict endemic *Ononis atlantica* Ball for example, have, through the evolutionary constraint of the harsh, dry, and cold conditions, converged towards a similar growth form, far from their herbaceous to sub-ligneous “sister” taxa found in the British Isles. These Moroccan plants embody the evolutionary and biogeographical influences that drives diversity. Within this matrix of scrubland, grasslands, saxicolous, hemicryptophytic and wetland communities will be found in different amounts. In the case of the Central High Atlas the merging and transitions between an Atlantic, Mediterranean and artico-alpine flora seems to be particularly visible, not only in the ecotones at the “breaking” point of altitudinal zonations, between north and south sides, but also in transitions from humid habitats and the surrounding environment.

The “Pozzines” first described in Corsica by Briquet in 1910, which form short green lawns often punctuated by little water pools, are, along with slope wetlands and stream sides, the common accruing humid

habitats in the mountains we surveyed. In an outstanding Pozzines near Mgoun we came across the strict endemic, *Gentiana atlantica* Litard. & Maire. This short-lived plant (annual to bi-annual) is not easy to spot, rarely exceeding 7 cm. The corolla is like no other from any European relative, with only two scarious visible petals that slightly exceed the calix. Despite the non-typical look of this plant, the parallel primary venation and rosette, along with the habitat, should make it distinguishable. Aside from being the only taxon of the *Chondrophyllae* section in Africa, its singularity in appearance and the co-occurring flora should be immensely rewarding for any keen botanist. These habitats play a pivotal role for the wild flora. They hold numerous rare endemic taxa such as the *Epilobium psilotum* Maire & Sam., *Globularia liouvillei* Jahand. & Maire, *Campanula mairei* Maire, that were observed along the stream on the Oukaïmeden plateau. The Oukaïmeden area, which is partly subjected to the traditional regulation of open periods for pasture (Agdal management), was less degraded than many non-Agdal humid localities. Despite this, generally the high pastoral value and the presence of water, along with possible climate change factors, has made these habitats and the natural history they carry particularly vulnerable. This can result in over-grazing, nitrification, erosion, and high extinction risks for strict endemics.

Mountains are fascinating in that they give you the opportunity to travel thousands of “latitudinal” miles biogeographically, in only a few hundred meters in altitude. Added to this, the contrasts between north and south, high and low, wet and dry that can be seen in the High Atlas translates into tremendous plant diversity over “small” areas. In the same day, the cactiform *Euphorbia resinifera* O.Berg, Mediterranean bulbs such as *Drimia* or the many *Narcissus* and even temperate elements such as *Carex capilaris* L. and *Parnassia palustris* L. can all easily be seen. In subjective terms, this first experience of the high atlas, differs from any other mountain that I have worked on, be it the Alps, Pyrenees, or the Taurus. It feels more lived in yet in many regards “wilder”. For these reasons, I feel compelled to encourage any keen botanist to consider the High Atlas and Morocco for their next botanical adventures.

Disclaimer: I recommend that especially in the rural areas, ethical and cultural respect is considered in the design and during your potential trip. Furthermore, that safety and risks are taken into consideration as well as any required paper work if you intend to collect

plant material. Local botanical institutions and Universities (mainly found at Rabat or Marrakesh) are from my experience very friendly although communicating in French might be required. More often than not, they will guide you in regards to collection requirements especially if you leave your herbarium or part of it, in a local receiving institution and in this sense, help generate chorological and taxonomical data that is still much needed in many parts of this country.

Jah-wild Skipper

Don't hesitate to contact me, at jahskipper@gmail.com.

Useful books and sources:

Morocco has recently completed their three-volume national flora:

Fennane, M., Ibn Tattou, M., Mathez, J., Ouyaha, A. & El Oualidi, J. (1999–2014). *Flore pratique du Maroc: manuel de détermination des plantes vasculaires*, vols. 1, 2 and 3. *Université Mohammed V Agdal, Institut Scientifique, Rabat*.

If you are interested in knowing the rarity of species:

Fennane, M., Tattou, M. I., Raimondo, F. M. & Valdés, B. (1998). *Catalogue des plantes vasculaires rares, menacées ou endémiques du Maroc*. Herbarium Mediterraneum Panormitanum.

A very good overview of the habitats and conservation challenges facing Morocco:

Benabid, A. (2000). *Flore et écosystèmes du Maroc: évaluation et préservation de la biodiversité*. Paris, Ibis Press.

The African vascular plant data base held and curated by the Botanical gardens of Geneva is worth visiting online for bibliographical references for individual plants: www.ville-ge.ch.

CONSERVATION WORK ON SEA PEA IN ANGUS

The University of Dundee Botanic Garden contains a large collection of native plant species (circa 500) and has a long term commitment to support the conservation of rare or declining plant species in Angus and Tayside.

The project that I describe here was initiated in 2006 when it was thought that construction works on the beach at Carnoustie, in Angus, might damage the existing population of Sea Pea, *Lathyrus japonicus ssp acutifolius*. Damage did not occur, but it brought the potential

problem to the attention of the Curator of Dundee Botanic Gardens, Alasdair Hood, who decided that some research on Sea Pea would be needed if conservation efforts were required in the future. Further reconstruction of the sea defences by Angus Council was to take place and it seemed likely that current sites might be destroyed or that new planting sites might be created. In conjunction with the Scottish Golf Environment Group (SGEG) and Carnoustie Golf Club it was agreed to propagate this plant. The objective was to establish a protocol for growing the plant with a view to transplanting new seedlings into the immediate vicinity (of the existing population) if suitable sites could be found. As the population appears to be so isolated, we thought it would be useful to investigate the genetic diversity of the plants using DNA fingerprinting.

It is thought that the Sea Pea was once much more frequent around the Angus coast and we looked for historic records. At the moment it would appear that there are just two sites in the UK, one at Carnoustie and a recent colony at Tentsmuir, Fife. A population at Elliot Links, Angus, died out in the 1990s (Loizou, 2006). In southern England the Sea Pea found growing in shingle is a different subspecies (*L. japonicus ssp maritimus*)

Historic records from William Gardiner's *Flora of Forfarshire* note the Pea was found in three locations in 1857 but the exact locations were not stated. Records from BSBI show that the plant was formerly found on the coast of Shetland and at Loch Ewe, but it has not been seen there either. It is described as having a circumpolar distribution.

We were unable to find any collections in the Herbarium of the University of Dundee. The Royal Botanic Gardens Edinburgh holds four specimens in the Herbarium but only one of these is from Angus, the others are from Shetland.

The herbarium at the University of St Andrews has a specimen of the southern subspecies *L. japonicus ssp maritimus* and we also looked at the herbarium material held at the MacManus museum, Dundee.

In Denmark the Sea Pea plant is more common with an interesting distribution. There is a population of *L. japonicus var acutifolius* in northern Denmark growing on sand dunes and a southern population of the subspecies, *Lathyrus japonicus ssp maritimus* growing on shingle. This is similar to the U.K. distribution, with plants in Suffolk and Rye

being *Lathyrus japonicus ssp maritimus*. This latter subspecies is also much reduced in range due to habitat loss.

We would have expected to find more ancient references to the Sea Pea if it had previously been more abundant, given that it is distinctive and attractive. Possibly the plant has always been an opportunist visitor in the U.K with seeds drifting here from Scandinavia when sea currents were favourable.

Sea Pea Description

Sea Pea is a long lived perennial herb, which may scramble to about 30 cm with vetch type leaves and tendrils at leaf tips. The subspecies *Lathyrus japonicus ssp acutifolius* often shows marked reddish colour in the new stems and has a straggling habit, often growing with and through grasses. It suckers freely and an established plant can spread quickly through sandy soil.

In contrast *Lathyrus japonicus ssp maritimus* is totally blue green with broad leaflets and a compact ground hugging habit. It grows only in deep shingle in southern England.

The flowers of both subspecies are rosy pink and produced abundantly. A large amount of seed is set. Like other legumes the seed has a hard seed coat and has a long viability.

Habitat

This species has been found on dunes and coastal areas in association with Lyme grass, *Leymus arenarius*. Where vegetation becomes fertile and rank it is out competed by coarse grasses. It will scramble up through light grasses. It is vulnerable to trampling but one of the main losses of habitat is due to coastal erosion, installation of sea defences (rock armour) and agriculture reducing the area between marginal fringe and high tide zone. A good example of the latter would be Elliot Links, Angus, where the plant used to flourish (Loizou, 2006).

The Carnoustie plants have established in the spaces between rock armour (sea defences) and are thus protected from foot fall. However, on the landward side a continuous tarmac path prevents the plants spreading and the seaward side falls steeply to the sea. It seems unlikely that any seed would be able to distribute from here.

Genetic Diversity

We are indebted to Joanne Russell from The James Hutton Institute (JHI) for contributing the following genetic analysis. Dundee

Botanic Garden staff helped with the initial DNA extraction work in the laboratory.

In 2014 it was decided to sample the population at Carnoustie with a view to judging the level of diversity within this small isolated colony. The approach taken was similar to that published by the group at JHI to identify genetic markers for tropical trees (Russell et al., 2014). Briefly, seeds from the Garden were grown and RNA extracted. Libraries were constructed and sequenced by the Genome Technology facility at JHI. From the sequencing, after quality control, over 85,000 transcripts (expressed genes) were identified. These were compared to the closest sequenced genome (*Medicago* spp) and analysed for simple sequence repeat motifs (SSRs) from which genetic markers could be developed. Over 5,000 potential SSR markers were identified from which 10 dinucleotide repeats and 10 trinucleotide repeats were tested on a subsample of Sea Pea DNAs. A final set of eight robust SSRs were then used to determine the genetic diversity within the samples from the Carnoustie population (Table 1). Staff collected 43 samples of tissue from the wild plants at Carnoustie and also from seedlings grown in the garden nursery, including some seedlings from Aarhus in Denmark. Genomic DNA was extracted from each sample and amplified using the eight gene based SSR markers.

Table 1. Description of 8 SSR markers, number of alleles amplified in 48 samples and diversity, ranging from 0.000 all individuals identical to 0.556, over half samples are different.

SSR name	SSR type	Repeat unit	No of alleles	Diversity
<i>c21680</i>	<i>dinucleotide</i>	(CT) ₁₀	2	0.023
<i>c38251</i>	<i>dinucleotide</i>	(GA) ₈	2	0.046
<i>c27406</i>	<i>dinucleotide</i>	(AC) ₈	2	0.024
<i>c21987</i>	<i>dinucleotide</i>	(CT) ₈	2	0.208
<i>c7583</i>	<i>dinucleotide</i>	(CT) ₈	2	0.046
<i>c12856</i>	<i>trinucleotide</i>	(ACT) ₇	3	0.556
<i>c16076</i>	<i>trinucleotide</i>	(GTT) ₇	1	0.000
<i>c13808</i>	<i>trinucleotide</i>	(ATT) ₇	2	0.479
		Mean	1.875	0.228

The level of diversity was relatively low for each of the SSRs but, when combined, identified 11 unique samples from Carnoustie, the remaining 32 forming 7 groups with 2 to 9 identical individuals. Interestingly two of the three Danish lines are very distinct from the Carnoustie collection.

Translocation work

The original idea was firstly to try and grow the species in cultivation and later to look for possible translocation sites in the immediate vicinity of natural populations. The natural range of the plant seems very narrow, in sandy dunes above the high tide line but not so far inland as to be out-competed by other vegetation. Seed was first collected from Carnoustie in 2006 and the resulting plants were planted at the Botanic Garden within the Native plants area.

Seed is soaked in warm water for 12 hours – this speeds up germination and gives a more regular result, but it is not essential. At first whalehide sweet pea tubes were used to encourage a good root system but normal pots are just as good. It was found that the seedlings dislike being pricked out when small so the seeds are sown 1 or 2 per pot to avoid disturbance. At the Botanic Garden nursery plants did not flower until 3 years old.

In 2009 about 80 seedlings were planted on the sandy areas, which we believed were above high tide, with help from the Scottish Golf Environment Group. Unfortunately the storms that winter removed most of these plants along with the beach. At the M.O.D property at Barry Buddon Training Camp a small planting of about 35 plants was introduced. The area was later subjected to friendly fire!

The most successful action has been to introduce 2 year old plants into the new rock armour installed by Angus Council on the beach area which was swept away in 2010. In 2013 Botanic Garden staff placed a further 80 plants in between the boulders of the rock armour and in the coastal strip west of the Barry Burn bridge. In order to be certain we are monitoring the introduced plants, photography has been our main tool as it has been difficult to find a method of marking new plantings. Small wire sticks were used but several of these were removed by someone or something and discarded.

Conclusions

This species occupies a very narrow ecological niche, being dependent on spacious sandy dunes that are sufficiently stable without

being frequently eroded. The seeds are dispersed by the sea and it appears that seed from the Carnoustie colony has succeeded in spreading as far as Fife. However, the coastline of Angus and Tentsmuir point are both notoriously subject to erosion.

The conclusions of the DNA analysis show there is a reasonable amount of diversity given the small number in the sample. We noted that the seedlings from Denmark showed greater vigour than the Carnoustie plants.

We will continue to grow this plant at the garden and if secure planting sites become available it may be appropriate to add small numbers of new plants. We will continue to monitor the health of the original plants and introduced plants. There is interest from the Easthaven community with support from Angus Council in re-introducing the plants at Elliot Links.

We would like to thank Carnoustie Golf Club, M.O.D Landmark at Barry Buddon, and The James Hutton Institute at Invergowrie.

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CODEWORD 3

In this codeword each number always codes for the same letter, and each letter occurs at least once. Solutions do not enter grey squares or cross thick lines. Further helpful hints may be found at <http://www.botanical-society-scotland.org.uk/xwordhelp>

	12	4	32	5	15	2	6	26			2			
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THE EARLY DAYS OF THE NATURE CONSERVANCY

In January 1950 I joined the newly-formed Scottish Office of the Nature Conservancy, which for two weeks consisted of the Director Scotland, Dr John Berry (a zoologist), his secretary and me; then we moved to 12 Hope Terrace and were joined by Peter Marker, a young Cambridge Botany graduate, Sidney Holt, a statistician, Frank Green, a meteorologist, and a librarian, secretary and telephonist.

In February Dr Berry gave me my first 'job', which was to go to Pitlochry by train to oversee the removal of the rare rush *Schoenus ferrugineus* from the shore of Loch Tummel, where it would soon be submerged by the new hydro-electric scheme, to a prepared site on the loch bank. I was met by a squad of men with spades, who dug up as much of the *Schoenus* as we could plant in the prepared site. The translocation was not successful as the rise and fall of the loch level did not replicate natural conditions. Years later the *Schoenus* was found thriving on a higher site. Nature Conservancy staff were given a list of "sites of possible interest for nature conservation" which had been drawn up by professors of botany and zoology, and we set off to report on them. Woodland sites often did not exist – wartime felling had done much damage, and the Forestry Commission was re-planting with Sitka Spruce.

In March 1951, we heard that the old native pinewood above the shore of Loch Maree in Wester Ross was up for sale and that the Forestry Commission was 'interested'. Dr Berry tried, and failed, to reach the owner, Mrs. Gregg. The road was blocked by snow. In April, he tried again, got to her cottage above Loch Maree and asked the price of the pinewood. Mrs. Gregg's answer, "It's not just the woodland I want to sell, it's the whole mountain" astonished him, and when he asked "How much do you want for the whole mountain?" he was quoted a very low price, and replied "The Nature Conservancy will buy it. He returned to Edinburgh, and was told by head office in London "You should have consulted us first", so Dr Berry said "If the Nature Conservancy won't buy it, I will, and I will then sell it to the N.C. at a profit." So, the Nature Conservancy bought it, and Beinn Eighe became the first National Nature Reserve in Britain. I was 'officer in charge' for two years, and gave permission to the Forestry Commission to collect seed, which they did by shooting cones from the tops of trees! Years later, the Beinn Eighe pines were identified as genetically different from Strathspey pines, and were therefore a potentially valuable source of genetic

variation. Beinn Eighe NNR does not have a rich flora apart from bryophytes. It was then that I first saw the 'Atlantic' bryophytes growing on outcrops and boulders of Torridonian sandstone, and I was delighted to be told by Dr David Long that my collections are now at the RBGE.

Once, after a week at Beinn Eighe, the botanist Dr Donald McVean and I decided to go exploring near the coast shore down Glen Torridon. Going up a single-track road we were astonished to see a small wood of ash trees flourishing among boulders; Rassall Ashwood, unrecorded until then!

In contrast to remote sites in the North-West Highlands was the bay of St. Cyrus on the coast of Aberdeenshire. Here, just above sand level and enclosed by cliffs was a grass turf where fishermen dried their nets. When gorse bushes encroached on the green they were burned. Occasionally fires got out of control and advanced up the cliffs, resulting in open soil for plants to seed into. The cliff flora was remarkably rich, and included several rare species that may have been relicts from a time when they were grown in the medicinal herb garden of a nunnery. St. Cyrus is now an NNR, the fishermen have gone, and the rare plants were overwhelmed by rank grasses; an example of the consequences of abandoning traditional practices. I believe that the management of St. Cyrus (by the Nature Conservancy's successor, Scottish Natural Heritage) has now improved.

I married in 1954 and Dr Berry kindly changed my 'area' to the Scottish Borders so that I could be nearer my husband in Edinburgh. The most interesting site I surveyed there was a series of raised bogs known as The Silver Flowes, on Forestry Commission land in Wigtownshire, where, very unusually, I could not find any evidence of peat cutting. In late 1955, I had to leave the Nature Conservancy to join my husband abroad. Later, after I returned to Scotland and had settled in Aberdeen, I had several summer jobs with the Nature Conservancy, such as surveying the peat bogs of Aberdeenshire (many of which were cut and planted with non-native conifers) and the moorland above the pinewoods of Glentamar (burned for grouse moor, and very poor floristically); the completion of a survey of woodland in Morayshire after the original surveyor unfortunately became too ill to complete it; and a survey of the cliff flora of Longhaven south of Peterhead.

Heather Fairlie, B.Sc., Ph.D.
(now Mrs Salzen)

FEMALE MATE CHOICE IN FLOWERING PLANTS

Almost as soon as the first angiosperms appeared in the mid-Cretaceous they radiated species four times faster than any of the three major groups that preceded them, and started to out-compete them (Niklas et al. 1985 and Muller 1981). Several reasons have been proposed for this (Regal 1977, Raven 1977, Mulcahy 1979 and Soltis et al. 2008). I now wish to suggest another: female mate choice.

The objective of reproduction is for each individual to get as many copies of its own genome as possible into the next generation. Half of the progenies' genes come from each parent, so it is in the interest of both sexes to choose partners whose genetic endowment is the best available so as to help to carry their genomes successfully into the next generation.

In the animal kingdom, the advantage to males and females of choosing a 'fit' partner is asymmetric. A female (or the female function of an hermaphrodite) typically directly invests substantially greater metabolic resources in her progeny than the male, and it is therefore imperative that she should mate only with genetically well-endowed males. The cost to a male of mating with a poorly-endowed female whose progeny do not survive to maturity is slight: provided he mates also with well-endowed females there is a good chance that his genome will be well represented in the next generation.

Female animals therefore typically consent to mate only with the male they deem best. For this to work, three criteria must be met: (a) the female must be able to make an effective choice, i.e. be able to reject unsuitable suitors; (b) she must select her mate according to criteria that correlate strongly with real genetic fitness in the male, and (c) males must not be able to cheat in their 'exams'. The best way to achieve this is a phenotypic assessment of the available males by the female. Female mate choice often has the appearance of contests between males, and there are many refinements in the details.

These considerations apply equally to plants as to animals, but seed plants (and sessile animals such as coral polyps) are unable to exercise phenotypic choice. This is ultimately because they rely on vectors of their pollen, such as insects or the wind, over which they can exercise no genetic control. Many plants and seeds have senses for detecting day length, temperature or pheromones emitted by other plants under attack by herbivores, and seeds in soil seed banks can

detect when it is propitious to germinate; but none have senses that can detect the phenotypic qualities of prospective pollinators because they have no way of acting on that information.

There are many mutualistic relationships between plants and other organisms. In some of these, the heterotrophic organism exercises epigenetic control over its autotrophic partner: the gradual conversion of endosymbiotic cyanophytes into chloroplasts started in this way. Maybe an autotroph can exercise epigenetic control over a heterotrophic partner? The Glomeromycota have, since ancient times, had a mutualistic relationship with autotrophic plants which allows these arbuscular mycorrhizal fungi to have very intimate contact with strictly selected cells in its host's roots. This would seem to be a high-risk strategy for the plant, if the fungus were to turn parasite. This seems rarely/never to happen now (one cannot be sure of past relationships), and I wonder if the plants exercise epigenetic control over their partners, perhaps by exuding genetic material into the Glomeromycota's cells? This method is used by the parasitic larvae of the wasp *Cotesia glomerata* L (Fleming & Summers 1991; Tanaka & Ohsaki 2006) to control the behaviour of their caterpillar hosts. Readers may complain that there is no evidence for this hypothesis; I reply that it has probably not been looked for, and might be very difficult to demonstrate.

Let me now indulge in deeper fantasy. Bullhorn acacia (*Vachellia cornigera*) has an elaborate mutualistic arrangement with the ant *Pseudomyrmex ferruginea*, based on the self interest of both species. This arrangement does not extend so far as the ants seeking out the best pollen to pollinate the acacia's stigmas, because there is no incentive of self interest for the ant to do so. Suppose, however, that a descendant of bullhorn acacia played a trick like *Cotesia* by producing nectar for the ants' larvae, and secreting into that nectar a virus-like particle that infected their brains. This would give the plants an opportunity to exercise epigenetic control over the ants' behavior. Then the ants might be induced to fly to nearby acacias, select the best pollen on a phenotypic criterion such as the showiness of their inflorescences, return bearing carefully selected pollen, and pollinate the flowers of their home tree. They might also, perhaps, carry their home plant's seeds to a distance and bury them at a prepared site. Such an arrangement, if it were ever to arise, would be a strong evolutionary incentive to dioecy in the plant, and to only female plants having mutualistic ants. This may be the next great evolutionary breakthrough in the reproductive strategy of

plants, but it hasn't happened yet. It only remains for the BSS to hire a Tardis for an afternoon and have a field excursion 2×10^8 years in the future to prove me right!

All angiosperms (except Resedaceae) have closed carpels, and pollen tubes have to grow through female tissues, which exposes them to close scrutiny. This allows the female to repulse pollen tubes of allospecific pollen or, worse, hyphae of parasitic fungi: sexually transmitted diseases other than *Ustilago* seem to be rather infrequent in angiosperms given the possibilities for their transmission. But it also allows the female to inspect the gene products of pollen tubes and make an attempt to select between them. There is circumstantial evidence for this hypothesis in Tanksley et al. 1981, Willing et al. 1984 and Stinson et al. 1987. As a method of mate selection, it is inferior to phenotypic selection: females cannot assess males as being superior to themselves and can therefore only safely select males similar to themselves, and it is perhaps too easy for pollen tubes to cheat in their exams.

However, it can lead to rapid evolution. Suppose there is an allele *A* present at a frequency *a* in a population. If mating is random, the probability of offspring homozygous for *A* is a^2 , but if an *Ax* or *AA* style, presented with pollen tubes of different genotypes, selects *A* pollen, the frequency of *AA* seeds could be appreciably greater than that. If *A* has hitherto been selected against and is therefore present at low frequency, but now becomes advantageous, it can increase in frequency rapidly. Conversely, if *A* becomes disadvantageous it will be eliminated rapidly. This may account, at least in part, for the surprisingly high rate of speciation among early angiosperms.

Roger West

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NEW TRUSTEES (COUNCIL MEMBERS) FOR THE BOTANICAL SOCIETY OF SCOTLAND

Maude Grenier: BSS Student Representative. Second Year undergraduate at SRUC in Environmental Resources Management, based in Edinburgh but originally from Canada. Keen novice botanist, currently working bettering her identification skills.

Ewan Cole: BSS Publicity Officer. Ewan is an Edinburgh based amateur botanist currently working with the visitor welcome services at the Royal Botanic Garden Edinburgh (RBGE). Ewan recently graduated from the University of Edinburgh with an honours degree in Plant Science. His interests include polyploid evolution in plants and plant phenology.

Felicity 'Flic' Anderson: BSS Web Admin. Edinburgh-based plant and data/computer geek, currently working as a Research Assistant at the Centre for Middle Eastern Plants (CMEP) at the Royal Botanic Garden Edinburgh (RBGE) after studying MSc in Biodiversity & Taxonomy of Plants at RBGE and BSc (hons) in Ecological Sciences at University of Edinburgh.

Roger West: Degree in Botany (a long time ago), but never worked as a botanist. Interested (but not expert) in evolution. Writer of Botanical doggerel and crosswords that find their way into BSS News

Brian Ballinger: Retired hospital consultant. BSS local secretary, Dundee and Tayside, BSBI vice-county recorder for Easter Ross (VC106). Formerly President Dundee Naturalists' Society and formerly chairman, Scottish Wildlife Trust Angus and Dundee Members Centre
See Chris Jefree's photo of the new trustees on the inside back cover.

FUTURE EVENT: "BIO-BLITZ" AT CASHEL FOREST, A 'MILLENNIUM FOREST' NEW NATIVE WOODLAND ON EAST LOCH LOMOND.

Date: Saturday 03 June 2017

- Re-establish the network of Biological Recorders who use Cashel;
- Revisit and refresh the base-line information collected in the late '90's;
- Determine some actions for the future.

Location: Cashel Forest Car Park is at NS 397 938 (OS Landranger Sheet 56: Loch Lomond and Inveraray Area); Cashel Centre is at NS 400 940 (Post Code: G63 0AW).

Directions: Take the B837 from Drymen to Balmaha. Cashel lies 2.5 miles north of Balmaha, on the north east side of the minor road from Balmaha to the road end at Rowardennan.

There is ample on-site car-parking, including for mini-buses if you wish to bring a group of members. The event is organised on a 'self-help-self-funding' basis – Bring your own lunch – Provide your own transport. Please confirm that you will be attending, which organisation you are affiliated to and your particular interest.

Contact: Michael Osborne - Dunblane (01786) 822034 – Mobile 07919 496872

Email: osbornemichael765@yahoo.co.uk

SOLUTIONS TO PUZZLES

Phytolexicon cruciformis 16

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BSS NEWS – INFORMATION AND GUIDELINES FOR CONTRIBUTORS

The Newsletter of the Botanical Society of Scotland
ISSN 0967-5922

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Aims of BSS News

The chief aims of BSS News are to communicate with the membership, to keep members informed and to act as a vehicle for members' contributions on all things botanical. All contributions are welcome.

Scope of the newsletter

The content of BSS News is as kaleidoscopic as possible around the botanical theme and we are keen for this variety to continue. For a list of ideas for contributions see the BSS website (www.botanical-society-scotland.org.uk) and the following list, but please don't feel constrained by it. New ideas are welcome. Regular contributions include the following items:

- Reports of field excursions (leaders please take note) picking out the botanical highlights.
- Descriptions and recommendations of other botanical sites in the UK or abroad. (It might help people to plan their holidays.)
- Articles of current or historical interest, including ethno- and archaeobotany.
- Biographical profiles of botanists.
- Botanical poems.
- Botanical notes, news items, announcements of future events, reports of meetings attended, correspondence, small ads., etc.

- Book reviews.
- Crosswords and quizzes.
- Illustrations, including paintings, photographs and line drawings. Subjects could include plants, habitats, people, events, or even witty cartoons if they are your forte!

Guidelines for contributors

Don't worry if you cannot comply with all of the following guidelines. Just send what you can and the Editors will make adjustments.

File name for email submissions and web uploads

Please include your own name and indicate article content in the file name. Also add your name, preferred title and affiliation etc. to the end of your article.

Text

The Newsletter is set up on A4 pages in MS Word 2010 using Arial font (size 15 for major text, 18 for main headings and 14 for references). And acknowledgements. Margins are set at 2 cm (sides), and 2.5 cm (top and bottom), with headers and footers at 1.5 cm. Text is justified and single-spaced. Paragraphs are followed by 6pt spacing. Please use the [template](#) on the BSS website to submit articles in this format.

Illustrations

The cover is the display area for colour pictures. Please include the name of the photographer or artist with all images. Line drawings, maps or graphs within the text look best in black and white or greyscale.

Submission

Please send your contributions to the Receiving Editor by:

- post at the address above,
- email to jill.thompson99@gmail.com,
- or through the BSS website at <http://www.botanical-society-scotland.org.uk/content/bss-news-newsletter-botanical-society-scotland>.

When sending something by post please phone 0131 258 2358 or email jill.thompson99@gmail.com to let Jill know something has been posted.

The LAST deadline for the next issue will be 15th July 2017. Earlier submission would be appreciated.

BOTANICAL SOCIETY OF SCOTLAND FINANCIAL STATEMENT FOR THE YEAR TO 30 APRIL 2016

**The Botanical Society of Scotland SCIO
Financial Statements
For the Year to 30 April 2016**

Report of Council

The Council has pleasure in presenting its report for the year to 30 April 2016.

Constitution

The Botanical Society of Scotland was established on 14 April 1836 as the National Botanical Society of Scotland. It became the Botanical Society of Edinburgh and its constitution was revised in June 1984, with a further change of name to the Botanical Society of Scotland in 1991. The management of the Society is in the hands of an elected Council as shown on page 1. The Society was incorporated as a SCIO on 15 April 2014.

Objectives

The objectives of the charity are to advance the study of plants and to spread botanical knowledge.

Principal activities and charitable purposes

1. Arrangement of botanical lectures in the main cities of Scotland
2. Arrangement of excursions for the study of plants in the field
3. Publication of a Journal reporting on botanical research
4. Publication of Newsletters which include less academic reports, news of other societies, coming activities and reports of field meetings
5. Periodic conferences are arranged on topics of special interest.

Activities 1-4 have been advanced in 2015/16.

Council members

The Council members during the year are listed on page 2.

Council

1. The BSS is a Scottish Charitable Incorporated Organisation No. 016283 and is governed by a Constitution. Members of the Society appoint people to serve on the Board and take decisions on changes to the Constitution. The Board controls the activities of the Society and is responsible for monitoring and controlling the financial position of the Society. The BSS is not affiliated to any other body.

2. Trustees are elected by the Members at the AGM. At each AGM all Trustees shall retire from office but are re-eligible for election. Those who have served on Council for a period of 3 years shall automatically vacate office on expiry of that 3 year period but shall then be eligible for re-election. No external bodies are entitled to appoint trustees.

Financial information

The operating surplus for the year is £4099.98. Cash assets at 3 May 2016 stood at £70,148.05. The general unrestricted funds of £64,747.99 were available to the Society on that date. It should be noted that the promotion of the Society's Journal and the Printing of the Newsletter are now treated as falling within the stated activities of the Society and associated costs are therefore legitimately expenditures in pursuance of its charitable aims. The Treasurer will make adjustments to the account when it is deemed that there is sufficient stability in the financial markets to increase the revenue earned.

Council's responsibilities

The Council is responsible for keeping proper accounting records which disclose with reasonable accuracy at any time the financial position of the society and to ensure that the financial statements comply with the statutory requirements. They are also responsible for safeguarding the assets of the Society and hence for taking reasonable steps for the prevention and detection of fraud and other irregularities.

Risk management

The Council has examined the major strategic, business and operational risks which the Society faces and confirms that adequate systems are in place to identify and mitigate those risks.

Reserves policy

The Society maintains its unrestricted funds, which are free reserves of the Society at a level to provide sufficient funds to cover management and administration costs.

Membership

The number of members of the Society remained by and large the same during the year.

Taxation

The Society is a charity and is recognised as such by the Inland Revenue for taxation purposes. As a result there is no liability to taxation on any of its income.

Dr. D.F. Chamberlain, September 2016, Treasurer

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The Botanical Society of Scotland SCIO
Financial Statements
For the Year to 30 April 2016

Statement of Receipts and Payments

Year	2016	2015
	£	£
Incoming resources:		
Voluntary income:		
Subscriptions	6,295.25	5,305.89
Donations	95.00	119.00
Total	<u>6,393.25</u>	<u>5,424.89</u>
 Incoming resources from charitable activities:		
Journals and publications sold	-	-
Editorial Subvention	3,346.00	3,329.00
Royalties, - Journal (Taylor & Francis)	3,650.83	3,191.49
Royalties - Publications (EUP)	-	60.00
Sale of Merchandise	57.00	-
Miscellaneous (incl. excursion donation)	17.00	35.00
Contribution to a lecture	253.00	-
Total	<u>7,323.83</u>	<u>6,615.49</u>
Interest & Stock Redemption (£225.77)	<u>225.77</u>	<u>316.66</u>
Bank Compensation	-	500.00
Total receipts	<u>13,942.85</u>	<u>12,857.04</u>
 Payments:		
Costs of generating funds:		
Printing Members' Copies of Journal	<u>5,508.00</u>	<u>5,576.00</u>
Charitable activities:		
<i>Directly allocated to activities:</i>		
Lecture Expenses	1,195.55	578.84
Excursion costs	-	50.00
Printing Newsletter	1,216.92	684.51
Journal Editor Remuneration	-	-
Student Essay Prize	200.00	150.00
Student Grants	200.00	600.00
Urban Flora Project (data-base development, etc.)	-	2,658.00
Total	<u>2,812.47</u>	<u>4,721.35</u>
<i>Support costs:</i>		
Stationery & Postage	-	-
Printing	-	165.00
Insurance	140.38	140.38
Web page	192.00	84.00
Total	<u>332.38</u>	<u>389.38</u>
Grand total	<u>3,144.85</u>	<u>5,110.73</u>
 Governance costs:		
Subscription Rebate	40.00	20.00
Accounting Fees	140.00	170.00
Annual Meeting Costs	-	-
Secretary's Expenses (incl. postage)	1102.29	177.98
Membership Secretary's Expenses	-	238.99
Total	<u>1,282.29</u>	<u>606.97</u>
Total resources expended	<u>9,935.14</u>	<u>11,293.70</u>
Gross Surplus for the year	<u>4,007.71</u>	<u>1,563.34</u>

**The Botanical Society of Scotland SCIO
Financial Statements
For the Year to 30 April 2016**

**Statement of Balances
Year**

	2016 £	2015 £
Bank and cash in hand		
Closing balances at Bank	19,906.45	16,032.24
Opening balances at Bank	-16,032.24	-14,585.82
Interest	225.77	216.92
Surplus for the year (incl. deposit – interest)	4,007.71	1,563.34
Closing balance		
Cash at Bank	19,906.45	16,032.24
Cash at Paypal	68.42	160.69
Cash in CCLA reserve fund	50,173.18	49,947.41
Net Assets (see note 4)	70,148.05	66,140.34
Reserves		
Designated funds		
Symington Grieve Trust Fund	500.00	500.00
Sir W. W. Smith Lectureship Fund	300.00	300.00
Urban Flora Project	2,342.00	2,342.00
Botany of the Lothians Fund	2,258.06	2,258.06
Total	<u>5,400.06</u>	<u>5,400.06</u>
General (unrestricted) funds	<u>64,747.99</u>	<u>60,740.28</u>
Total Funds	<u>70,148.05</u>	<u>66,140.34</u>

The notes on page 7 form part of these financial statements.

The financial statements have been approved by Council.

Dr. D.F. Chamberlain , Treasurer

September 2016

The notes on the following page form part of these financial statements

Notes to the Statements of Receipts & Payments

Note 1 Accounting Policies

Receipts and Payments

The accounts are presented on the basis of receipts and payments basis in accordance with the Charities & Trustee Investment (Scotland) Act 2005 and the Charities Accounts (Scotland) Regulations 2006 (as amended).

VAT

The trust is not registered for VAT and accordingly expenditure includes VAT where appropriate.

Unrestricted funds

Revenue

The Revenue Fund represents the unrestricted funds of the Society which the Council are free to use in accordance with the Association's objects. Any unrestricted revenue surplus is transferred to the unrestricted capital fund.

Note 2 Council members remuneration

Council members do not receive any remuneration in their role as council members

Note 3 Taxation

The Fund is recognised by the Inland Revenue as a charity and no charge for taxation arises on the results for the year

Note 4 Liability

In view of the time elapsed, the liability to the Tenth International Botanical Congress (held in 1964) has been written off. There is therefore a discrepancy between the 2013-14 and the 2014-15 sets of Accounts with regard to the presentation of this liability.

Note 5 Commitments and contingent liabilities

There are no contingent liabilities at the year end (2015 £nil). Editorial Subventions provided by the Publishers, Taylor & Francis, for 2014/15 and 2015/16, totalling £6,675.00, are available to cover costs of the Journal Editor, including the promotion of the Journal at International Conferences. There are liabilities of £240.60 at the year end for a Student grant and speakers expenses.

Independent examiner's report to the council members of

Botanical Society of Scotland

Respective responsibilities of trustees and examiner

The charity's trustees are responsible for the preparation of the accounts in accordance with the terms of the Charities and Trustee Investment (Scotland) 2005 Act and the Charities Accounts (Scotland) Regulations 2006. The charity trustees consider that the audit requirement of Regulation 10(1) (d) of the Accounts Regulations does not apply. It is my responsibility to examine the accounts as required under section 44(1) (c) of the Act and to state whether particular matters have come to my attention.

Basis of independent examiner's statement

My examination is carried out in accordance with Regulation 11 of the Charities Accounts (Scotland) Regulations 2006. An examination includes a review of the accounting records kept by the charity and a comparison of the accounts presented with those records. It also includes consideration of any unusual items or disclosures in the accounts and seeks explanations from the trustees concerning any such matters. The procedures undertaken do not provide all the evidence that would be required in an audit and, consequently, I do not express an audit opinion on the accounts.

Independent examiner's statement

In the course of my examination, no matter has come to my attention

1. which gives me reasonable cause to believe that in any material respect the requirements:
 - to keep accounting records in accordance with section 44(1) (a) of the 2005 Act and Regulation 4 of the 2006 Accounts Regulations, and
 - to prepare accounts which accord with the accounting records and comply with Regulation 9 of the 2006 Accounts Regulations

have not been met, or

2. to which, in my opinion, attention should be drawn in order to enable a proper understanding of the accounts to be reached.

D. Millar, Edinburgh

Back cover pictures

Outside

Watercolour illustration of *Rhododendron ponticum* L. (Ericaceae) by Janet Dyer.
See article on page 33.

Inside

Top left: New BSS Council members. Image by Chris Jeffree. See article on page 54.

Top right: *Lathyrus japonicus* (Sea Pea). Image by Sandy Edwards. See article on page 42.

Bottom left: *Lathyrus japonicus* (Sea Pea) re-establishment at Carnoustie, July 2013. Image by Clare Reaney. See article on page 42..

Bottom right: *Lathyrus japonicus* (Sea Pea) seedlings growing in Dundee Botanic Garden nursery. Image by Clare Reaney. See article on page 42.



