BSS News

The Newsletter of the Botanical Society of Scotland

No. 110 March 2018

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

Front cover pictures

Outside

Cotoneaster horizontalis. Drawing by Janet Dyer. See article by Adrian Dyer on page 32.

Inside

Top

Eroded dune at Coul Links, an SSSI threatened with destruction by the proposed construction of a golf course. The BSS has objected strongly to this proposal. See articles by Brian Ballinger and Julia Wilson on pages 16 and 19. Photo by Brian Ballinger.

Bottom

Flooded dune slack at Coul links. Photo by Brian Ballinger.

Botanical Society of Scotland

c/o Royal Botanic Garden Edinburgh
20A Inverleith Row, Edinburgh, EH3 5LR

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. Subscriptions can be paid by cash, cheque (payable to the Botanical Society of Scotland), or Banker's Order. Please ask for a Banker's Order form if required. Or you can join online and pay by PayPal via the BSS website at http://www.botanical-society-scotland.org.uk/content/bss-membership

Subscriptions fall due on 1st October each year:

Standard rate (with the Journal Plant Ecology and Diversity)	£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

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EDITORIAL

For many months, the BSS Council has been deeply concerned about the proposal to create a golf course at Coul Links, near Dornoch, Highland Region. The proposal has been supported by many (but not all) local residents, on the assumption that it will create jobs, but has been strongly opposed by many conservation groups as vandalism of an internationally ecologically important natural site. The BSS submitted to Highland Council, an objection to the golf course proposal. On behalf of the BSS, we thank Julia Wilson and Brian Ballinger, who did most of the work to prepare our objection document. See the summary of the objection from Julia and a report of a visit to Coul links Brian Ballinger (pp. 16-19 and 19-21). Objections were also submitted by BSBI, SNH, SWT, RSPB and others; SEPA submitted a notably forensic criticism of the hydrological implications of the proposal. A decision had not been reached at the time of going to press, and the developer has recently submitted many more documents in defence of their proposal. If the application is approved, Scotland will ruin its international reputation as a protector of the natural environment.

The Urban Flora Project is continuing and we hope that many more people will become involved this year. This project also generated, a Schools Photographic Competition (p.36).

BSS is very grateful for the legacy of £50,000 that was given to the BSS by the late Basil Ribbons, who was long time member of the society. An obituary printed with permission from BSBI is on page 7, and by Mike Richardson on page 9.

Congratulations to Chris Jeffree for winning the photographic competition at the BSBI/BSS meeting. BSBI was quicker than us in preparing their newsletter, so look out for Chris's photograph on the cover of BSBI's January 2018 edition https://bsbi.org/subscriptions

We are very pleased to have received botanical articles of such as high standard and warmly thank all contributors. Please continue to send articles, and do not be shy if this is your first time, we are happy to help you prepare them. Guidance for contributors is included near the back of this issue.

Jill especially thanks Roger West for offering to be the new coordinating editor, and for helping to prepare this edition of BSS news.

Roger West and Jill Thompson

ANNUAL GENERAL MEETING 2018

The 2018 Annual General Meeting of BSS SCIO will take place on Thursday 17th May immediately following Yadvinder Malhi's lecture in the RBGE lecture theatre. We will report on our activities over the last 12 months, present our financial accounts, elect members to our governing body (the BSS Council) and answer your questions about the BSS.

The Provisional Agenda for the AGM is as follows

1. Apologies for absence
2. Draft Minutes of AGM 2017[1] for approval
3. Election/re-election of Council members
4. President's Report
5. Treasurer's Report and determination of subscription rates
7. Any Other Business

Would you like to help to run the BSS?

The BSS is run in accordance with the rules of the Office of the Scottish Charity Regulator, through the BSS Council. All Council members are volunteers. We arrange the lecture and field programmes, keep the accounts and a register of members, edit and print the BSS News and Plant Ecology & Diversity, liaise with other Societies, provide refreshments at meetings, run the website, publicize events, get involved in projects (e.g. the Urban Flora project and School Photography project), award student prizes and grants, and sometimes comment on relevant national strategy and issues.

We have some vacancies and would like to bring new people and their skills and ideas onto Council, while retaining sufficient existing members to ensure continuity in the running of the BSS. We hold about 4-5 formal Council meetings a year at the RBGE (starting at 17.30 or 18.00h) and use email a lot. There is no need to be a 'qualified botanist': an interest in plants and some experience relevant to the BSS activities is all that is needed.

Applicants should be nominated by two members of the BSS (a proposer and seconder) and provide a brief (2 sentence) résumé of their

[1] these minutes are available on the Members Area of our website and will be available at the AGM

interests and experience. Please come and talk to us at one of the lectures or send us an email if you are interested. **Nominations should be sent to the General Secretary of the Society (address below), by email or post, to be received no later than 19th April.** The list of candidates for Council will be published by email and on the BSS web site during the following week.

Note to all members

Please check that your contact details are up to date in our records. This can either be done by logging into your BSS account (http://www.botanical-society-scotland.org.uk/user), or by contacting the Membership Secretary.

Julia Wilson
Membership Secretary

membership.secretary@botanical-society-scotland.org.uk
general.secretary@botanical-society-scotland.org.uk

General Secretary, Botanical Society of Scotland,
Royal Botanic Garden Edinburgh, 20A Inverleith Row, Edinburgh EH3 5LR

BASIL WALSTON RIBBONS (1926–2017)

Basil Walston Ribbons, well known in Scottish botanical circles, died on 1 January 2017, aged 90. He was a botanist at the University of Glasgow and a mainstay of the Committee for the Study of the Scottish Flora (CSSF) in the 1960s and 1970s. His active involvement with BSBI appears to have finished when that Committee was wound up in 1978, although he remained a member until his death.

Basil was born on 21st May 1926 and educated at the City of Norwich School, Norwich. He went on to study at Queen Mary College, University of London, graduating in 1947 with a B.Sc. in Botany. He held a postgraduate studentship there from 1947 to 1949, when he joined the University of Glasgow as an assistant lecturer in the Botany Department. He was promoted to lecturer in 1952, working part-time from 1984. He remained with the University until his retirement in 1988.

Basil was a keen field botanist from his student days. He visited the Isles of Scilly with Peter Wanstall (also of Queen Mary College) in 1948, where Miss A.D. Tiddy, a retired teacher on St Agnes, gave him a copy of C.A. Johns' *A week at the Lizard* (*BSBI News*, **30**: 26, 1982). On a later visit, in 1950, he found a clump of *Acanthus mollis* on St Agnes which might have persisted for at least a century (Ribbons, 1953). In 1953 he joined Bob and Esther Mackechnie and Ted Wallace for a fortnight's tour of Ireland which took them from Kerry to Donegal (Wallace, 1979). He joined the BSBI in 1949 and became the Vice-County Recorder for Stirlingshire (v.c.86) in 1953, resigning in 1980; he was also the Recorder for neighbouring West Perthshire (v.c.87) from 1956 to 1969.While at Glasgow Basil was a popular and respected lecturer and his field courses were enjoyed by the students (who nevertheless mimicked his Norfolk accent, examining plants with their 'spoi glaass' rather than their hand lens). He also led a popular field botany course for the Extra-mural Department, generally running from April through to summer, with excursions often every Wednesday and further afield at weekends. These excursions, along with others with local botanists, resulted in a comprehensive coverage of the local flora between 1957 and 1987. His efforts was particularly noteworthy in Renfrewshire (v.c. 76) where he produced a map showing the many 1-km squares visited and lists of excursions with dates and recorder initials. He collaborated with the Recorder, Robert Mackechnie, and later

Elizabeth Conacher, and together they generated many hundreds of field record cards. These were made available to the *Atlas of the British Flora* (1962) and later over 33,000 records were entered into the database for the recent *Flora of Renfrewshire* (Watson, 2013). Following a request for information on earlier recording in Renfrewshire, he replied by letter in 2008, with helpful comments on his former activities, offering enthusiastic support and commenting that he was "delighted that all the recording we did is being made use of". He was also relieved to hear that the Glasgow (GL) herbarium had survived the disastrous fire that occurred at the Botany Department in 2001.

The Committee for the Study of the Scottish Flora (CSSF) was set up in 1953 to co-ordinate the activities of the Botanical Society of Edinburgh and the BSBI in Scotland, with each society appointing an equal number of members to the committee. In 1953 B.L. Burtt was appointed its chairman and Basil its Secretary. He remained Secretary until 1962 and was re-appointed in 1969 (Ribbons, 1976a), staying in post until the Committee ceased to exist in 1978. He contributed lengthy reports on CSSF field meetings to Caithness in 1972, a meeting marked by a visit to the Queen Mother at Castle of Mey (Ribbons, 1973), Italy and Austria in 1970 (Ribbons, 1972), Lapland in 1973 (Ribbons, 1974) and Poland in 1976 (Ribbons, 1979).

By 1976 the partnership which had established the CSSF was under strain. Some members outside the Glasgow-Edinburgh belt felt rather isolated, and the formidable Mary McCallum Webster raised this criticism at the BSBI AGM at Dumfries in 1975 (Briggs, 1976; Brookes, 1979). Although the Botanical Society of Edinburgh supported the CSSF (Ribbons, 1976b), a vote of the Scottish members of BSBI rejected the status quo (Briggs, 1977). CSSF was replaced by the current (and highly successful) BSBI Committee for Scotland, and the *BSBI Scottish Newsletter* established to tackle the communication problem. The divorce must have been rather acrimonious, as ill-feeling was still lingering in the early 1980s when C.D.P. first attended the Scottish Exhibition Meeting. Whether CSSF would have lasted longer with a more emollient and unifying figure as secretary will never be known; we are told that Basil sometimes came across as pernickety and legalistic. Most of his contributions to the BSBI's publications had been made on behalf of CSSF, and with its demise they more or less ceased. He was, however, BSBI's nominated expert on Scottish vice-county boundaries from 1979 to 1988 (c.f. Ribbons, 1961).

Basil's publications characteristically reported new plant records, often with a detailed survey of the relevant earlier literature. He documented the rediscovery of *Homogyne alpina* in Scotland by Alf Slack (Ribbons, 1952) and his presidential address to the Andersonian Naturalists, delivered in 1964 but not published until much later (Ribbons, 1976c), was a detailed survey of British *Ledum* records. He edited the *Glasgow Naturalist* from 1964 to 1976. He also contributed 718 specimens to the Glasgow University herbarium (GL), now held by Glasgow Museums (GLAM). Most of these are from Scotland, especially Wester Ross (v.c. 105, 260 specimens), but they cover a wide range of localities in England (especially West Cornwall and Teesdale), Wales and western Ireland. The genus with most specimens is *Empetrum* (68 specimens, including 48 of *E. nigrum* subsp. *hermaphroditum*). He also took an active part in university life and he was the Honorary Secretary of the Glasgow Association of University Teachers (GUAT) from *c*. 1960, becoming its President in 1964.

Following his retirement from Glasgow he moved to Dorset. In his letter of 2008 he related that he was doing "pretty well for an old 'un" adding that he hadn't done any British botanising since he retired, but he noted that he made walking trips to France and NE Italy each year adding "of course I don't ignore the plants I walk past". With his retirement to Dorset he acquired a garden where he "transferred his interest to garden plants". He later moved to Norwich where he died on 1 January 2017, aged 90.

Much of the factual information in this obituary is taken from the on-line catalogue of the University of Glasgow Archive. We thank Jim Dickson, Roger Downie, Gwynn Ellis, Alison Moss, Bill Stewart and Richard Weddle for help in preparing this obituary.

Keith J. Watson & Chris D. Preston

This obituary was written for the BSBI News and printed here by kind permission of the BSBI.

BASIL WALSTON RIBBONS 1926-2017

Basil Ribbons was a longstanding member of the Botanical Society of Edinburgh (now the BSS) and of the BSBI. He was the Glasgow Local Secretary of the BSE for many years. His participation in the BSBI and in the collaborative activities of these societies is described in the BSBI

obituary reprinted above. He became a Member of The Institute of Biology [now the Royal Society of Biology] in 1972, and a Fellow of the Linnean Society in 1954 [after becoming an Associate in 1949]. When he was an assistant lecturer and later lecturer at Glasgow University, he concentrated on excellent teaching of botany rather than research and publications. He also took an active part in university life. From *ca* 1960 he was the Honorary Secretary of the Glasgow Association of University Teachers, becoming its President in 1964. Basil was an excellent field botanist and organiser, but always remained in the background. One of his greatest contributions, apart from his teaching, was his involvement in the Scottish Field Studies Association. The SFSA used to arrange irregular field courses, often at Garth Youth Hostel, and he was largely instrumental in the acquisition of Kindrogan House as a permanent base for the SFSA in 1963. It still exists as a very successful field centre, now owned and run by the Field Studies Council. Basil also contributed numerous records of Scottish plants, mainly from his local area and Wester Ross, and mainly as Notes in *The Glasgow Naturalist*, the journal of the Glasgow Natural History Society. Basil was President of that society from 1961-63, and from 1964-1976 he was the Editor of the journal.

Mike Richardson
mjrichardson@clara.net

Selected publications:

Ribbons, B.W. 1954. A Contribution to the Flora of the Beinn Eighe Nature Reserve. *Transactions of the Botanical Society of Edinburgh* **36**(3):230-265. doi.org/10.1080/13594865409441612

Ribbons, B.W. 1964. *Ledum* in Britain. *Glasgow Nat*. **19**(4):219-233. With portrait. Delivered as Presidential Address with the title ‘Tea, St James and Labrador’.

BSS is very grateful for the legacy of £50,000 that was bequeathed to us by the late Basil Ribbons, who was long time member of the society.

JOINT BSBI/BSS SCOTTISH ANNUAL MEETING SATURDAY 4TH NOVEMBER 2017.

Welcome

John Faulkner President of the BSBI opened the meeting which had attracted a record number of visitors (151) - probably the largest gathering of botanists in Scotland in recent years.

The BSBI Scottish Year and AGM

The business of the meeting proceeded with the AGM of BSBI Scotland, led by Robin Payne, BSBI Scottish Chair, with approval of the minutes of the last AGM and elections of Alan Walker, Lindsay Mackinlay and Aileen Meek to the BSBI Committee.

Jim McIntosh, BSBI Scottish Officer presented his report, highlighting some of the activities over the year:

- the Scottish Recording Conference at Kindrogan in March where there were major sessions on MapMate, Atlas 2020 and the BSBI Database,
- 5 million BSBI records have been supplied to the new NBN Atlas Scotland,
- three very successful plant ID workshops, led by Faith Anstey, were held in Glasgow and Edinburgh,
- a Scottish recording week was held in Torridon and a 'rough crew' weekend in Glen Affric,
- a huge amount of recording has been done for Atlas 2020,
- Jay MacKinnon replaces Jackie Muscott as Recorder for West Lothian, but no replacement has yet been found for Michael Braithwaite (Berwickshire), sadly, Ken Butler, the retired Recorder for Caithness has died recently,
- Jim has been doing much support work across the UK and Ireland. His funding from SNH expires in 2018.

Robin Payne presented the Scottish Chairman's report:

- the Scottish Newsletter was published,
- Eric Meek, who died in February will be greatly missed, he was a great contributor to the BSBI,
- There is substantial concern about proposals for a golf course on the sand-dunes at Coul Links near Dornoch. The BSBI is providing data to reinforce the case against the proposal.

- There have been numerous field meetings in 2017. Meetings planned for 2018 include Haddington, Strathpeffer, Wigtownshire, Invergarry (Westerness) and Drymen (Stirling).

The BSS Report

Brian Ballinger, President of the BSS, reported that the BSS had held nine lectures in Edinburgh and others in Dundee, Perth, Inverness and St Andrews (joint with other societies). Edinburgh lectures are now held jointly with the RBGE. The BSS produces a scientific journal (Plant Ecology & Diversity) and the BSS News. Thirteen field meetings were held in 2017 and recording has continued for the BSS Urban Flora project, with about 20000 plant records entered to BSS iRecord so far. Although the most frequent records are of very common species, analysis of data from Easter Ross VC 106 reveals 55 species of vascular plant were found in urban centres and nowhere else, and 32 species are listed in the Rare Plants Register.

Sadly, Jane MacKintosh died last summer. She had been a member of BSS Council for many years and was a marvellous co-ordinating editor for the BSS News. Her obituary was included in BSS News 109. Jane will be very much missed by the BSS.

Atlas 2020

Jim McIntosh presented progress on Atlas 2020, which aims to produce comprehensive maps for all native and introduced taxa occurring in the wild in Britain and Ireland, and to analyse and report on the changes since the last Atlas was produced.

For the Atlas, each hectad (10 x 10 km) is being subsampled by surveying 5 or more tetrads (2 x 2 km) within it. More than 90% of records added in the last year have been recorded at monad resolution or higher precision. Surveying in Scotland is an enormous challenge as it has 1/3 of the total land area of the UK, but only 12% of the BSBI membership.

Outputs of the Atlas 2020 will be a book which will interleave results from the Atlas 2020 with interpretation of the data, an online Atlas and Smartphone App, a summary for policy makers and possibly a print-on-demand book.

Much data has been added to the BSBI database and the number of records entered for years since 2000 now exceeds all of the records entered prior to the year 2000. However, the checking of records is

lagging behind data entry and there is some catching up to be done. Jim presented some preliminary data showing the species that have increased and decreased and the number of hectads in which they have been recorded. *Crassula tillaea* has increased from 4 to 65 hectads since 2000, while *Galeopsis speciosa* has declined from 406 to 166 hectads.

If you would like to help with recording, please contact your Vice County Recorder. Jim is planning a workshop in Spring for intermediate botanists to help them become confident recorders.

Threatened plants in Britain and Ireland

Pete Stroh, BSBI's Scientific Officer, introduced the Threatened Plants Project, which aims to improve knowledge concerning the abundance of threatened species and their ecological and management requirements, to quantify losses since 1970, understand the main threats and provide a baseline for future surveys. Fifty species were selected for the survey, covering a wide range of habitats and geographic areas and ecological and climatic conditions.

A principal coordinate analysis was done of the key ecological and climatic requirements of all GB and Irish species and the threatened species placed in the context of this. Field surveys have been used to follow up previous records. Only 51% of plant populations were re-found (varying from 18% for *Ranunculus arvensis* to 87% for *Sibbaldia procumbens*). Species declines in lowlands were greater than in uplands. The main threats were considered to be lack of suitable management and agricultural intensification. Populations were more likely to be re-found in SSSI's than in unprotected sites (though re-finding rates in SSSI's were only 65%).

Afternoon short talks
Marsh Saxifrage in Scotland - Aline Finger RBGE

Aline presented her work on the extent of clonal reproduction in *Saxifraga hirculus* in Scotland. This species occurs in wet base-rich flushes and mires and has been lost from lowland habitats due to land use change, but persists in five locations in Scotland at altitudes *Phytophthera austrocederi* from 300 – 750 m.

Leaves were collected from transects across the sites and analysed using microsatellite genetic markers. Sites varied enormously in their genetic variation. Small sites of < $10m^2$ tended to be of low

genetic diversity. However, while some large sites could be highly diverse, others were not.

The results suggest that clonal reproduction is important in Scottish populations of this species, and that population size is not necessarily a proxy for genetic diversity.

Discovery of a Scottish Monkeyflower – Mario Vallejo-Marin, University of Stirling

Mimulus guttatus was imported as a botanical curiosity in the 1812 and cultivated as a garden plant. Horticulturalists produced hybrids with this species. By the 1830's, records of its escape into the wild were appearing, and it is now widely distributed in wet habitats in Britain and Ireland.

Studies conducted in the Shetlands revealed a polyploid population containing tetraploids with 56 chromosomes compared with the diploid which has 28 chromosomes. Molecular analyses indicate that northern populations in the Shetlands are genetically distinct from more southerly populations and that the new tetraploids have arisen in a population where both northern and southern diploid genetic types occur. The tetraploids tend to have larger flowers and leaves than the diploids.

Polyploidisation has played a part in the evolutionary history of Mimulus over the last 30 million years. Our data show that is still occurring in populations today.

Plant Monitoring and Conservation in Stirling – Roy Sexton, Scottish Wildlife Trust

Roy presented some of the work of the Stirling and Clacks SWT Group. Most of their projects involve monitoring the status of either habitats or species which are considered as being of conservation concern in local Biodiversity Action Plans. This involves finding the species or habitat, recording species numbers or conducting detailed mapping, monitoring and taking action if the species or habitat is threatened.

Over the last 17 years they have built up a portfolio of over 60 sites and species that are monitored. If plant numbers decline by more than 70%, action is taken. Many examples were presented of where species had been under threat due to invasive species, changes in management or land-use, and where new species-rich sites in need of protection have been found. Liaison with land owners and local organisations has been

successful in many cases in reversing species loss, but this is not always the case.

Mountain Flowers – Guest Speaker Michael Scott

(author of 'Mountain Flowers' published by Bloomsbury ISBN 978-1-4729-2982-2 in 2016)

This talk was dedicated to Ken Butler, the former vice-county recorder for Caithness, who was a great champion of the Plantlife Reserve at Munsary. Mike also paid tribute to the people who had sparked his interest in botany, especially Charles Gimingham of Aberdeen University and the student field courses which were run at Bettyhill, and Grant Roger, of the Nature Conservancy, who ran a course on mountain flowers at the Kindrogan Field Centre. He also highlighted the influence of the Raven and Walters' Mountain Flowers book in the Collins New Naturalist series, first published in 1956 and still relevant today.

His talk brought together themes of plant distribution, ecology, and threatened habitat, combined with the fun and comradeship of shared interests in botany. He referred to an early attempt to relocate *Schoenus ferrugineus,* which was threatened by rising waters at the 1940's hydro-electric scheme at Loch Tummel. Relocation to new habitats failed probably because it was not recognised at the time that the original loch-side habitat that they attempted to replicate was not representative of its general habitat in Europe and that the Loch Tummel plants were outliers and probably already struggling for survival.

The BSBI species maps and database are a wonderful resource and enable the most species-rich areas to be identified and highlight the odd distribution of some species, raising questions as to what are the limiting factors in the distribution of some of them. Records of field meetings provide invaluable information and can at the same time convey the feeling of the meeting – new finds, confirmation of old records and the fun of working together in a group.

Many challenges remain to record, understand and conserve our mountain flora.

Photographic Competition

The day closed with the announcement of the results of the photographic competition which was judged by popular vote. The winners were Chris Jeffree whose photograph of Henbane (*Hyoscyamus niger*) at Lindisfarne was the most popular in the 'Archaeophyte'

category and Heather Kelly whose photograph of Greater Knapweed (*Centaurea scabiosa*) on the Fife coast won the 'Plants in the Landscape' category.

The categories for the 2018 competition will be 'Plants and People' and 'Plants and Pollinators'.

Julia Wilson

THE BSS SAYS 'NO' TO THE PLANS TO CREATE A GOLF COURSE COUL LINKS

In December 2017 the Botanical Society of Scotland was one of many organisations and individuals that submitted objections to a proposal to develop a golf course on sand-dunes at Coul Links, north of Embo, Sutherland. The BSS does not usually get involved in planning applications, but the threat to a sand-dune system which is protected by national and international legislation moved us to become involved.

Background

The application for the development of an 18 hole golf course and the erection or renovation of buildings for use as a club house, and ancillary uses was made on behalf of two Americans, billionaire Mike Keiser, (owner of the Bandon Dunes golf resort in Oregon, and other courses in the USA, Canada and Australia), and Todd Warnock who already owns property in the area and is an investment banker. There are already five other golf courses in the vicinity of the proposed development.

The application documents run to many hundreds of pages with numerous separate annexes and drawings. The main 'environmental statement' consists of nearly 400 pages with many sub-documents to be read, so it was quite a task to absorb them in sufficient detail to consider the proposal in the round and evaluate the environmental risks associated with it. Sometimes it was the case that we needed to work out what was not said in the documents, rather than what was said. We confined our objection (mostly) to botanical aspects, anticipating that other organisations would comment on other aspects of the proposal.

The Site

Coul Links is a Site of Special Scientific Interest (SSSI), which means that it is recognised as a site of national significance, protected

for nature conservation. Not only that, but it is also designated as a Ramsar site and a Special Protection Area for birds (under the EC Birds Directive), due to its international significance as a wetland site.

Coul Links is valued for its wide range of sand dune habitats (seven out of nine Annex 1 sand dune habitats) providing a mosaic of habitat diversity not found elsewhere in the Dornoch and Loch Fleet Special Protection Area. It contains several rare and protected species and habitats. These nationally and internationally protected habitats include rare lichen-rich dune heath and rare stands of juniper dune scrub. The latter is the second most important population in Britain. Coul is also important in providing coastal continuity for species and habitats between the Dornoch Firth and Loch Fleet. The groundwater-dependent dune slacks are a particularly important component at Coul and the large winter seasonal loch is considered the best example of such a feature in Scottish dunes. The site floods regularly at spring tides and is flooded in winter. Brian Ballinger's photos of the site are on the front/back covers of this issue, and you can see videos of the site at http://www.notcoul.com/home.html.

Sand dune complexes, their associated dune slacks and heaths take millennia to develop and are dynamic, changing through time in successional processes that are essential for their long-term health. Changes in nutrient status, soil pH, organic matter and stability are among the factors influencing the stages of the natural succession from fore-dunes to climax woodland. At each stage, the colonising plant species change the soil and the microclimate, influencing the further development of the succession. Marine currents and wind bring fresh sand to the foreshore for further foredune formation, while erosion through storms or anthropogenic influence can reverse the processes of succession.

This dynamism is an intrinsic part of a healthy dune system, for which this site has protected status. Efforts to stabilise dunes to protect tees and greens will interfere with these processes. This need for dynamism conflicts with the stability required for golf course facilities and their management objectives.

Why did we object?

Underpinning the basis of our objection was that we considered that the proposed development would irreversibly damage the site,

which is protected at national and international levels. Sites such as these should be protected for the long term and for future generations.

Results of botanical surveys, combined with desk studies were presented in the proposal document but they were not given in sufficient detail to determine their adequacy. Other objectors, who know the site well, noted many deficiencies in the data and considered that these deficiencies and errors in the precise mapping of species and habitats made it impossible to fully evaluate the impact of the proposed layout of the golf course.

The applicants ignored or under-estimated the knock-on effects of the creation and maintenance of the golf course on wild-life and the integrity of the dunes as a whole, removing connectivity between habitats, and ignored changes in drainage which are implicit in the proposal. They also failed to evaluate the effects of run-off of fertilizers and other chemicals applied to the golf course on adjacent vegetation and presented misleading comparisons of rates of fertilizer input – comparing golf courses favourably with intensive agriculture, rather than with a natural dune system. The dune slacks are highly ground-water dependent and will be particularly vulnerable to such run off and changes in hydrology and nutrient loading, which will change the species present.

To mitigate damage to vulnerable habitat and plants, the applicants proposed translocation of dune heath and transplanting of juniper. Translocation involves using heavy machinery to excavate habitat donor and recipient sites to a depth below the rooting zone and transporting of blocks of soil and plants to the recipient site. Clearly, this process involves much disturbance. A report by the UK's Joint Nature Conservation Committee (JNCC 2003) considers that it is not possible to move species assemblages in this way and they find that '…experience shows that habitats translocation is, at best, merely a means of achieving partial compensation (in the sense of seeking to make amends for the impact) for development'.

An over-riding impression of the application was that the developers are seeking to impose a static golf course on a mobile and dynamic sand-dune system which floods at spring tides throughout the year and through the winter. They propose to locate the greens and tees on raised areas (engineered to produce appropriate smooth profiles), linked by walkways which are sometimes elevated to enable movement over areas which flood. Some of the tees and greens would be on the

exposed and very mobile foredunes and would require 'soft engineering' to shore them up. Experience of other golf courses in similar situations suggests that soft engineering is often only a temporary protection and more engineering (such as stacks of stone-filled gabions) becomes necessary. This change in the profile of the foredunes affects the sand supply to the dune system and the movement of sand on the beach, often with widespread adverse effects.

The outcome

By the closing date, there were about 1100 submissions objecting to the proposed development and 300 supporting it. Most of the objections were of an environmental nature, while support was given on the basis of contribution to the local economy.

Writing this article in January 2018, we understand that the planning application will not go forward to the Planning Committee until the applicants provide more information to the Scottish Environment Protection Agency (SEPA), particularly on issues related to ground-water dependent terrestrial ecosystems. SEPA's objection letter can be found on the Highland Council's website*, where you can also find ours, and many others.

Several objectors have suggested that if this development is so important, 'why not move the golf course off the dunes and up the hill?' This would create a win-win situation for the local economy and the preservation of a protected dune system. A good point.

Julia Wilson
julia.jeffree@gmail.com

* At: wam.highland.gov.uk/wam ; enter 16/00053/SCRE in the 'keyword' box. The combined objectors' website is at: http://www.notcoul.com/planning.html

VISITING COUL LINKS

When I became aware of the proposed golf development on Coul Links just north of Dornoch in Sutherland I realised I had hardly been there. This is in spite of having a base at Fearn near Tain and being botanical recorder for the adjacent vice-county of Easter Ross. The Links have been well surveyed by the ecologist Dr Tom Dargie and recorded by the vice-county recorder Prof Mick Crawley, so I aimed to get a general impression of this important conservation site. Visiting in the autumn did

not allow a full botanical review, but had the advantage of giving a view of the flooded dune slacks (see photo ‘Ballinger flooded dune slacks’), which are very unusual in this area.

In November I parked in the village of Embo just north of Dornoch and walked into the links from the south. Near the village, sea-weed had been washed upstream for quite some distance along a small burn.

In the central area I rapidly came to regret wearing boots rather than wellies, as the hollows were wet and often under water. The flooded area extended a long way along the site behind the dunes. Here were large quantities of *Filipendula ulmaria* (Meadowsweet) and there were also dead heads of *Parnassia palustris* (Grass of Parnassus). *Salix repens* (Creeping Willow) was plentiful and there was some stunted *Juniperus communis* (Juniper).

I then retreated to the higher dunes overlooking the sea and a very fine long beach. In many places the dunes were eroding with large hunks of dune newly washed onto the shore, which was being battered by large breakers (see photo ‘Ballinger Coul Dunes eroding’). Large flocks of waders were feeding along the coastline.

On the dunes *Astragalus danicus* (Purple milk-vetch) was seen in many places in the Marram and *Thalictrum minus* (Lesser Meadow-rue) and *Helianthemum nummularium* (Rockrose) were also present. *Rosa* plants were frequent.

Further north, a long strip of saltmarsh extended inwards behind and parallel to the dunes and at the edge of it, the tide was advancing rapidly. Typical plants such as *Armeria maritima* (Thrift) were growing there.

A few weeks later I visited again, this time starting at the north end, parking at the Loch Fleet old railway crossing at NH8002 9479. Once more the dune slacks were flooded but the water level was higher and the flooding much more extensive. As well as the long slack area there were various other flooded places making progress difficult, even in wellies.

There is a considerable amount of coastal heath with *Calluna vulgaris* (Heather) and *Empetrum nigrum* (Crowberry), together with patches of birch and willow. *Ulex europaeus* (Gorse) seems to be spreading here. Also in the north there is evidence of grazing by sheep and cattle (I also saw roe-deer), leading to some areas being denuded

of vegetation. I found myself crossing several fences with barbed wire on top here, but this may have been a deficiency in route planning.

Coul Links are well worth a visit, perhaps before any golf development takes place (although I hope it will not). As well as being important and unique, it is very beautiful and peaceful with fine views over the sea, shore and hills.

Many organisations and individuals have put in objections to a golf course in this particular situation. If the golf course is given the go-ahead, one thing is certain: Coul Links will never be the same again.

Dr Brian Ballinger

brian@garrickwood.org.uk

AFTERNOONS IN THE ARCHIVES

Several of us have recently been spending time in the archives of the Society, clearing out surplus material, of which there is much, and trying to introduce some order into what remains. It is dull and dusty work, but there are bright moments of real discovery.

We came upon the first Annual Report of the Society, dated 1836-1837. We may reflect for a moment on what a long time ago this is. Charles Darwin had just returned to Falmouth on HMS Beagle with biological specimens that would shape his theory of evolution. King William IV suffered a heart attack, and the throne passed to his niece, a young woman called Victoria. Meanwhile, London's first railway station was opening, to be called Euston, with three trains a day. The middle-classes were being enthralled by a new serial, *Oliver Twist* by Charles Dickens, and London University was being given its Royal Charter at last, many centuries behind Oxford, Cambridge and St Andrews.

Against this busy background, we learn in the first Annual Report that 'A few gentlemen attached to the pursuit of Botany, having considered the importance of instituting a Botanical Society in Edinburgh, and with that view having prepared and drawn up a series of Laws and Regulations applicable to such a Society, a meeting was held this day [8th February 1836] in Professor Graham's Class-room in the College, for the purpose of considering these'. And so it all began. The membership grew from twenty-one to one hundred and thirty two in the

first year, and meetings were held on the second Thursday of each month in the winter, with field excursions in the summer, much as they are today.

The President of the Society, Robert Graham FRSE had been a major figure in the creation of Glasgow Botanic Gardens and the first Professor of Botany at Glasgow University. But in 1820 he left Glasgow to take on the role of Professor of Botany and Medicine at Edinburgh University. He was also the 6th Regius Keeper of the Royal Botanic Garden Edinburgh from1820 to 1845.

He made sure the Laws were properly written and enforced. Fellows resident in Edinburgh paid an annual fee of one Guinea whilst Fellows outside Edinburgh had to pay three Guineas. A Guinea in those days was equivalent in purchasing power to about 120 pounds today, so for non-Edinburgh botanists the privilege of attending lectures and excursions must have been highly regarded. But the Society was by no means parochial: a notable feature of the Society was its internationalism. Foreign members after only a year from the Society's foundation, were from Sweden, Russia, Switzerland, France, Denmark, Germany, Italy and the United States. Foreign botanists were allowed to join if they submitted 500 specimens of plants including at least 100 separate species, and there was apparently no shortage of botanists from many parts of the world submitting parcels of pressed plants. In the first year, specimens flooded in from France, Italy, Switzerland, North America, Mexico, India and Van Diemans Land (today, Tasmania). In the first year they accumulated 1400 species of British plants and 2000 foreign species. Over several years, the effect of this remarkable arrangement, fuelled by the fashion of swapping duplicate specimens, was to build a vast collection that became the basis for today's collection in the RBGE Herbarium, and to spread the knowledge of plants or as the Report puts it 'diffusing a uniform and accurate system of nomenclature, taken from the best authorities'. A less desirable effect may have been to denude some habitats of rare species.

What did the Fellows discuss at their meetings? As well as important business matters such as the election of more Fellows and proper labelling of herbarium sheets, there were many accounts of excursions and also controversial issues of taxonomy. I liked the discussion of 'vegetable monstrosities' and how they might give rise to other forms of life – indeed, some remarks demonstrate that Darwin's later theories were already in circulation albeit not written down. Effects

of electricity on plants were also mentioned and so were resurrection plants (but not by that name).

'Ladies' were poorly represented in the membership. The only female name I could find in the membership list was the Countess of Dalhousie, an eminent botanist of the time who donated her entire East Indian Herbarium to the Botanical Society of Edinburgh. However, females were not excluded by the Laws of the Society, they were eligible to be Life Members or Associates.

I prefer to look forward rather than backward, but an occasional look back helps the perspective view and puts the present into context. Botany, as an academic discipline, has now all but vanished in the University curriculum, having been replaced by something called Plant Science in which molecules and genes are more often the subject of attention. Yet it bothers me that many questions of plant form and function, addressed by generations of botanists, have never been adequately answered. Meanwhile, ecological questions about species distributions, community structure and biodiversity have become centre-stage, and are being tackled by young researchers who have not been supplied with the most basic botanical knowledge and skills that our founders advanced and espoused.

John Grace

(Past President of the BSS)

STUDENT UNDERGRADUATE DISSERTATION PRIZE.

Each year the BSS awards a prize for the best undergraduate thesis. All academic staff at Scottish Universities are invited to submit what they consider to be the best thesis, on a botanical theme, produced by one of their undergraduate students. Members of the BSS council assess the theses and choose which one deserves the prize. The award is presented at a Botanical Society event. Information on the rules for thesis submission are given on the BSS web site http://www.botanical-society-scotland.org.uk/content/botanical-society-scotland-student-prize. Last year we received three submissions, one from St Andrews and two from Edinburgh University. The winner was Galina Toteva of Edinburgh University School of GeoSciences. The thesis was in partial fulfilment of the requirement for the Degree of BSc with Honours in Ecological and

Environmental Sciences with Management. The abstracts of all submitted theses are given below.

Prize Thesis:

INVESTIGATING FLORAL AVAILABILITY DURING THE EARLY SEASON FORAGE OF *APIS MELLIFERA* IN NORTH EAST SCOTLAND

Galina Toteva, University of Edinburgh

Bee populations are declining globally but the underlying reasons remain unclear. This study emphasises the importance of forage diversity and availability as a means of increasing the resilience of honey bees, *Apis mellifera* to multiple stressors. Although studies on forage resource use by honey bees have been conducted before, this is the first study to investigate the topic in Scotland using pollen DNA barcoding. Pollen samples from Tain, Inverness and Banchory were collected in April and May 2015 as a part of the CSI Pollen project. The aim was to estimate the abundance and diversity of the plant species, which contributed to honey bees' forage during the early season. Pollen identity was determined by DNA barcoding using Sanger sequencing, colour matching using a pollen colour chart and a morphological analysis performed by microscopists. The three methods were compared and evaluated. Changes in plant community composition in time and space were also examined using NMDS analysis. I hypothesised that oilseed rape, *Brassica napus* would be the dominant species that bees forage on during the early season based on Westphal, et al.'s paper (2009). Instead, *Ulex* and *Prunus* were the most abundant genera across the samples, whereas *B. napus* was scarce. Plant community composition changed through time and space, exhibiting a longitudinal gradient, albeit not strongly pronounced. There were discrepancies between the three pollen identification techniques used. The findings emphasised the importance of a diverse pollen diet, based on wild plant species rather than agricultural crops, as well as the efficiency of molecular techniques. However, the conclusions of this preliminary study should be interpreted with caution.

DIVERSITY AND IDENTITY OF POLLEN FROM SCOTTISH BEES

Matthew Downie, University of Edinburgh

European honeybees, *Apis mellifera* L., gather either nectar or pollen when foraging flowers. This study examined pollen intercepted with pollen traps from colonies across Scotland during 2015 as part of a citizen science program. From this, a subset of samples were used to analyse the diversity of flowers visited by pollen foraging bees in Kilmarnock throughout 2015. *A. mellifera* are considered generalists as they gather pollen, primarily for its protein, from many species. Previous evidence from laboratory based experiments has shown a hierarchical preferencing system for pollen choice, suggesting that pollen gathered may not always be richest in protein. Similarly, field evidence has shown bumblebees to preferentially visit obligate zoophilous plants, which are often high in protein. Do honeybees target high protein taxa or maximise diversity of pollens gathered? DNA barcoding identified mono-floral pollen balls to probable taxonomic ID. From this, Shannon's diversity index was calculated for each time period. Time periods were typically dominated by few taxa. Taxon ID was combined with pollen protein information to estimate relative protein gathered per trip. A relationship was shown between this value and diversity. This indicates potential mechanisms by which protein intake is maximised impacting diversity of flowers visited.

TREE SPECIES DIVERSITY AND COMPOSITION CHANGE WITH LAND MANAGEMENT INTENSITY IN URBAN AND RURAL FORESTS OF CALIFORNIA

Haley Arnold, University of St Andrews

Human impacts on forest ecosystems can directly and indirectly alter tree diversity and composition. This project quantifies tree species diversity, in central California, a biodiversity hotspot with endemic habitats and species. It asks how land management intensity impacts biodiversity in two ecoregions - an urban area and a remote region. Three forest sites were surveyed in each ecoregion: (1) a near-natural forest, (2) a site under standard forest management, and (3) an artificially replanted forest. Alpha and beta diversity metrics were used to compare changes in the species richness and evenness of the forests, and the level of turnover in the species community. The results showed that both urban and rural forest biodiversity varied with land

management intensity, though variation was greater among the urban sites. Land management was linked to a reduction in tree density and an increase in species richness. Rural forests were very similar to one another in diversity and composition. Species turnover was greater between urban sites, and many exotic species were recorded in the urban community. Possible mechanisms of biodiversity and compositional change with land management include direct and indirect disturbance and the inclusion of exotic tree species.

ODE TO SPRING

Season of chilly breeze and opening buds,
of snowdrops, crocuses and narcissi,
of sunny intervals, but also of cloud that scuds
across the darkling, rain-besodden sky.
New leaves, verdant in their infancy,
unfolding in innocence to seek the sun,
dress what had been a stark, skeletal tree,
a sign that its renaissance has begun.
Soon, all too soon, these shall mature
into the darker, tougher leaves of June,
but for a while retain a juvenile allure,
and seem to sing “I’m young!” in cheerful tune.
Those animals that survived the winter frost,
those trees whose bridesmaid is the wind,
are fertile now, so that no time be lost
in reproducing offspring of their kind.
May they survive the summer and autumnal gold,
and, hopefully, endure next winter’s cold.

Roger West.

CODEWORD 3

In this codeword each number always codes for the same letter, and each letter occurs at least once. All the words are botanical genera, including some cryptogamic organisms. Solutions do not enter grey squares or cross thick lines. Further helpful hints may be found on the Members Page of the BSS website: click **Help for BSS News puzzles**.

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HIGHLIGHTS OF FIELD MEETINGS 2017

Seaweeds of Dunbar, Saturday 12th August 2017; Leader: Clare Scanlan

The day threatened to be wet and gloomy, but by the time we descended onto the beach from the end of Marine Road, the seaweeds sparkled in the sunlight. Since most of us were beginners, Clare introduced us to the basics of seaweed biology and classification. She showed us how to identify the different species from one another and regaled us with many interesting stories. The total list for the day numbered nearly 40 species, including 8 greens, 15 browns and 16 reds. Apparently the number of taxa and the ratio of the colours can be used to monitor the ecological status of a site, but given that the reds are actually quite difficult and need an expert to identify them, it may be that ecological status might depend on the ecologist's expertise. It is salutary to remember that our forebears would have been experts in identifying all the edible species of which we found at least 10. It is a shame that the East Lothian beaches are now too polluted to supply foraging enthusiasts with food for free. We thank Clare for a most enjoyable and informative excursion.

After the tide came in, a few of us stayed on in Dunbar (NT6779) to carry out a routine urban botany survey. An hour's walk along the coast above the beach yielded a list of 108 species of vascular plants and bryophytes. Notable among them was the sand-loving *Plantago coronopus*, which can be used in salads, and of course the tree mallow (*Lavateria arborea*), which is causing problems on the puffin islands on the Forth. All the species we found (including the macroalgae) have now been entered into iRecord.

Fungus Field Meeting to Abbey St Bathans, Sunday 17th September 2017; Leader: Stephan Helfer

This interesting area of Berwickshire included the historic estate village of Abbey St Bathans, woodland, a riverside walk along the Whiteadder Water and Edin's Hall Broch, a 2nd Century broch, which stands on an Iron Age hillfort. Historical interest aside, the mycological treasures included some beautiful Laccarias (*L. amethystina, L. laccata and L. proxima*) and Hygrocybes (*H. conica and H. hygrescens*). Not so beautiful but easy to identify was the Ugly Milk Cap, *Lactarius turpis*. However, it was *Russula* species that ruled the day – seven of them in

all. There were several species of *Psathyrella* of the *P. gracilis* group, one with a pink edge, and one with a root. They brought back fond memories for me (Maria Chamberlain), but given how difficult they are even with a culture lab at one's disposal, I offered no exact identification. Altogether 58 species were recorded. We thank Stephan for his expertise and a wonderful day out.

Kingussie and Aviemore Urban Botany Weekend, 8th-11th September 2017

The aim of this weekend meeting was to survey the urban conurbations of Aviemore (pop. 2840) and Kingussie (pop. 1470). A cottage in Insh provided cosy accommodation for about half of the 14 participants, some of whom were local. We were particularly pleased to have the flowering plant expertise of Jackie Muscott and the fungal expertise of Mary Clarkson. Unfortunately, the local experts, Em and Val Emmett were unwell at the time and were not able to join us. Mary hosted Jackie in her highland retreat in Kingussie and also provided all of us with a timely and homely indoor refuge when the heavens opened. The sites in Aviemore included waste ground around an abandoned primary school and a gravel pit that is currently under development. Sites in Kingussie included the Glebe Ponds Local Nature Reserve, allotments and a cattle market. We are grateful to the Kingussie Allotments Association for allowing us access.

Lists of between 70 and 110 species of higher plants were recorded from individual sites, with about 400 species recorded in all. These sometimes included discarded garden plant material and even crop species. Like most urban places, most of the sites we visited were relatively rich in species but these were in essence ephemeral, reflecting plant successions from open ground and inevitable human disturbance due to site development.

Notable plants found during the course of the weekend included:

- Small cudweed, *Filago minima,* a declining annual, on a sandy road margin close to Aviemore station.
- Des Etangs' St John's wort *Hypericum x desetangsii (H. perforatum x H. maculatum)* in a car park near Aviemore Station.
- *Lepidium heterophyllum* was found close to Aviemore Station and again in the Kingussie allotments, beside the railway line. Perhaps the railway is acting as a corridor along which it is spreading?

- An unusual viviparous *Holcus lanatus* on gravel along the river Spey bank.
- *Amsinckia micrantha* was scattered over the livestock market site in Kingussie. This is a comparatively rare plant in the Highlands that has been recorded since 2010 and may have some connection with its status as a market.
- *Erophila verna* was in flower and fruit well outside its normal season on gravel close to the railway at Aviemore.
- Broad-leaved and northern docks occurred together in many places, distinguishable by their fruits.

The weekend was a most enjoyable social occasion for all participants, made richer by the abundant supply of fresh chanterelles and the yummy cakes of the Inshriach 'Potting Shed'.

Maria Chamberlain

ILLUSTRATIONS OF NON-NATIVE INVADERS – 7
Cotoneaster horizontalis Decne. (ROSACEAE)

Cotoneaster horizontalis Decne., the Wall Cotoneaster ('Cotone-aster' meaning 'Quince-resembling', not 'Coton-Easter' as I have heard it pronounced), is a native of western China and Taiwan (and perhaps also Nepal) where it grows on rocky slopes and dry mountain areas. It has become a very popular garden plant in Britain. It was introduced into British gardens around 1880 (dates are variously given as 1879 and 1889) soon after it was first cultivated in France. It was first recorded growing in the wild in Britain in 1940, in vice-county 29 (Cambridgeshire). Since then it has spread increasingly rapidly and reached most of lowland Britain. It has become one of the most widespread and easily identified of the 85 non-native Cotoneasters recorded by Stace and Crawley in 'Alien Plants' (2015) as growing wild

in Britain. It is now listed in 96 vice-counties. While any non-native plant that becomes established in the wild must be to some degree 'invasive', the term is somewhat subjective, and in common usage usually describes a non-native species whose introduction does, or is likely to, cause economic or environmental harm or harm to human health. While some invaders are restricted to highly disturbed man-made habitats, of particular concern are those non-natives that can spread to form a major portion of a natural or semi-natural habitat. On that basis, *C. horizontalis* is a non-native invader, even though less conspicuous than the much publicised examples, such as Japanese Knotweed and Himalayan Balsam, already considered in this series.

Of the more than 400 Cotoneaster species that have been described, at least 100 have been cultivated in Britain. Of the 86 Cotoneasters now growing in the wild in Britain, one (under the name *C. cambricum*) is protected as a British endemic although its taxonomic status and origin are a matter of debate. Of the remaining 85 taxa, 82 are recognised as distinct species introduced from abroad into cultivation, and subsequently to have escaped into the wild, and three are hybrids that have arisen in cultivation and then escaped. Twenty-seven of these taxa, including two of the hybrids, are classified by Stace and Crawley (2015) as naturalised, i.e. they self-reproduce from year to year for at least 5 years. The other 58 taxa are referred to as 'survivors' that do not reproduce and their persistence is determined by their individual longevity.

According to Stace and Crawley (2015), *C. horizontalis* is the 50th most widespread neophyte (non-native plant introduced since AD1500) in Britain, based on the number of hectads (10km x10km OS grid squares) in which it has been recorded. It occurs in 1316 hectads, 34.1% of the British total. Stace and Crawley (2015) express surprise that no other Cotoneaster species feature in their 'Top 52'; a possible explanation is that *C. horizontalis* is easy to recognise and while a few less distinctive Cotoneasters might be more common, they are difficult to identify in a taxonomically difficult genus. *C. horizontalis* has a recognisable habit. It is a deciduous/semi-evergreen shrub with stems that form flat sprays, branching regularly to form a characteristic herring-bone pattern. The branches spread horizontally to form a ground-cover but will also fan out over vertical surfaces such as rocks and walls. Where branches touch the ground, roots form and daughter plants are established, enabling the plant to spread vegetatively by 'self-layering'.

The dark green leaves on a short (up to 3mm) petiole are broadly elliptical, up to 14 x 9mm, and shiny on the upper surface. In May to June it forms small clusters of 1-3 bell-shaped bisexual flowers up to 7mm in diameter with small (up to 2mm) triangular sepals. The pinkish erect petals are up to 3 x 4mm; there are about 12 stamens, shorter than the petals and with white anthers. The ovary has three styles. The fruits, formed in September onwards, are shiny orange-red globular pomes up to 7mm in diameter, usually with three 'seeds' (stones or pyrenes). *C. horizontalis* flowers are visited by a variety of insects but this species, like many Cotoneasters, is apomictic and can produce seeds without fertilisation of an egg cell. As a consequence, progeny raised from seeds are genetically identical to the parent. The seeds, distributed by birds that eat the fruits, are dormant when fresh but germinate in 1-18 months after suitable stratification, such as 3 months in soil at 5°C. Seeds can remain viable for 5 years. Like other apomictic Cotoneaster species, *C. horizontalis* is polyploid; only tetraploids (2n=4x=68) have been reported in Britain, but there are also triploids in Germany. Of the 86 Cotoneaster species growing wild in Britain, only the nine diploid species are sexual. The taxonomy of the many apomicts is made difficult by the clonally-reproducing variants ('microspecies') that differ only in small details, as in other groups of apomictic species such as Taraxacum. Because of apomixis, it is possible that all the plants of *C. horizontalis* in Britain belong to a very limited number of clones derived from a few original introductions.

As a garden plant (information gleaned from a variety of web sites e.g. CABI Invasive Species Compendium, and gardening books), it is easy to see why *C. horizontalis* has been so popular. It grows well in a wide range of soil and climatic conditions. It produces good ground cover and will also hide untidy areas and screen walls where its regular branching produces an attractively architectural growth habit, which can easily be controlled by pruning. Mature plants can grow to 2m or more with abundant flowers. While the flowers are rather inconspicuous, the fruits and autumn leaves are colourful; the leaves turn shades of red in November just before they fall. *C. horizontalis* is beneficial to wildlife. The leaves are eaten by the larvae of several moth species, including Grey Dagger, Hawthorn Moth, Mottled Umber, and Winter Moth, Cotoneaster Webber Moths, *Scythropia crataegella* and *Numonia suarella,* can cause extensive defoliation. The flowers are particularly attractive to Bumble bees and Honeybees, which visit in large numbers. Flies, wasps (*Vespula vulgaris*) and ants (*Formica fusca, Lasius alienus*)

have also been observed collecting pollen and nectar. Birds, particularly Blackbirds and other thrushes, feed enthusiastically on the fruits later in the winter when other berries are no longer available. The only negative comments about *C. horizontalis* as a garden plant are that handling clippings causes dermatitis in some people, and the fruits, which contain cyanogenic glycosides, are said to be poisonous.

As a consequence of its abundance as a garden plant, and its efficient dispersal by birds, *C. horizontalis* not only self-seeds around the garden but is carried to a wide range of habitats beyond the garden boundary. Improper disposal of garden waste might also contribute to its spread. It grows particularly well in light well-drained lime-rich substrates and is now found in rocky grassland, coastal dunes, railway and road banks, cliffs, limestone pavement, quarries, chalk pits, pavements and walls in most lowland areas of Britain, particularly in the south. Invasion of cracks and decaying mortar can lead to damage to walls. It is most troublesome in herb-rich calcareous grassland and crags where it can become dominant locally to the point that it excludes native species. Examples include sites in the North and South Downs of England where over the last 50 years or so, large areas of species-rich chalk grassland have become overgrown with scrub in which Cotoneaster species, including *C. horizontalis*, feature prominently. In limestone grassland in the Cotswolds, *C. horizontalis*, together with *C. integrifolius*, can become invasive when domesticated animals are taken off, and rabbits decline. In a quarry in Devon, *C. horizontalis* has, with other plants, shaded out *Lotus corniculatus*, the food plant of the Silver-studded Blue butterfly larvae and made conditions unsuitable for the ants upon which the butterfly's life cycle depends. It has also become invasive after introduction to most of western Europe from Scandinavia to Italy, as well as N. America, and parts of Australia and New Zealand and in several instances, an adverse impact on their native flora has been recorded (see CABI Invasive Species Compendium).

Of similar concern are several other Cotoneaster species that are to differing degrees widespread in the wild in Britain, including *C. bullatus, C. integrifolius, C. microphyllus* and *C. simonsii*. Stace and Crawley (2015) consider that the Cotoneaster species that causes most harm to the British native flora is probably *C. integrifolius,* which can form a dense blanket of tangled stems that smother large areas of limestone cliffs. *C. simonsii* invades heathland in Scotland. All five species became subject to the legal restrictions of the Wildlife and

Countryside Act when their names were added to Part II of Schedule 9 by The Wildlife and Countryside Act 1981 (Variation of Schedule 9) (England and Wales) order 2010. Under this Act, it is an offence in England and Wales to plant or otherwise cause to grow in the wild any plant, which is included in Schedule 9.

In Scotland, Cotoneaster species are covered by the wider remit of the amendment to the 1981 Act, the Wildlife and Natural Environment (Scotland) Act 2011, which takes into account the possibility, indeed probability, that there are non-native species that have not yet established in wild habitats but may become seriously invasive in the future. This amendment makes it an offence in Scotland "to plant or cause to grow in the wild any plant outwith its native range". Individual species are not named but some helpful clarification of the amendment was published as the Non-native Species Code of Practice (2012, page 5). 'Wild' is defined as a natural or semi-natural habit, urban or rural. Non-wild areas, exempted from these restrictions, include private gardens, public amenity areas, allotments and burial grounds, road verges and rail embankments within built-up areas, and agricultural or horticultural land. 'Native range' is the locality where the species is indigenous. 'To plant' includes introduction of seed, seedlings, or mature plant or part thereof. When a plant is 'caused to grow', the plant becomes present in the wild as a direct result of someone's actions even though they did not specifically plant it there. Actions that may cause a non-native plant to grow in the wild include inappropriate disposal of garden waste, planting a non-native species in a non-wild area with the result that it spreads into the wild, and failure to take proper steps to prevent the escape of a non-native plant from a non-wild place into the wild. 'Proper steps' include regular monitoring to detect spread, reducing seed production by dead-heading, and removing any regenerating plants that are spreading from non-wild areas. In summary then, it is not illegal to plant a non-native species in a garden, but it is an offence to fail to take reasonable steps to prevent it spreading into the wild, however invasive the species and however unintentional the consequence. In applying this Code of Practice to *C. horizontalis,* what constitutes 'reasonable steps' to prevent birds from taking seeds out of one's garden is not clear.

Cotoneaster species are not included in the first list of invasive plants prohibited from sale in England by the Wildlife and Countryside Act (prohibition on Sale etc. of Invasive Non-native Plants) (England)

Order 2014; nor are they among the 14 non-native invasive plants the sale of which was banned by the EU in 2016. So, despite being subject to legal restrictions as outlined above, *C. horizontalis* is still available commercially. Even the RHS offers it for sale on line from their Plant Shop, though with the exhortation to find alternatives if possible because of the risk of it spreading into the wild. The Code of Practice 2012 reinforces this. It states: "In an exempted area (such as a garden or amenity ground) you should consider whether the use of a native plant would be more suitable, bearing in mind the risk of anything you plant spreading into the wild. Non-native plants known to spread rapidly, for example by producing highly mobile seed, should be avoided." Particular care should be taken when planting close to vulnerable wild habitats which, in the case of *C. horizontalis*, include calcareous grassland and limestone rocks. It might be possible to increase public awareness of these risks, and to discourage mass plantings of this popular plant in landscaped areas, but although sales might be reduced, given the already widespread distribution of plants in both wild and non-wild habitats, further spread of this species seems likely.

Consequently, protection of threatened plant communities from invasion by *C. horizontalis* will depend to a large extent on expensive and labour-intensive on-site control measures within selected local areas. Elimination of established plants in the wild is difficult because of the ease with which it regenerates after fire or cutting. If it is impossible or impractical to remove whole plants with their roots, Plantlife recommend scraping back the bark for 2-3 inches close to the base of each stem during the growing season before dripping on neat glyphosate (Roundup Pro Biactive), with a follow-up 6 weeks later to treat any stems that were initially missed. Control of whole areas is necessary to prevent rapid re-seeding from nearby plants.

For further information see: CABI Invasive Species Compendium: www.cabi.org/isc/datasheet/16870

Footnote to explain the absence of an accompanying ink drawing.

This painting of *Cotoneaster horizontalis* and its matching ink drawing, together with illustrations of No.6 in this series, *Allium paradoxum*, and others, were awarded a Silver Gilt Medal at the 2014 RHS 'Shades of Autumn' Show in London (Nos 1 - 5 in the series were awarded a Gold Medal and Best in Show at the 2013 RHS Malvern Spring Show in 2013). The Cotoneaster painting and drawing were shown again in 2015 in an exhibition of Janet's work in St. Mary's Episcopal Cathedral during the Edinburgh

International Festival. However, during this exhibition, the Cotoneaster drawing and another picture were stolen from the Cathedral and never recovered. Unfortunately, we had not obtained a digital scan before the drawing was stolen.

Adrian Dyer.

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Non-native Species code of practise
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SCHOOLS PHOTOGRAPHIC COMPETITION WINNERS 2017: FIRRHILL HIGH SCHOOL, EDINBURGH

We are pleased to announce that the BSS Photographic Competition prize was awarded to pupils of Firrhill High School in Edinburgh. The students took their photographs in May and June 2017 and sent us a portfolio of photographs on cd at the end of the school year in July. The BSS Council commend their enthusiasm and plant ID skills. The prize, which was a cheque for £50 and a decorative certificate for their notice-board, was handed over in November by John Grace, when John and Maria Chamberlain went to meet the students and staff in the school library. The terms of the competition specified that the prize money should be spent to purchase some plant ID books. The photograph (on the cover) shows that the school already have a Keble Martin and a Phillips (books on display on the library shelf), but the teachers and librarian were keen to supplement their natural history section with some more up to date flower guides, such as Francis Rose's Wild Flower Key, David Streeter's Collins Wild Flower Guide, and Blamey, Fitter and Fitter's Wild Flowers of Britain and Ireland. The pupils we interviewed seemed keen to learn the names of plants and appreciated the value of surveys to monitor land use and climate change. We were impressed that Firrhill High School already has a well-tended garden and a well-attended Eco-Club that addresses these issues.

The common perception that seems to prevail in our commodity-based world is that wild plants are merely weeds to be discouraged or eliminated. This trend is clearly endorsed by the local Council who routinely spray built-up areas to clear them of plants that might have self-seeded. The aim of the photographic competition is to encourage the awareness of the heritage value of wild plants in peoples' lives and maybe instil a lifelong interest in plants and their relationship with other things. It is with these things in mind that we conceived of a photographic competition aimed at secondary school children.

The visit to the school proved useful in amending the ground rules for next year's competition. Under the original terms of the competition, the students were invited to photograph plants on their school grounds and surrounding green spaces. One problem, which we had not anticipated, is that schools cannot release their pupils outside the school gates without completing lengthy and time-consuming risk assessment forms. These undoubtedly necessary but tedious health and safety measures deter busy teachers (already suffering from an admin overload) from including fieldwork in the biodiversity studies syllabus. I suspect that most of last year's letters to head teachers remained unopened, or maybe were not sent on to the relevant teachers. Nevertheless, next year we aim to expand the competition to more schools, engage the help of GeoBus, an educational outreach project for schools, and hope for a wider participation. Letters will be sent to the schools in the spring. In the meantime, we would welcome any interested readers, parents or teachers to suggest ways of improving our schools programme of engagement. Should we restrict the area to within the school perimeter only? Do people think that primary schools should also be targeted? Do write and tell us your views. Please send your comments to Maria.Chamberlain@ed.ac.uk.

UK JUNIPER FACES A NEW THREAT, FROM *Phytophthora austrocedri*

Juniperus communis L.: this keystone species is no stranger to adversity as its population viability struggles in the face of poor seedling recruitment, habitat fragmentation and climate change. A new challenge has recently emerged in the form of a fungal-like pathogen, *Phytophthora austrocedri* Gresl. & E. M. Hansen, which is causing widespread juniper population dieback. By studying how juniper

population structure and environmental factors mediate disease establishment at field and regional scales, I am hoping to develop management and containment strategies to lessen the impact of *P. austrocedri* on Scottish juniper populations.

Before starting this PhD, I was most familiar with juniper as an occasional gem of sheep-bitten, acidic heathland or inaccessible rocky ledges in the NW Highlands. However, as BSS members will know, juniper exists in a wide variety of Scottish habitats: dune slacks along coastal fringes of Sutherland, Caledonian pine woodland in the Cairngorms, improved field margins in the Borders and of course the A9 embankment at Slochd, to name but a few. Juniper is extremely variable in form, from prostrate, scrambling mats to statuesque, almost columnar, trees with multiple, intertwining stems. Juniper hosts over 100 species of UK fungi and slime moulds and at least 50 species of mites and insects (such as the juniper carpet moth and juniper shield bug). It provides nesting habitat for birds such as black grouse, and berries for birds (mostly thrushes) to feed on (Wilkins & Duckworth, 2011; Ward & Shellswell, 2017). It is concerning, therefore, that juniper is experiencing a UK-wide decline, both in terms of geographical range and population size (Sullivan, 2003; Plantlife, 2015; Ward & Shellswell, 2017). There is no shortage of hypothesised causes: direct habitat destruction (e.g. burning or afforestation), ageing populations with poor reproductive vigour, diffuse pollution (particularly nitrogen deposition) hindering fertilisation, changes in temperature cycles needed to trigger seed germination, deficit of potential recruitment sites through under-grazing, or direct loss of seedlings from over-grazing (Sullivan 2003; Long & Williams, 2007; Broome *et al*., 2017). This steady decline led to the inclusion of *J. communis* in the Vascular Plant Red Data List for Great Britain (Dines *et al.*, 2005), albeit as of “Least Concern”. From the early 2000s onwards, however, much larger areas of dieback were visible in some of the UK’s most significant populations, which could not easily be attributed to the factors listed above, nor indeed to a known pathogen. Finally, in 2012, Green *et al.* (2012) isolated and identified *Phytophthora austrocedri* from native *J. communis*.

Phytophthora austrocedri is an oomycete (fungal-like water moulds). It disperses through soil water via free-swimming zoospores that attach and encyst on host species’ roots. By secreting enzymes and inhibitory proteins, Phytophthoras suppress host defence mechanisms and break down tissues, spreading into the cambium and phloem

(Kamoun, 2003). The first symptom of infection in juniper is a yellowing discolouration of the foliage, which then progresses to bronzing of large areas of needles. At this stage, investigation of the infected stem or branch can reveal characteristic necrotic lesions on the phloem that may extend for some distance up the stems. The time from initial infection to death of juniper appears to vary, with some trees dying very suddenly and others showing little symptom progression. Some trees at heavily infected sites appear to have escaped the disease. Further work is needed to identify the proportion of infected trees that die, and whether genetic resistance to the pathogen exists in UK populations.

Phytophthora austrocedri was first described in 2007 from Argentina, the only other country currently known where the disease exists in the wider countryside. *Phytophthora austrocedri* is now understood to be the agent causing 'mal de ciprés': the devastating loss of Chilean cedar (*Austrocedrus chilensis*) populations in Patagonia that has occurred since *c.*1948 (Greslebin, Hansen & Sutton, 2007). In the UK it is known to infect Nootka cypress (*Cupressus nootkatensis*) and Lawson cypress (*Chaemaecyparis lawsoniana*) as well as horticultural juniper varieties and native juniper (Green *et al.*, 2015). It is likely that *P. austrocedri* has been present in the UK since at least the mid-1990s and is now present at > 100 geographically separate juniper sites from Bonar Bridge right down to Blackwater in Cornwall. *Phytophthora austrocedri* is only present in the UK as a single genetic clone implying asexual spread across a wide geographical area (Henricot *et al.*, 2017). We are now asking questions such as: Is every juniper population equally susceptible to invasion and high levels of mortality, or is the diversity of habitats that juniper occupies the key to its survival? Does the severity of *P. austrocedri* infection correlate with particular environmental gradients or juniper density, and are the drivers causing spread across isolated populations the same as those acting across regions?

To address these questions, I am using a combination of statistical and epidemiological modelling techniques to identify the most significant *P. austrocedri* risk factors. In October 2017, with the help of Forest Research pathologists and a group of hardy volunteers, I investigated juniper stands at three study sites that we believe have been infected for differing lengths of time. These are Glenartney SSSI in Perthshire, Birk Fell SSSI in the Lake District, and Whitewell in the Cairngorms. I scored the percentage of juniper in visible disease-symptom categories within 10 x 10 m plots and collected information about juniper density,

reproductive status, and morphological stage of development (as opposed to chronological age) using the same descriptive categories (e.g. “pioneer” or “mature”) as the Scottish juniper survey carried out by Sullivan in 2003. The environmental covariates recorded include soil moisture, altitude, species’ community composition, and proximity to tracks and water courses. We have also installed a small number of data-loggers to record hourly temperature changes across a whole year. This range of covariates will help me elucidate which factors underpin both juniper and *P. austrocedri* distribution and how these factors interact to facilitate disease invasion and spread at these different sites.

In addition to modelling field scale relationships, I shall also interrogate occupancy of *P. austrocedri* across regions and/or the UK as a whole. This is not possible without reliable distribution data on the occurrence of juniper. Your records are, therefore, invaluable. Thank you for those already submitted to the BSBI/NBN and please continue to send them records of juniper wherever you find it. If you suspect it might be infected, or indeed come across any other tree diseases, you can upload photographs to the online Forestry Commission Tree Alert service https://treealert.forestry.gov.uk/. All submissions will be followed up by forest pathologists.

I hope to update you on the findings of this research in due course.

Flora Donald
flodon@ceh.ac.uk

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THE REDGORTON WOODS OF THOMAS GRAHAM, LORD LYNEDOCH

Alistair Godfrey 13th February 2018 held in Dundee University Dundee Naturalists’ Society and the Botanical Society of Scotland

Alistair Godfrey, Chairman of the Botanical Section of the Perthshire Society of Natural Science and Botanical Recorder for Mid-Perthshire for the Botanical Society of Britain and Ireland, gave a talk describing his studies of his local woodlands near Perth. For 25 years he had driven past the Redgorton Woods, but more recently embarked on a

detailed historical and ecological study of them. Alistair studied plant distribution and plant communities in different parts of the wood using the National Vegetation Classification.

These woods had been planted over an area of around 800 acres in the 18th and 19th centuries. Thomas Graham, who was born in 1748 and became Laird of Balgowan and Redgorton at the early age of 19, played a major part in this development. Planting was also continued by his heirs after his death to the end of the 19th century, and was preceded by planting in the first half of the 18th century by other members of the Graham family. Old documents and maps provided valuable information.

Planting was intended to provide ornament and utility and there was also some land "improvement" with the draining of marshes, but some wetland survived. Several tree nurseries were established on the estates.

Scots Pine ("fir") was often used as a nursery tree and was succeeded by broadleaves, particularly Pedunculate Oak (Q*uercus robur*) with some Sessile oak (*Q. petraea*) and their hybrid, but also Hazel, Ash and Aspen. Where oak has been removed, Birch (*Betula pubescens*) often replaces it as a dominant, establishing thickets at first that discourage browsing.

The presence of Bracken (*Pteridium aqulinum*) in some places helps to keep excessive grass growth under control, benefitting some herbs.

The ground flora is interesting and diverse and 58% of the Scottish ancient woodland indicator species are present. Chickweed wintergreen (*Trientalis europaea*), Bluebells (*Hyacinthoides non-scripta*) and Wood anemone (A*nemone nemorosa*) are to be seen. Common wintergreen (*Pyrola minor*), which is scarce in this area, is present and, by the river, the scarce Yellow Star of Bethlehem (*Gagea lutea*) has been found.

Interesting bryophytes, including the moss *Ptilium crista-castrensis* and the liverwort *Nowellia curvifolia*, are present. Other wildlife includes a population of red squirrels.

This study shows what is possible in the investigation of the history and biodiversity of a local site and could be very usefully repeated elsewhere.

Brian Ballinger

NATURAL HISTORY OF GLENCOE: DAN WATSON, NATIONAL TRUST FOR SCOTLAND

28TH NOVEMBER 2017. JOINT MEETING BETWEEN THE DUNDEE NATURALISTS' SOCIETY AND THE BOTANICAL SOCIETY OF SCOTLAND HELD IN THE DALHOUSIE BUILDING, UNIVERSITY OF DUNDEE.

Dan Watson from the National Trust for Scotland gave an account of the Trust's Glencoe reserve, which has recently been designated as a National Nature Reserve.

Dan drew attention to the fact that this area has received less attention from naturalists than the Trust's other property of Ben Lawers, where he is also ecologist and which is renowned for its arctic-alpine flora. Glencoe is also of considerable interest however, although its attractions are more widely distributed.

He described some of the important places in the reserve, beginning in the alder wood near the visitor centre. Pipistrelle bats and Small Pearl-bordered Fritillary butterflies have been seen nearby.

Behind the visitor centre, is Meall Mor, with its limestone outcrops. Although only 676 metres high there is considerable botanical interest, including Mountain Avens (*Dryas octopetala*), Alpine Cinquefoil (*Potentilla crantzii*) and Hair Sedge (*Carex capillaris*). Whortle-leaved Willow (*Salix myrsinites*) is present over a wide area. Chequered Skipper butterflies and Narrow-bordered Bee Hawkmoths have been seen, as well as Mountain Ringlet butterflies at a higher altitude.

To the east the Bidean massif presents a contrast, being rocky and less densely vegetated. Ring Ouzels, Ptarmigan and Mountain Hare may be spotted. In some years, snow lingers until autumn in the high gullies.

The scarce Mountain Bladder fern (*Cystopteris montana*) and Wilson's Filmy-fern (*Hymenophylum wilsonii*) have been recorded. In one place seven different saxifrage species grow close to each other, including the rare Drooping Saxifrage *(Saxifraga cernua*) and Highland Saxifrage (*Saxifraga rivularis*). The lowest level patch of Highland

Saxifrage has diminished considerably in recent years, suggesting a possible effect of global warming.

Seeds have been collected from Sibbaldia (*Sibbaldia procumbens*) plants, to help reinforce the Ben Lomond population

Among other rarities are some remarkable mosses and liverworts and at the bottom of the corrie is a field rich in waxcap fungi.

Elsewhere Buachaille Etive Mor is much photographed and is known to be home to the Black Mountain Moth. A caterpillar of Rannoch Brindle Beauty moth was photographed here, although an adult has yet to be seen.

This is a wonderful area where new discoveries continue to be made.

Brian Ballinger

A NEW SCOTTISH RECORD FOR BURDOCK MILDEW (*Golovinomyces depressus* (Wallr.) V.P. Heluta) IN THE HERMITAGE OF BRAID, EDINBURGH

During a walk in the Hermitage of Braid in early Autumn (8 September 2017) I noticed that the leaves of most of the Burdock plants (*Arctium minus* agg.) along the path that follows the Water of Leith at the start of Blackford Glen were in a state of collapse – dry, brown and shrivelled. The undersides of the leaves were peppered with small black spots. The spots looked like, and were confirmed as, cleistothecia, the fruiting bodies of powdery mildew fungi. They were dark reddish brown under transmitted light and lightly held to the leaf surface by a weft of hyphae; they were ca 125µm diameter, containing a few large ellipsoid asci with hyaline, ellipsoid ascospores ca 38 x 22 µm. I identified it as a powdery mildew fungus, *Golovinomyces depressus* (Wallr.) V.P. Heluta. This species started life as *Alphitomorpha depressa*, described by Wallroth in 1819; *Alphitomorpha* became a synonym of *Erysiphe* and the new combination *E. depressus* (Wallr.) Link was made in 1824; and this is the name it would be known by for 164 years until it became *G. depressus* in 1988, as a result of the change of status of some Sections of *Erysiphe* to generic status, one of which was *Golovinomyces*. As fungal name changes are often slow to be taken up it will doubtless

continue to be called *Erysiphe* by some. As well as occurring on *Arctium* it has been recorded from *Centaurea*.

The fungus appears to be widespread in England and Wales; of the 454 records from the British Isles, only eight are from Scotland (https://species.nbnatlas.org/species/NHMSYS0021128059 (accessed 18 September 2017 – the NBN Gateway, with records that are very incomplete for fungi), and only one location in the Edinburgh area, very close to the Botanic Gardens. For the record, the location of the latest collection was:- Blackford Glen, Edinburgh (Grid Ref. NT 257 702).

M.J. Richardson

BRITISH RHODODENDRONS: WHAT ARE THEY, AND WHAT SHOULD WE CALL THEM?

Rhododendron ponticum is, famously, aggressively naturalised across much of the British Isles. It causes plenty of headaches for conservationists, but recently a new one had been added, with uncertainty about what to call the plants. The name *Rhododendron* x *superponticum* was introduced by Cullen (2011) in an attempt to separate naturalised British material from native stock, based on his claim that all British material was part of a single, giant hybrid swarm. However, unhybridized plants almost certainly occur, and the situation with British material is far too complex for it all to have one name that separates it from native material. Indeed, Cullen (2011) himself admitted that “there seems no possibility of recognising any kind of taxonomic units within the British stands”. It is therefore most regrettable that he went ahead and did it anyway, instead of leaving the taxonomy as it was. I should have written a rebuttal at the time, but I hoped the new name would be ignored, and really do not like attacking other people’s work. Over the last few years, however, the name “*superponticum*” has started turning up more and more often, and I have even been contacted by conservation workers who are understandably confused about what to call our plants. In this article, therefore, I aim to first set out exactly what we know about British naturalised *Rhododendron* material, and then all the many reasons why use of the name *R. x superponticum* should be avoided.

What we know about naturalised British *Rhododendron* material

Three species of *Rhododendron* occur wild in Britain. Aside from *R. ponticum*, there are occasional escapes of *R. luteum,* (though the only naturalised population I have ever seen is a small one from near Gaerloch in Scotland), and populations of *R. groenlandicum* (formerly known as *Ledum palustre*) around Flanders Moss in central Scotland. Plants of other species, hybrids, or cultivars might occur occasionally as relics of cultivation, as in Glen Ample near Lochearnhead. This article concerns only *R. ponticum*.

1. Our *ponticum* plants originate from Spain and Portugal.

Rhododendron ponticum is native to three small areas on the Iberian peninsular: one in southern Spain, and two in Portugal. It also occurs, far more abundantly, around the southern coast of the Black Sea, from Bulgaria through Turkey into the Caucasus, with a small outlier in Lebanon. The first introduction of *R. ponticum* occurred in 1763, from Spain, but more introductions are likely to have followed, including from other parts of its range. Nonetheless, Chloroplast DNA markers clearly show that all wild *ponticum* material in Britain originates from Spain or adjacent Portugal (Milne and Abbott, 2000).

2. Some, but probably not all, of our material, is slightly altered by hybridisation.

Morphological and DNA evidence, discussed in detail below, shows that some of our material is not pure *R. ponticum*. It is vital, however to be aware that our plants are, according to the only quantitative estimate we have, on average probably 90-95% *R. ponticum* (Milne and Abbott, 2000). Hybridised plants in Britain resemble pure *R. ponticum* in all ways except a few minor morphological traits, and possibly enhanced cold tolerance. Several other species may have contributed DNA, which I attempt to narrow down below, but the picture is unclear and complex. Pure *ponticum* plants probably also occur, especially in Ireland. Cullen (2011), who looked at far more morphological characters than I did, found evidence of hybridity in only a quarter of his specimens, so the proportion of pure *ponticum* plants could be much higher (but see below). There may be occasional individuals that are early generation hybrids with as much as 50% *catawbiense* germplasm, but these are likely the exception – I saw only one among hundreds of plants I surveyed, that might have been an F1.

3. We can use cultivated history to narrow down which species might be involved

Rhododendrons hybridise extremely freely, and *ponticum* will have crossed both accidentally and through deliberate breeding with other species in gardens. It is highly interfertile with most or all of the other 222 species in subgenus *Hymenanthes* of *Rhododendron.* Although hundreds of Rhododendron species are cultivated in Britain, nine *Hymenanthes* species dominate cultivar production, having given rise to over 100 cultivars each (Milne, 2017). These species were commonly used in deliberate crossing, which also implies that they were widely grown and had ample opportunities for accidental crossing. They are, with the year of introduction in brackets: *maximum* (1736)*, ponticum* (1763)*, caucasicum* (1803)*, catawbiense* (1809)*, arboreum* (1812)*, griffithianum* (1848)*, thomsonii* (1849), *campylocarpum* (1851)*,* and *fortunei* (1859)*.* Bearing in mind that it would take decades from first introduction of a species to it being cultivated in any quantity, the last four had little opportunity to introgress DNA into *R. ponticum* before that species became widely planted, as happened gradually through much of the 19th century (Milne, 2017). Hence their influence if present may well be localised (see point 9 below). Species introduced before 1849 were widely used by nurserymen in early breeding experiments. *R. ponticum* had vigour, *arboreum* had beauty, and the other three (*catawbiense, maximum* and *caucasicum*) were extremely frost-hardy. Early cultivars were intended to combine these traits, for example 'Altaclarense' ((*catawbiense* x *ponticum*) x *arboreum*) From this, the species we would most expect to be involved in naturalised *ponticum* material are *arboreum*, *catawbiense, maximum* and *caucasicum*, although we have no direct evidence for involvement of *caucasicum*. Cullen notes three specimens that might involve *R. fortunei*, which could be planted cultivars, but they also could indicate localised introgression from this species, where *fortunei* or its cultivars have been planted.

4. Many of our plants contain some DNA of the American *R. catawbiense*.

By far the most important species to our material, other than *ponticum,* was *R. catawbiense*. About 10% of wild British *ponticum* plants contain a genetic marker of this species, from which I estimate the average proportion of *catawbiense* DNA among our plants might be 5% (Milne and Abbott, 2000). But I emphasise (i) this is an estimate, and (ii) the proportion will not be even between locations (see point 9).

Cullen found morphological evidence of *catawbiense* involvement in between 7 and 12 of 138 specimens.

5. Hairy ovaries prove a hybrid origin but not with which species, while plants with glabrous ovaries might or might not be pure *ponticum*.

Morphologically, *R catawbiense* differs from *ponticum* most obviously in the former's hairy ovaries, but *ponticum*'s hairless ovaries are very unusual among related Rhododendrons, so this trait could come from many other species including, as Cullen (2011) notes, *R. maximum*. Two other morphological signatures of *catawbiense* are more rounded leaves, and pedicels bearing dendroid hairs (Cullen 2011), but any of these could potentially have come from another cultivated species. Hence one or more of these traits will indicate certain introgression, but cannot with absolute certainty implicate *catawbiense* as the culprit (though it is certainly the likeliest one). Moreover, in such specimens one cannot be sure that only one additional species is involved. A further problem is that, because the average proportion of *catawbiense* DNA is expected to be low, it is perfectly possible for plants to contain some genes from this species, but not those that cause detectable morphological traits. From this, plants with hairless ovaries might be pure *ponticum*, but equally could contain DNA from one or more other species. In short, one can prove hybridity from morphology, but cannot prove its absence, nor can one show precisely which species are involved, because there are so many candidates.

6. *R. maximum* is involved, but it is unclear to what extent.

Among 259 individuals of British naturalised material, two were detected with a DNA marker indicating some influence from *R. maximum*. Morphologically, this species differs from *ponticum* and *catawbiense* in its much longer calyx lobes: 3-5 mm as opposed to ≤1mm in those species. Of the nine main species noted above (point 3), *maximum* is the only pre-1849 species with long calyx lobes. Based on this, narrow calyx lobes ≥ 2mm imply probable influence from *R. maximum*, but unless there is DNA evidence for that particular specimen, this falls short of proof that the character is acquired from *R. maximum* and not another long-sepalled species. Cullen states that smaller and "pinker" flowers also implicate *R. maximum*, but these traits could potentially come from many other species.

Among eight Scottish populations surveyed (Milne and Abbott, 2000), just under a quarter of individuals displayed calyx lobes 2-8 mm long, though this may not be representative of Britain as a whole (see below). Cullen (2011) found long calyx or glandular ovary traits implicating *maximum* in 17% of his specimens – more than for traits of *catawbiense*, but that might be because *maximum* traits are more detectable and/or more dominant in expression. Because so few individuals had the *maximum* DNA marker, and the long calyx lobes were rarer than hairy ovaries in material I examined, I tentatively infer that the overall proportion of *maximum* DNA is less than that of *catawbiense* DNA in our plants, hence probably <5%.

7. *R. arboreum* may be involved, but hard evidence is lacking.

R. ponticum, R. catawbiense and *R. maximum* tend to have corolla flecks ranging from green to orange, or faint reddish brown in *catawbiense* sometimes, but never deep or dark red. All three belong to the *Pontica* group, a relatively old assemblage of rhododendrons which occur outside the Himalayas. The remainder of subgenus *Hymenanthes* within *Rhododendron* comprises >200 species, which diversified relatively recently, in and around the Himalayas; many of these have red to red-black corolla flecks. Based on this, plants of *ponticum* in Britain with deep red corolla flecks would appear to show an influence from species outside the *Pontica* group. Based on point 3 above, *R. arboreum* is much the most likely of these, but of course this falls some way short of proof. In theory, red corolla flecks could be produced by segregation in hybrids involving *R. ponticum, R. catawbiense* and/or *R. maximum,* but this explanation seems unlikely given the apparently low proportion of *catawbiense* and *maximum* DNA. Cullen reports the presence of eight plants with probable *arboreum* parentage and three with possible *R. fortunei* parentage, but he dismisses them as planted cultivars. Some may have been, but one cannot tell without seeing them in the wild, and most of his specimens were sent to him. I have seen plants with dark red corolla flecks that are certainly part of an actively naturalising population – it makes no sense to try to exclude all these from an examination of British *ponticum*, or to separate them taxonomically from the rest. In summary, red corolla flecks in any UK specimen indicates introgression, with *arboreum* the most likely culprit, though any cultivated red-flecked *Hymenanthes* species could be responsible, and segregation cannot entirely be excluded.

8. Influence of *R. catawbiense* varies geographically.

During surveys based on single samples from 177 locations around the British Isles, ten of 67 from Scotland contained the *catawbiense* DNA marker, compared to only five out of 64 from England+Wales, and none of the 27 from western Ireland (Milne and Abbott, 2000). Eastern Scotland, with five of 17 samples showing *catawbiense* influence, is especially striking. Were I to repeat the work now, I would of course sample each population more heavily, but the trend is fascinating: the coldest places have the most *catawbiense* influence, and the mildest, W. Ireland has little or none. From this comes a very attractive hypothesis, that introgression from *catawbiense* increases cold tolerance, leading to introgressed plants being selected over pure ones in cold places like eastern Scotland, but not at all in mild western Ireland. There is as yet no proof of cause and effect here; it could be a chance finding, or reflect choices of Scottish gardeners to plant hardy hybrids of *R. ponticum*. What it does tell us is that material may vary in composition between regions, as well as between and within populations (see points 9 and 10). Irish material might be closer to native Iberian *R. ponticum* than it is to Scottish material, for example.

9. Each British population results from a local introduction and so has its own particular history.

Some British aliens, notably *Senecio squalidus*, descend from a single introduction, meaning that British material forms a distinct evolutionary lineage with a common history since escaping cultivation. Not so *R. ponticum*. Driving around regions such as western Scotland it quickly becomes apparent how patchy its distribution is, with dense populations centred around a garden or estate where it was originally planted, and large stretches of land free from the plant in between. This indicates that each population naturalised independently, and hence arose from different cultivated individuals. This is important, because the precise cultivation history may differ between sites, meaning different combinations of species may be involved as possible hybrid parents, depending on the population.

Specific populations may for example contain DNA from an unusual species that was present alongside *ponticum* in the source garden/estate, or indeed from several species if it has crossed with a hybrid cultivar. Moreover, different estates may have planted different *ponticum* source material, some choosing pure plants, others different types of *ponticum*-based hardy hybrid. Therefore, naturalised

populations are likely to differ from one another in whether or not they contain introgressed material from each of the three most significant species *catawbiense*, *maximum* and *arboreum*, and indeed others. The strange upshot of this is that any given naturalised population may be no more similar to another than it is to native material!

10. There is lots of within population variation.

Surveys of eight Scottish populations (Milne and Abbott, 2000) found high levels variation for ovary hair, calyx lobe, corolla flecks and other traits. This probably reflects chance inheritance of characters acquired from other species through the generations, hence an entire population might be descended from the same few planted individuals, and have roughly similar proportions of *catawbiense* and (e.g.) *arboreum* DNA, but each individual has a different set of characters, and some may have no clear non-*ponticum* characters.

11. *R. macrophyllum* is not involved.

Cullen (2011) inexplicably implicates *R. macrophyllum* as a parent of his "*superponticum*", yet there is not a shred of evidence for any involvement of this species. It is seldom grown in Britain, was not introduced until 1850, and has very rarely been used in cultivar creation; basically as a less vigorous version of *ponticum*, or a less hardy one of *catawbiense*, it had nothing to offer the gardener or nurseryman. I found no evidence of any kind for any influence of this species on naturalised *ponticum*, and Cullen also cites only "pedicels sparsely glandular to glabrous", which falls within the range of variation for pure *R. ponticum*. He seems to have included it solely on the basis that it is a member of "subseries Ponticum", a now defunct grouping of similar looking plants together with *R. ponticum, R. maximum* and *R. catawbiense*. In fact, *ponticum* is closest to *maximum* and the Turkish *R. ungernii*, but surprisingly distant from *catawbiense* and *macrophyllum* despite the morphological similarity (Milne, 2004). However this point is moot, because *ponticum* is interfertile with any member of Hymenanthes, so there is no reason to think that only its closest relatives within the group are involved. In short, there is absolutely no reason to think that *macrophyllum* is involved at all.

12. Any attempt at giving British plants taxonomic distinction is doomed to fail

Taking all this together, we see that British material is highly variable at every level – between individuals, between populations and

between regions. Some but not all of this variation may reflect differences in species parentage between locations. The best estimate we have suggests on average about 5% DNA from *catawbiense*, and probably less from any other species. Some individuals and possibly even populations are likely to be pure *ponticum*, especially in western Ireland; crucially we cannot exclude this possibility. Each population stems from a local introduction, and hence the source material may differ between sites. Therefore, many introduced populations may be more similar to native Iberian material than to other naturalised populations. Hence, any attempt to provide an over-arching taxonomic distinction for British material is simply not going to work.

13. Our material can, therefore, be accurately described as "*R. ponticum*, much of which is introgressed with material of *R. catawbiense* and other species"

The problems with "*R. x superponticum*"

The above text demonstrates, I hope, why the name "*R.* x *superponticum*" should never have been introduced. Cullen (2011) was certainly diligent in examining material of *ponticum* sent to him, and his paper usefully lists a raft of subtle characters that appear to indicate introgression, going well beyond those noted in Milne and Abbott (2000). Had he confined himself to surveying UK material and providing the means to identify likely source of introgression in given specimens, it would have been a valuable combination. Instead, Cullen described *R.* x *superponticum* as a name to cover hybrids involving *R. ponticum* and *R. catawbiense*, *R. maximum* and/or *R. macrophyllum*, within the British Isles. He gave three ways of distinguishing it from pure *R. ponticum*: introgressed traits such as hairy ovaries, increased vigour, and location. Let us examine all the problems with this name.

A: None of Cullen's diagnostic characters work. Let us consider them in turn.

(i) Introgressed traits. See (5-7) above: any individual with hairy ovaries, long calyx lobes or deep red corolla flecks is certainly not pure *ponticum*, but the reverse does not hold: individuals with no obvious distinguishing traits from pure *ponticum* may or may not be hybrids. Hence, even if we accepted that all hybrid material should be called *superponticum* (and I certainly do not – see below), these characters don't work because taxonomic distinction demands consistent characters. One cannot distinguish a taxon based on traits that not all

individuals have. Only a quarter of the material seen by Cullen (2011) had traits that distinguished them from pure *ponticum*!

(ii) Vigour. Naturalised British material is far more vigorous than native Iberian material. However, this is normal for invasively naturalised aliens, and usually unconnected to hybridisation – Japanese knotweed is a good example. Indeed, native Turkish material of *R. ponticum* can behave invasively if the habitat is disturbed. Cullen (2015) was later forced to concede, therefore, that the character of vigour is useless.

(iii) Location. One cannot distinguish a taxon based on location alone, as Cullen attempted to do, basically, claiming that if it is in the British Isles, it is *superponticum*. By this logic, any pure material of *ponticum* present in Britain would have to be called *R.* x *superponticum* despite not being hybrid. Likewise if living British plants were transported to Spain, as conceptual artist Simon Starling once did (Milne, 2017), do they revert to being "*R. ponticum*" as they cross the border?

The latter two traits are doubly invalidated by Cullen's assertion that any individual with parentage from *arboreum* should be excluded from *superponticum* – not always possible via other traits, but certainly impossible from vigour or location.

To summarise so far, it is impossible to consistently distinguish "*R.* x *superponticum*" from pure material based on Cullen's description. But should the name be applied anyway based on parentage, even if it cannot consistently be identified in the field?

B: Taxonomic rules do not permit hybrid names to cover multiple combinations. A specific hybrid name is, as I understand it, supposed to cover one particular combination of species. Cullen's description covers seven possible combinations, but the name should only correctly apply to one of them.

C. The wrong species are named. As noted above (11), *R. macrophyllum* is certainly not involved, therefore only three of the seven possible combinations named by Cullen are likely to occur: *ponticum* x *catawbiense*, *ponticum* x *catawbiense* x *maximum*, and *ponticum* x *maximum*. However, *R. arboreum* and possibly other species might be involved in some individuals as well (see 3 and 7 above), so Cullen's description still manages to exclude some likely parentages, e.g. some plants might be *ponticum* x *catawbiense* x *arboreum*. Cullen (2011) does mention the presence of specimens involving *R. arboreum* but claims that most or all are planted cultivars, and specifically excludes any

individual involving *R. arboreum* (and others) from his *superponticum*. However, I have seen specimens that seem to involve *arboreum* as a parent, which are certainly part of a naturalising population. Hence by Cullen's own criteria, not all hybridised British materials belongs to *superponticum*, because one can never prove that *arboreum* is not involved; for the same reason, no single specimen can ever be assigned to it with total confidence.

Problems B and C could be laid aside if we knew for certain precisely which species were ancestors to the chosen type specimen. The name would then be applied to that specific combination.

D. We do not know the identity of the type. Quite simply, it is not possible to determine with certainty the precise parentage of any wild British *ponticum* plant, because so many species might be involved, and their influence will usually be small. Theoretically, this could be done with full genome sequencing of the type and of all candidate species, but that is an extremely expensive way of solving an unnecessary taxonomic tangle. The type is most probably *ponticum* introgressed with *catawbiense* and/or *maximum* and/or *arboreum*, giving seven possible identities even before we consider other, less likely contributors, but the point is we cannot be certain which precise combination it is.

E. Even if we did know the precise identity of *R. x superponticum*, we would not know which individuals belonged to it. If we could (say) attach the name *superponticum* to *ponticum* x *catawbiense*, we would hit the exact same problem for every other specimen we examined: is it this precise combination, or another? Morphology could exclude some specimens from the taxon, would offer no more than a best guess concerning which specimens belonged to it.

So we have a taxon that is impossible to identify consistently, and whose precise identity is unknown. If we attempt to apply the name to all British material we will misclassify some pure *ponticum* individuals as *superponticum*; conversely if we apply the name only to material in Britain with clear evidence of hybridity, then we misclassify as pure those introgressed individuals that lack an obvious morphological marker. Both approaches also attempt to classify multiple hybrid combinations under a name that should only apply to one (and we do not know which one). In short, any attempt to use this name creates taxonomic chaos, and insoluble problems for the field worker. The problems do not end here, however.

F: Using the name "*superponticum*" is creating serious misconceptions.

As this unfortunate name has crept into use, it has brought with it damaging misunderstandings about the nature of our material. As noted above Cullen repeatedly describes British material as a "hybrid swarm", when more accurately it is introgressed material of *R. ponticum*. Whether or not the term "hybrid swarm" can be technically applied to a population descended from material hybridized in cultivation is a moot point – my concern is that use of the term for British *ponticum* misleads non-specialists, and using the name "*superponticum*" likewise encourages people to treat our material as a hybrid swarm. "Hybrid swarm" generally refers to a population of fertile early generation hybrids, and suggests ongoing hybridisation. Moreover, it implies that all British material is one giant hybridising population, which it is not (see point 9 above). Furthermore, it over-emphasises the role of other species, leading some to believe that our material might be 50% *catawbiense*. We cannot expect laypersons to go and find my *Molecular Ecology* paper that shows this is not the case!

Do these misconceptions matter? Yes. Controlling an invasive plant requires that we understand it, and it needs to be understood that invasiveness is a feature of *R. ponticum*, and likely unaffected by hybridisation. Our plants might have become more cold-tolerant through introgression, but hard evidence is lacking as yet.

Damage has already been done. Based surely on the over-emphasis on hybridity, the EU has proposed legislation banning the planting not only of *R. ponticum*, but all of its hybrids (Cox, 2014). There are over 200 of these (Milne, 2017) and they include Cunningham's White, the most popular grafting stock for delicate rhododendrons. None have ever been recorded as naturalised. Banning the planting of pure or introgressed *ponticum* is sensible, but extending it to all hybrids helps no-one and harms rhododendron enthusiasts.

Conclusion.

British Isles material is best described as *R. ponticum*, some of it introgressed with DNA of *R. catawbiense* and other species. The name *R.* x *superponticum* causes confusion, misconceptions and practical headaches at multiple levels, and should be expunged from common usage. Comprehensive floras will have to mention the name, but should summarise all the problems associated with it.

One final point to make is that James Cullen was a fine taxonomist who made plentiful contributions to *Rhododendron* systematics, and science in general. One mistake, however regrettable, should not dampen our opinion of the man and the rest of his work.

Dr Richard Milne
Edinburgh University

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SCOTTISH PUFFBALLS

The collection some years ago at Carrifran of the Pedicellated Puffball, *Lycoperdon caudatum* Schroet., was a great delight and a significant find as it is a rather rare fungus in Scotland and appears in many European Red data lists. A greater treat was the finding by Peter Ashmole only months ago of *L. norvegicum* Demoulin the first UK evidence that it is here in the British Isles. It is rather interesting in the monograph on *British Puffballs, Earthstars and Stinkhorns* by Pegler, Laessoe & Spooner (1995) that they commented on the fact that *L. norvegicum* has the same kind of distribution to *L. caudatum* and should be looked out for in Scotland. *L. norvegicum* differs from the widespread Common (or Jewelled) Puffball, *L. perlatum* in that the spores are almost smooth, the ornamentations being just discernible with the low power of the microscope and the scales on the outer surface of the fruit-body (peridium) are small and leave only a slight trace of scars. The sterigmatic stalk is extremely short in this puffball in contrast to *L. caudatum* where it is so long it is a definitive character of the fungus.

Under their entry for *L. perlatum* Pers.: Pers. these same authors also say that *L. norvegicum* is similar to *L. perlatum* and should be looked out for in Scotland. The Carrifran collection was in the planted deciduous woodland but where the canopy had barely closed. The whole site had previously been a grazed hill-pasture but woodland restoration commenced there in 2000 with plants grown from seed sourced locally (*Alnus, Crateagus, Quercus, Betula* and a few *Corylus)*. The Carrifran project has a good website and I can recommend those interested to view it. The *L. caudatum* collection was found on the trackside beside the same planted woodland. Now *L., norvegicum* has been found it will possibly turn up elsewhere, especially if people look more closely at what they first consider to be *L. perlatum*. *L. norvegicum* has been found in Finland, Norway and Sweden, but nonetheless it is rare in temperate to sub-boreal regions. It has been found in dry sandy pine forests as well as pastures. Our collection would probably be referred to the latter habitat preference. *L. caudatum* appears to be a boreal continental species and know from North America as well as Denmark, Finland and Sweden. *L. norvegicum* was recognized as distinct by Vincent Demoulin the mycologist from Liege, who had previously looked at the material in the Edinburgh herbarium. Within my material he located two collections labelled *Lycoperdon molle* which in fact were *Lycoperdon turneri* Ellis & Everhart, placed by Demoulin in *Calvatia*; see below. This also is new to Britain. It is significant in that although the collections were made on the same day (8 ix 1984) and in the same general locality, 'The Cairnwell' (Aberdeenshire), the sites in fact were rather different. One collection (Wat. 17458) was from a grassy outcrop of sugar limestone, which supported a whole range of arctic-alpine vascular plants, whilst the other (Wat. 18043) was found amongst the Least Willow *Salix herbacea,* on rather more peaty soil. The Least willow is also known to be of arctic-alpine distribution in the British Isles known in addition to the sites in Scotland from mountainous regions of Wales and the Lake District. The Cairnwell locality is well-known for its outcrops of calcareous rocks imparting locally rich vegetation. The rock-outcrops are schists hidden in some areas beneath rock debris and peaty deposits, which themselves supports a typical acidic vegetation. Such areas are colonized by *Vaccinium* spp., Mountain Azalea (*Loiseleuria procumbens)* and *Salix herbacea* especially on the rather exposed areas.

L. turneri was originally described from Labrador, although it has subsequently been found in several additional sites in North America but all areas of a northern clime, invariably in open ground at relatively high

altitudes or latitudes. All habitats, which were later described as arctic-alpine by US authors. It is even known from the Falkland Islands (Watling, 2012). In Europe, it is probably better known as *C. tatrensis* Hollos, which was originally described from Czechoslovakia. It was Demoulin in fact who demonstrated that these two puffballs were conspecific and *Lycoperdon turneri* was the earliest available name. *C. turneri* is documented from Finland, Iceland, Norway & Sweden; it is extensively discussed by Morten Lange in his account of the larger fungi of Greenland (Lange, 195). The British collections follow this pattern, *viz.* closely cropped turf at 936m.

C. turneri can be identified by the relatively small fruit-bodies compared with other calvatioid members of the genus in Europe *viz*. 2-6cm with an obconic, sometimes plicate base, compared with *L. excipuliforme* (Scop.) Pers. and *L. utriforme* Bull. The exoperdiuim is granular or roughened with a brownish ornamentation composed of small spines often with connivent apices; no diaphragm is present thus resembling *L. excipuliforme*. Microscopically the capillitial threads are multiseptate, whereas those of *L. excipuliforme* and *L. utriforme* lack septa; slit-like pits are also absent unlike the last two British species. There is little difference in spores characters, although on average the size of those of *L. turneri* might be slightly larger, reaching 6µm diam. *L. turneri* is a true arctic-alpine puffball, whereas *L. excipuliforme* and *L. utriforme* may only occasionally be found in the Highlands of Scotland; they occur more frequently at lower altitudes, the former sometimes also in woodland. It should be noted the very much larger *L. utriforme* has also been found on a Cairnwell ‘green’. The other arctic species, not yet recorded from the British Isles, are *L. cretacea* Berk., with curved spines, and *L. arctica* Ferd. & Winge, with pyramidal warts, although the latter is considered by some authorities to represent a coarsely ornamented form.

For those less familiar with name changes I have used the generic name *Lycoperdon* throughout this contribution, reflecting the recent changes as a result of molecular studies. Thus both *Calvatia* & *Hankea* used previously for *L. utriforme* and *L. excipuliforme* are no longer employed.

The Borders also acts as host to another rare puffball, the Fen Bovist, *Bovista paludosa* Lev., which from its epithet one can guess that it likes wet sites. It grows at Whitmuir Moss between St Boswells and Selkirk in very boggy often flooded mossy/sedgey area. The site even

attracted the mycologists at Kew who came to collect material as it is only known from two other fenland sites, one in Norfolk and the other in Yorkshire. The latter was the first British collection dating to 1909 and based on a determination by the American gasteromycetologist C.G. Lloyd. Apparently, in some parts of Europe, it occurs with *Lycoperdon caudatum*, the puffball mentioned above. It also is a Red data list species.

Roy Watling

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CHARLES DARWIN, VICTORIAN MYTHMAKER

A review of the recent biography by A.N. WILSON,
John Murray Ltd, ISBN 978-1-444-79488-5
438pp., £25

A.N. Wilson is a competent and established biographer, and this is in many respects a well written biography. Many of the facts will be known to those who have read other biographies of Darwin, but he has come up with some facts about Darwin, his contemporaries and his antecedents that were not known to me. However, he is severely critical of Darwin on several counts.

Firstly, A.N. Wilson accuses Darwin of being excessively jealous of his reputation in posterity, as the sole author of the theory of evolution, and of refusing to acknowledge an intellectual debt to anyone, not even his grandfather Erasmus Darwin, except the father of geology, Sir Charles Lyell. Wilson particularly accuses Darwin of plagiarising Edward Blyth, a naturalist who wrote articles in *The Magazine of Natural History* between 1835 and 1837. In these articles Blyth proposed a theory of evolution by natural selection, which had striking similarities to that put forward much later in *On the Origin of Species*, and which, Wilson says, Darwin had undoubtedly read at about the time they were published.

Later, Blyth became the curator of a museum in India, and supplied Darwin with a great quantity of useful information. I believe that in the first edition of *The Origin*, Darwin thanked Blyth for this (I do not have a copy to hand), but Wilson says that Darwin never acknowledged any debt to Blyth for his theoretical ideas. In 1835-1838, Blyth was a prolific writer to The Magazine of Natural History, mainly on aspects of British ornithology. I make no comment on the extent of Darwin's debt to Blyth, but I have tried to identify the relevant articles (Wilson does not cite them), and readers who are interested may compare Blyth 1835, 1836 and 1837 with *The Origin* and decide for themselves.

Secondly, Wilson says that Darwin was rigid in his belief that evolution always progressed by small steps. This was at least in part an ideological stance, because admitting the sudden origin of new species would have let in a Creator deity in by the back door, which Darwin was loath to do. Wilson points out that the objections to his theory that worried Darwin most were scientific, not theological: even Sam Wilberforce's critique at the famous Oxford meeting was on scientific grounds, and the notorious exchange of insults between Wilberforce and Huxley was an addendum unwisely tacked on at the end of Wilberforce's address. In 2002, Donald Rumsfeld (USA secretary of defense) said, in the context of statesmanship, "as we know, there are known knowns; there are things we know we know. We also know there are known unknowns; that is to say we know there are some things we do not know. But there are also unknown unknowns – the ones we don't know we don't know. (Wikipedia accessed 3 March 2018)

In 1859, this was true in spades for the biological sciences. For Darwin, the criticism of his theory by fellow scientists transferred things from the third to the second of these categories, and he felt obliged to backtrack, so that (as Wilson gleefully notes), by the sixth edition "the theory itself was in tatters" (p.342). No wonder that the editors of modern editions of *The Origin* prefer to work from the confident first edition!

Today, our understanding of the mechanism of evolution is a combination of Darwin's theory, as modified by the theory of kin selection (inclusive fitness) etc., 'classical' genetics, and molecular genetics. This allows us to comprehend the gradual separation of species, which can allow intra-generic or even inter-generic hybrids. In the British flora we have, e.g., *Festuca pratensis* × *Lolium perenne* = ×*Festulolium loliaceum* and *Secale* ×*Triticum* = ×*Triticosecale*; *Festuca* and *Lolium*, and *Secale* and *Triticum* presumably must have fairly recent

common ancestors and have diverged by many small mutations over an extensive period of time. On the other hand, the British flora includes the famous *Spartina anglica*, which arose circa 1870 by *S. maritima* × *S. alternifolia* = *S.*×*townsendii*, + polyploidization = *S. anglica*, and *Erythranthe (Mimulus) guttata* × *E. lutea,* + polyploidization = *E. peregrine*, which many readers will remember from a recent BSS lecture. In these cases, the polyploidization event, which causes the speciation, is instantaneous, which would have mystified and appalled Darwin.

There are many indications in the text that Wilson does not understand either Darwinian or neo-Darwinian evolution, and is deeply sceptical of the theory. There are several instances of this, particularly in chapters 12 and 13. A striking example is in his discussion of Wilberforce's scientific criticism of Darwin. One of his arguments was that the descendants of domesticated animals, if they become feral, revert to their wild ancestry, so that "…the behaviour of animals under domestication disproved rather than proved the Darwinian thesis." The other was that there is no geological evidence of transitional forms. Wilson writes "As far as I know, no Darwinian has ever given a satisfactory answer to Wilberforce's two points." (p.259). On the contrary, I think that a university tutor in biology might nowadays set the rebuttal of Wilberforce as an undergraduate essay, and expect satisfactory answers. Wilson regards Darwinism as a "Grand Narrative" – "It is easy to see why, given the vacuum left behind by the apparent collapse of Christianity … the 'theories' or 'generalisations' of Marx and Darwin made their metaphysical appeal." (p.329) and "… there can be no doubt that Darwin set out to destroy 'the old argument from design in Nature'. He had thereby abandoned science *tout court* and set up his stall beside those of Herbert Spencer, Auguste Comte, Karl Marx and others – Dr Freud would not be slow to join the bazaar – of ersatz religions, theories of everything." The dispute between Richard Dawkins and his critics seems to be seen by Wilson (p. 355) as an ideological dispute, rather like that between Stalin and Trotsky, though without icepicks. In the light of this it is worth reminding ourselves why Darwinism, as modified since Darwin and combined with molecular genetics, is our best hope of understanding evolution: it provides a plausible mechanism for natural selection that is entirely compatible with the laws of chemistry and physics, and if it were to be abandoned we

would be very hard pressed to come up with an alternative that met that criterion.

Lastly, Wilson accuses Darwin as being the godfather of the excesses of eugenics, down to and including the horrors of the Third Reich. He quotes various sentences uttered by Darwin in support of this contention, then opines "… it would be harsh to lay at [Marx's] door the millions of murders perpetrated by Lenin, Trotsky, Stalin and Mao. It remains fair, however, to say that Darwin was a direct and disastrous influence, not only on Hitler, but on the whole mid-twentieth-century mindset." (p. 346). Darwin's belief that there was a hierarchy of intelligence in the 'races' of mankind, and between the classes of civilised society, is now considered abhorrent and known to be wrong, but was a commonplace among educated Victorians. Moreover, other mentors in anti-Semitism, such as Martin Luther, probably had more influence on Hitler. It is not compulsory for biologists to defend Darwin's character, any more than it is compulsory for physicists to defend the character of Isaac Newton, and Wilson produces a lot of evidence that there was an unattractive side to Darwin's, but I believe that the extract quoted above is likely pitching it a bit strong.

The defects in this book will probably irritate readers of BSS News considerably, and I cannot recommend that you spend £25 in order to be irritated.

Roger West
rogerandcarolwest@gmail.com

References

I have tried to identify all the possibly relevant articles by Blyth. They can all be read at:
https://www.biodiversitylibrary.org/item/19589#page/54/mode/1up
Here there are dialogue boxes that allow you to skip quickly from one volume to another and to any page in the selected volume.

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SOLUTION TO CODEWORD

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BSS NEWS – INFORMATION AND GUIDELINES FOR CONTRIBUTORS

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

Editors:
Receiving editor:
Dr Jill Thomson
E-mail: jill.thomson99@gmail.com (home: preferred address)
jiom@ceh.ac.uk (work: please use only if essential)
c/o Botanical Society of Scotland
Royal Botanic Gardens Edinburgh
20a Inverleith Row
Edinburgh
EH3 5LR

Coordinating Editor:
Roger West
Email: rogerandcarolwest@gmail.com

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 contributors 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 acheo-botany.

- 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, or even witty cartoons if they are your forte! A stock of small b/w line drawings of plants would be useful for filling areas of whitespace at the end of articles. Coloured illustrations can only be printed on the inside and outside cover, and usually illustrate articles.

Guidelines for contributors

Do not worry if you cannot comply with all 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. If possible, please add a contact email address (see our template on the BSS website for full instructions)

Text

The Newsletter is set up on A4 pages in MS Word 2010 using Ariel 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 in 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 the Receiving Editor at jill.thomson99@gmail.com
- 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.thomson99@gmail.com to let Jill know that something has been posted.

The last deadline for the next issue will be 15th July 2018. Earlier submission would be appreciated.

Back cover pictures

Outside

Top:

Rhododendron ponticum at Inverarie. See article by Richard Milner on p.46. Photo by Richard Milne

Bottom:

Juniperus communis infected by *Phytophthera austrocederi*. See article by Flora Donald on p.40. Photo by Flora Donald.

Inside

Burdock Mildew.
Top left: infected plant;

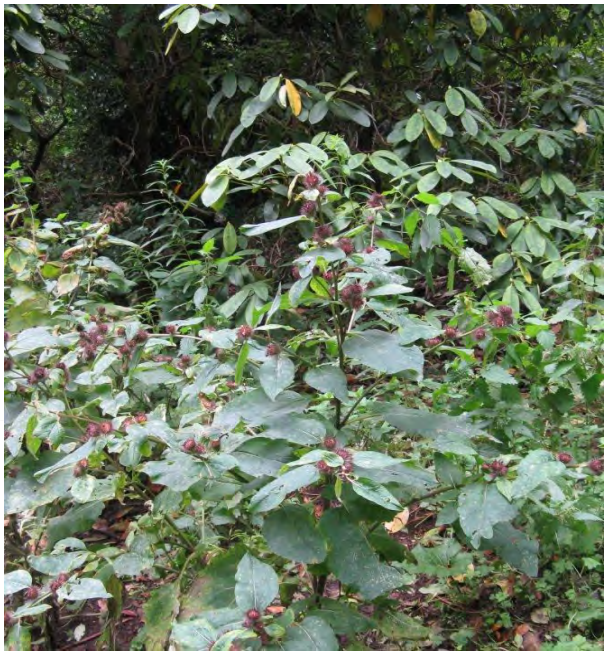
Top right: uninfected plant;

Middle left: detail of affected leaves;

Middle right: Cleistothecia of *Golovinomyces depressus*. See article by M.J. Richardson on page 46. Photos by M.J. Richardson

Bottom left: Introgressed *Rhododendron ponticum*. See article by Richard Mile on page 47. Photo by Richard Milne.

Bottom right: Lesions caused by *Phytophthera austrocederi* on *Juniperus communis*. See article by Flora Donald on page 40. Photo by Flora Donald.

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