BSS News

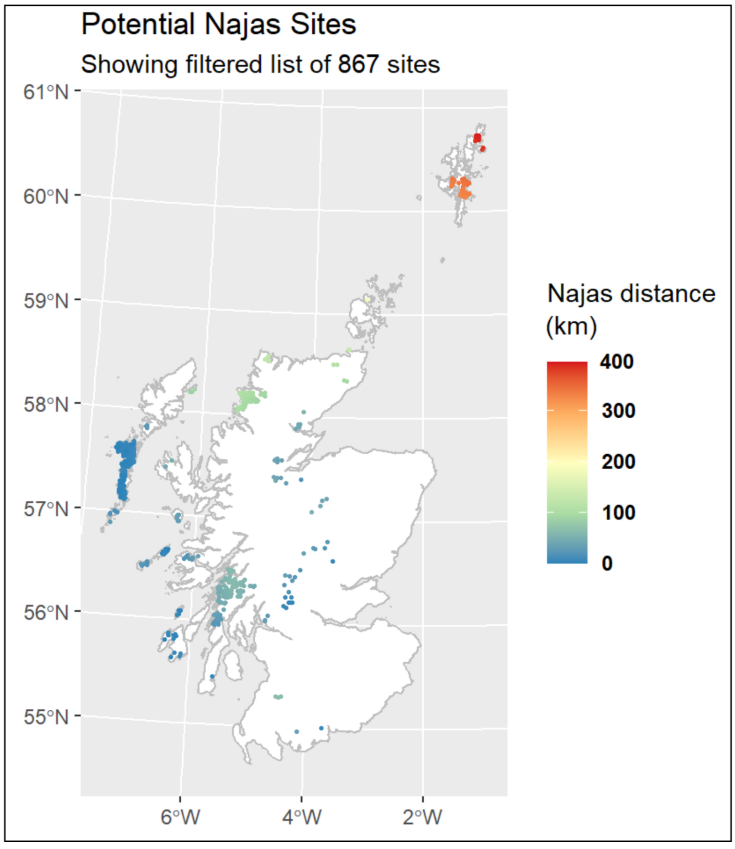
The Newsletter of the Botanical Society of Scotland

No. 117 September 2021








Potential Najas Sites
Showing filtered list of 867 sites
61°N
60°N
59°N
58°N
57°N
56°N
55°N
6°W
4°W
2°W
Najas distance (km)
400
300
200
100
0

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

Captions to front cover pictures:

Outside: Flowering shoot of the Californian Bay Laurel, *Umbellularia californica*, illustrating the article on page 35. Photograph © Peggy Edwards

Inside: **Top:** Slender Naiad, *Najas flexilis* from Tangy Loch, Argyll.

Bottom Left: Seed of Slender Naiad, *Najas flexilis* (stained red in seed viability test)

Bottom Right: Distribution of 867 potentially suitable loch sites based on environmental and plant suitability. Colour code indicates proximity to existing Slender Naiad sites.

Both photos by Kate Waters-Hart, illustrating the article on page 14.

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.

Founded in 1836 as the Botanical Society of Edinburgh, the Society became the Botanical Society of Scotland in 1991. Meetings are held in Edinburgh, Aberdeen, Dundee, Glasgow, Inverness, Perth and St. Andrews. 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. Standard members can also go online and download all the Society's journals, from papers which have just been accepted for publication in Plant Ecology & Diversity, all the way back to the first issue of Transactions of the Botanical Society of Edinburgh published in 1844 (instructions can be found on our website).

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 via the BSS website at https://www.botanical-society-scotland.org.uk/content/bss-membership.

Subscriptions due 1st October each year. Deadline to pay 31st December

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

Although Covid restrictions reduced opportunities for group fieldwork, our members have managed to get out and about and some meetings have been organised as restrictions eased. Thanks to Brian Ballinger and colleagues for organising fieldwork and reporting it in this issue. We also thank all other contributors.

Scotland will soon welcome delegates from around the World to COP-26 in Glasgow. We hope that it achieves something useful, and stimulates renewed efforts to stop climate change. There are many alarming reports of weather extremes, and current estimates for plant and animal species extinction are horrifying. We must all contribute in whichever way we can to preserving biodiversity and reducing our carbon footprint.

Meanwhile, threats to Scotland's coastal habitats have not abated, and Tom Dargie has been obliged to turn his attention once again to Coul Links to combat the new golf course planning application. Please read Tom's article on page 43, tell your friends and colleagues, and if you can, please offer your help to Tom to support the protection of this internationally important site.

We are having trouble with our Paypal account at the moment, and are currently arranging to change to a different method of on-line payment. If you normally renew online, please go to the usual place on our website and follow the instructions. Otherwise, please send your subscription by cheque to David Chamberlain as instructed in the insert accompanying this News, or consider setting up a direct debit/BO for a bank transfer. If you join by cheque or BO it would help to be registered quickly as a member if you could also contact the membership secretary so you can be manually added to members list: membership@botanical-society-scotland.org.uk

You will see a farewell note from Roger West on page 6 as this is the last issue of BSS news that Roger will help with. I am very grateful for all the time and effort he has volunteered to help produce this newsletter. I welcome Cameron Diekonigin who will be taking over from Roger starting with the next issue due in spring next year.

We also thank all members of our Council for their continuing work and accepting re-election this year. You can see our current Council members and their roles at https://www.botanical-society-

scotland.org.uk/content/bss-council-constitution. We do need more volunteers and a new incoming vice president. If you are interested in this role yourself, or have suggestions on who might be interested then please get in touch.

We would also like to extend a special thankyou to Julia Wilson for being a marvellous president of the Botanical Society, especially during this very difficult past year. Julia stepped down from president to vice president after the annual meeting this year, and Jill Thompson has taken over as president. I look forward to working with you all in the future.

Roger West and Jill Thompson

SCOTTISH BOTANISTS' CONFERENCE, 6th NOVEMBER 2021

Everyone with an interest in Scottish botany, whether member or not, is very welcome to the Scottish Botanists' Conference 2021. We will have an inspiring programme of talks and exhibits on Saturday 6th November- all online and recorded so you can view them later (or again). All you need is a broadband connection and you're there – no travelling involved!

We are delighted to announce that the full day programme, starting at 10am, features talks on the plants of two of the most important and iconic National Nature Reserves in Scotland! One on Beinn Eighe - the UK's first National Nature Reserve currently celebrating its 70th anniversary - by Ian Sargent, NatureScot Nature Reserves Manager, and another on 40 years of rare plant monitoring on Ben Lawers, by Sarah Watts, University of Stirling and former National Trust for Scotland ecologist. We will also have an interesting variety of botanical short talks.

We plan to mount a virtual exhibition but, as always, we rely on participants to generate botanical interest by volunteering to display their interesting botanical findings and posters. It is simpler to do than you might think, and we can help, so do please consider exhibiting. Participants will also be able to vote for their favourite image of the 2021 BSBI Photographic Competition. (Entries in the two categories: Native

and Alien should be emailed directly to Natalie Harmsworth (natann29@freeuk.com) by 22nd October).

Registration is essential but there is no booking fee. To register and for more information on how to submit exhibits, photos for the competition, the finalised programme and on our speakers see: https://scottishbotanistsconference.org .

The Scottish Botanists' Conference is a collaboration of the Botanical Society of Britain & Ireland, the Botanical Society of Scotland and the Royal Botanic Garden Edinburgh.

FAREWELL!

This is the last issue for which I shall be Co-ordinating Editor. Cameron Diekonigin will take over from the next issue. The task is to assemble articles, which have been sub-edited by the Receiving Editor, into one document and see it through the printers. It consists of long periods of inactivity punctuated by short episodes of panic. During my time in office the quality of articles has been consistently high, which has been very satisfying. The principal change has been the introduction of the full-colour centrefold, which started as a 'one-off' to accommodate what we thought was an exceptionally large number of pictures, and immediately became the standard. The possibility, and relative cheapness, of increasingly attractive printing has been a continuing trend in publication for many years.

I thank all contributors for their articles and pictures. I particularly wish to thank Jill Thompson and Julia Wilson, whose hawk-eyed scrutiny of drafts for publication has ensured that there have been a surprisingly small number of typos in successive issues, and Janet Dalgarno and Andy Laycock at the Edinburgh University Printers for their consistently friendly and helpful service. Finally, I wish Jill and Cameron all the best in producing many more excellent issues of BSS News.

Roger West

KEPTIE POND, ARBROATH, 18TH MAY 2021. DUNDEE NATURALISTS' SOCIETY AND BSS

A group of 14 gathered for this evening meeting at the Keptie Pond, Arbroath. This is a well-loved local park with a large pond, an island and a sloping edge to the east leading to a Victorian Water Tower. Some of the party later went up the steep steps to the tower. It was a dull evening with some light drizzle later on, but we coped reasonably well. In order to follow Covid guidelines we immediately split into two groups, one taking the clockwise route and the other the anti-clockwise alternative. Anne Reid kindly led the anticlockwise party and we did not arrange to meet at the end. As so often, some dog walkers looked on with some curiosity at our activities.

This meeting aimed to collect records for the Botanical Society of Scotland's (BSS) Urban Flora project, but also recorded information on other wildlife. Although a managed site, there are some wild areas where native species flourish. Many other species have been planted in this park; these were excluded from the BSS survey.

Putting together all of the contributions from many members of the group, we recorded 99 vascular plant species, many in flower, a good total for a managed urban site. We did not see any rarities but we recorded, for instance, three species of Buttercup (*Ranunculus repens. acris* and *bulbosus*) and five of Speedwell (*Veronica arvensis, filiformis, chamaedrys, serpyllifolia* and *hederifolia*). Primroses (*Primula vulgaris*) and Lesser Celandines (*Ficaria verna*) were still in flower. Bluebells (*Hyacinthoides*) were plentiful, but all appear to have been derived from the cultivated hybrid (*H. x massartiana*).

Most of the trees were probably planted, but some, such as Rowan *(Sorbus aucuparia*), Elder (*Sambucus nigra*) and Alder (*Alnus glutinosa*) were self-propagating. An interesting find was Spotted Deadnettle (*Lamium maculatum*), growing on a wall and undoubtedly a garden escape.

The birdlife was active and species noted included Coot, Moorhen, Tufted Duck, Willow Warbler Chiff Chaff and Jackdaw. Twenty-three bird species were recorded in total.

It was not a good evening for insect life, but one dead butterfly was on the ground, probably a Green-veined White. Jim Cook also spotted a few fungi.

Brian Ballinger
Dundee

BALGAY HILL DUNDEE 1ST JUNE 2021. DUNDEE NATURALISTS' AND BSS

This was a joint evening meeting, aiming to collect information for the Botanical Society of Scotland's Urban Flora project and also to enjoy and record the other wildlife of this city park. We were fortunate to have a sunny evening, although there was a cool breeze in the more exposed places. Fifteen people attended and we immediately split into two groups to comply with Covid regulations, observing the usual precautions. Anne Reid let the other party.

Balgay Hill is part of a large green area about a mile from the city centre, being part of an igneous intrusion into old red sandstone. It is adjacent to an old cemetery and two other parks. The hill has been a public park since 1870 and has old plantation woodland with a mixture of native and exotic trees as well as an observatory.

The parties set off up the steep slope and explored the complex network of paths on the summit and over into the cemetery. We did not do a full survey in the limited time of an evening meeting. We entered two 1km squares and collected records from both, but mainly from the western one. We recorded 98 vascular plant species in all.

Although extensive development has taken place in Balgay Hill park, some native species persist. A striking feature was the large population of *Conopodium majus* (Pignut), which was in good flower.

In the hilly part of the adjacent cemetery *Potentilla erecta* (Tormentil) was in flower, unusual for an urban site, as it is normally a heathland plant. I had seen *Galium saxatile* (Heath Bedstraw) here in the past, but it eluded me on this occasion. One wonders what this habitat must have been like before the cemetery was developed and

whether it once housed some of the rare plants to be found on the hills of Edinburgh.

Luzula campestris (Field Woodrush) was widespread in the cemetery area and this plant seems to be frequent in many Dundee cemeteries.

Allium ursinum (Ramsons Garlic) was present in the woodland area. Here the bluebells were of the hybrid variety (*Hyacinthoides x massartiana*), although one patch was pointed out to me that came near to the native *Hyacinthoide*s in appearance. An unwelcome sight was a large and apparently increasing patch of Himalayan Balsam (*Impatiens glandulifera*) by one of the paths. In the newer part of the cemetery *Amsinckia micrantha* (Fiddleneck) was in flower – this species may be increasing and I have seen it in other local cemeteries.

Nineteen bird species were recorded, some seen, others heard. These included bullfinch, goldcrest, blackcap and willow warbler, although the nuthatch recently reported from here eluded us on this occasion.

I live very near Balgay Hill, and this evening reminded me that I do not visit often enough.

Brian Ballinger
Dundee

KINROSS BSS AND PSNS, 9TH JUNE 2021, LED BY SANDY EDWARDS AND BRIAN BALLINGER

This was a joint meeting between the Botanical Society of Scotland (BSS) and the Perthshire Society of Natural Science (PSNS). It was aimed to collect data for the BSS Urban flora Project and also for the BSBI (Botanical Society of Britain and Ireland). Kinross is in Vice-County 85 (Fife) for recording purposes (Sandy is the VC recorder), although politically it is associated with Perthshire. Kinross is a small town with about 5,000 inhabitants situated on the shore of Loch Leven.

Seven of us gathered on an overcast day. There was only a little light rain later on for a short period, making me to reach for my

waterproof notebook. The Boathouse car park by Loch Leven was being resurfaced, but there was still plenty of parking.

The Loch is very interesting botanically, but on this occasion, we turned our backs on it and headed into town. In fact, the first hour was spent in the car park, which has some wild areas and was quite species rich. There were sedges, *Carex nigra* (Common Sedge) and *Carex leporina* (Oval Sedge), as well as rushes, including the increasingly common *Juncus tenuis* (Slender rush), a feature of so many tracks. Other finds in this area included *Circaea x intermedia* (Upland Enchanter's Nightshade), *Dryopteris affinis* ssp*. borreri* and the garden escape *Geranium x oxonianum* (Druce's Crane's-bill), which appears to be becoming more widespread.

Following Alistair Godfrey's advice, we headed for the southern part of the town, recording on roadsides, verges, and walls, as well as in a small park, which was only partly mown. An interesting find was *Geranium columbinum* (Long-stalked Crane's-bill), very rare in this area.

We finally reached a large patch of wasteland, a former industrial site, and this proved to be rich botanically. After a picnic lunch on the grass, we looked carefully at this area, which is next to the busy motorway. There was a large population of Northern Marsh-orchid, *Dactylorhiza purpurella* (also found at Muir of Ord, fig. 4, centrefold) and also some orchids with spotted leaves, not yet fully in flower, which may have been the hybrid, *D*. x *venusta*, between *D. purpurella* and *D. fuchsii* (Common Spotted-orchid). There were fine patches of *Cruciata laevipes* (Crosswort) and *Silene (Lychnis) flos-cuculi* (Ragged-robin, fig. 17, centrefold), as well as *Carex hirta* (Hairy Sedge).

We then walked back through the town, visiting a teashop on the way, and sitting outside on the benches for our refreshments. On this day we visited four monads (1km squares), two more thoroughly than the others. The totals for the four squares were 93,19, 39 and 89 species. There is another monad at the north end of the town that we did not have time to go to, and that must await a future visit.

Brian Ballinger
Dundee

MONIFIETH SHORE 15TH JUNE 2021 LED BY ANNE REID AND BRIAN BALLINGER DNS/BSS

This was an evening meeting held jointly by the Dundee Naturalists' Society (DNS) and the Botanical Society of Scotland (BSS). Seventeen members gathered on an overcast evening and we immediately split up into two groups in order to follow Covid regulations (in Angus the limit was 12 for an outdoor group).

The aim was to gather information for the BSS Urban Flora project and to also record and enjoy all the natural history of the area. As the tide was in, our exploration of the shore was limited. Although close to home, one of us (BB) did not know this area well. This coastal strip alongside the town is popular with holidaymakers and dog walkers.

The western party (with BB) headed into the 1 km^2 (monad) NO4932 and only just ventured beyond it. The eastern party (with AR) went into the 1 km^2 monad NO 5032, taking them out of the urban area and to the edge of the Barry Buddon Military range, where the flag was down, allowing access.

The western group started in a rather over-managed parkland area, passed the caravan site and explored the dunes. One strip has been planted with wild flowers, but we did not include these, although it was noted that Viper's Bugloss (*Echium vulgare*) had self-seeded beyond the enclosed planted area.

We had a few special species in mind and Brian and Jenny Allan led us to a small patch of the scarce Maiden Pink (*Dianthus deltoides*), tucked away in the dunes and not yet in flower – not easy to find here.

Another target was Purple Milk-vetch (*Astragalus danicus*), a Red Data Book species, but present in various places on the coast in this area. We located this in low turf where it was managing to flower in spite of rabbit grazing and grass cutting (fig. 1, centrefold).

The other special was the rare Yellow-vetch *(Vicia lutea*) and here the eastern party was rewarded, as they found it growing on the slope near the sea. (fig. 2, centrefold). This plant was considered extinct in Angus when the 1981 Angus Flora was written.

Other species noted included Horseradish *(Armoracia rusticana*) and Hoary Cress (*Lepidium draba*). An *Allium* species was present but it

was not yet in flower, so it defied precise identification. In all we recorded 99 vascular plant species, and seven seaweeds.

Seventeen bird species were seen, including Goosander, Linnet, Eider and, right at the end on the evening, an Osprey. It was not ideal weather for invertebrates, but Cinnabar and Yellow Shell moths were recorded, as well as the larvae of the 6-spotted burnet moth.

This proved to be a productive site, worthy of further visits.

Brian Ballinger
Dundee

MUIR OF ORD 24TH JUNE 2021 BSS/BSBI/IBG

This meeting was mainly devoted to the urban flora of Muir of Ord, making records for the Botanical Society of Scotland's (BSS) Urban Flora project and also for the Botanical Society of Britain & Ireland (BSBI). We were joined by members of the Inverness Botany Group (IBG).

We had had to limit numbers to 12 because of Covid restrictions and, in fact, 11 members of the various societies attended on the day. Rain had been forecast, but the day was mainly dry and the little light drizzle that did fall did not curb the enthusiasm of the botanists.

Muir of Ord has a collection of small lochans and ponds distributed through the town and we were only able to visit part of the area in the time available. It is mainly in Easter Ross (Vice-County 106) but a small part is in Easterness (VC 96).

We met in the rather obscurely signposted car park and started to examine its flora that included a large patch of *Anthyllis vulneraria* (Kidney Vetch).

The next stop was a small lochan opposite the primary school, associated with a park and community orchard. Here there was a large population of *Carex vesicaria* (Bladder Sedge), although the access to the *Carex lasiocarpa* (Slender Sedge) site was too wet to enter. A convenient table in the park area served as a lunch stop.

A short walk along the access road and urban footpaths added to our plant list, including *Crassula tillaea* (Mossy Stonecrop), tiny and reddish, now quite a frequent find in gravelly places in Easter Ross.

A parkland and grassland area to the south of the town was really out of the urban area but here we visited the population of *Cerastium arvense* (Field Mouse-ear), now so rare here, although formerly described as common (fig. 3, centrefold). It is probably under-recorded, as it is easy to overlook. There were some marshy areas dominated by rushes in the centre of the grassy areas and here there was a substantial population of *Dactylorhiza purpurella* (Northern Marsh-orchid, fig. 4, centrefold). This year seems to have been a very successful one for this species in parts of Scotland as several sites have displayed very large populations. There was also *Dactylorhiza maculata* (Heath Spotted-orchid) and some apparent hybrids. It was good to see *Veronica scutellata* (Marsh Speedwell) in a damp hollow.

We then re-entered the urban area, noting *Lepidium heterophyllum* (Smith's Pepperwort) and *Viola tricolor* (Wild Pansy) amongst other species. A teashop now summoned and we were able to sit outside to enjoy the refreshments.

Time did not allow us to go to the other lochans, so that must await another day. Our walk had taken us though two tetrads, recording 97 species in the first, and 99 in the second.

This was our fifth Easter Ross Urban flora field meeting, but more towns await our attention in the future.

Brian Ballinger and Mary Dean

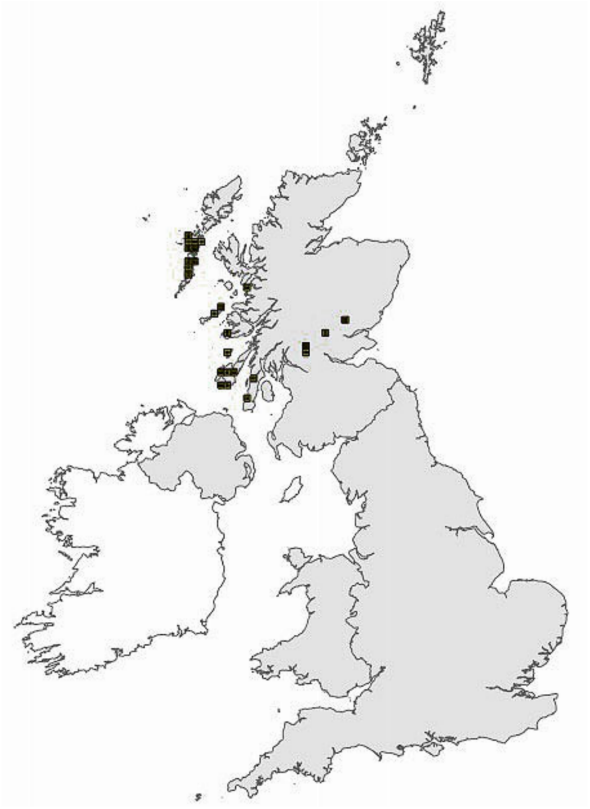
A BUMBLE BEE FORAGING GRASS

On 15th July 2021 I saw a bumble bee, Bombus sp., on an inflorescence of *Agrostis capilaris*. Its mouthparts appeared to be working at a flower, but I could not determine whether it collected anything. This has been noted before, but seems to be rare: see bsbipublicity.blogspot.com/2015/07/bees-spotted-collecting-pollen-from.html . If you have seen a bee apparently foraging on grass, please let *BSS News* know.

Roger West

REVERSING THE DECLINE OF A THREATENED AQUATIC NATIVE – THE SLENDER NAIAD!

One in three of all freshwater species in the world are threatened with extinction, with an estimated overall decline of 84% since 1970, according to the World Wide Fund for Nature's 2020 Living Planet Index. There have been few successes in halting or reversing the decline in freshwater biodiversity, but one possibility for us to actively do this in Scotland is with the threatened freshwater plant species, the Slender Naiad (*Najas flexilis* (Willd.) Rostk. & Schmidt) (top fig. on the inside front cover). The Slender Naiad is of European conservation importance, and all of its UK sites are now in Scotland, with its strongholds historically in Argyll, the Hebrides, where it is locally known as the Aibhneag in Gaelic, and in Perthshire (see map on this page). Its Scottish mainland sites, in particular, are under increasing threat, with local extinctions, primarily due to nutrient enrichment and competition from local extinctions, primarily due to nutrient enrichment and competition from invasive non-native species (Wingfield et al., 2005; Gunn and Carvalho, 2020). This aquatic plant is rare, and typically found submerged and rooted in clear-water, lowland lakes, often in water with base-rich substrates (high in calcium and magnesium). As a submerged aquatic plant, the Slender Naiad is particularly difficult to survey, as it typically, grows below 2m in clear water. The Slender Naiad is relatively short, usually only growing to about 30cm, rarely reaches the surface and is one of only about 5% of aquatic species, overall, that pollinate underwater. As an annual, abundance may vary from year to year. It is not easy to capture samples using a grapnel, the usual method of sampling submerged plants, and destructive methods are



Locations of Slender Naiad in Scotland. NB Loch Kindar in Dumfries and Galloway has been omitted.

also problematic due to its status as a European Protected Species. The recommended survey method involving diving is relatively complicated and expensive.

To help stem the decline of the Slender Naiad and hopefully, restore its populations at mainland sites, a research programme was set-up and funded by Scotland's Centre of Expertise for Waters (CREW), and carried out by the UK Centre for Ecology & Hydrology (UKCEH) in collaboration with the University of Stirling. In the first phase of this project, Gunn and Carvalho (2020) reviewed the available information and gathered expert opinion on the habitat quality requirements of the Slender Naiad.

In the second phase of the project, we used the phase one project findings to identify lochs in Scotland with suitable habitat, where the Slender Naiad is currently unrecorded, and where it could potentially be re-introduced (Taylor *et al.*, 2021). Suitable Slender Naiad sites were first identified using measured and modelled water quality data. Applying a combination of thresholds for alkalinity and phosphorus concentrations produced an initial list of 4092 potentially suitable lochs across Scotland. To produce a shorter list of sites with the most likely suitable habitat, we decided to use other plant records. Data on a set of 80 "associated" aquatic plant species that have previously been recorded at known Slender Naiad sites were first collated from loch survey data held at the Biological Records Centre. From this dataset, habitat suitability scores were generated by adopting a novel approach of calculating an "Indicator Value" score for each of the 80 species, based on their occupancy of and fidelity for sites with, and without, the Slender Naiad. Applying these indicator scores, to plant records from lochs across Scotland, produced a shorter list of 867 potentially suitable lochs (see map on inside front cover). This list was further refined through prioritisation of sites on the Scottish mainland and sites within 60 km of an existing Slender Naiad site to produce a final short-list of 156 lochs as priority sites for further conservation action. Additional criteria, such as connectivity to other lochs or absence of invasive non-native species, such as *Elodea* spp. in the area, were highlighted that could also be used to further prioritise sites in future site selection for plant introductions. Of the top 20 ranked sites from the short-list of 156 lochs, the majority occur in Argyll, Dumfries, Galloway, and Stirlingshire, all close to known existing Slender Naiad sites. This shortlist of prioritised

loch sites are strong candidates for either the introduction or re-introduction of the Slender Naiad.

The next stage in the Slender Naiad recovery story we hope will be field surveys to check whether the most suitable lochs identified, as described above, hold previously undiscovered Slender Naiad populations. As well as plant surveys, this could involve the sampling of loch sediments to check if Slender Naiad seeds are present (illustrated at the bottom of the inside front cover). More novel survey methods, such as eDNA techniques, may also be an option to detect the presence of Slender Naiad populations in these sites.

If such loch site surveys do not find evidence of the presence of the Slender Naiad, the next potential opportunity is for Slender Naiad seeds to be translocated to the highest priority sites, as part of a species introduction programme. This possible conservation option has arisen as an unexpected bonus from Kate Waters-Hart's PhD research in which Kate collected Slender Naiad plant fragments from Tangy Loch in Argyll in 2018 (Waters-Hart, 2020). Kate was able to propagate Slender Naiad plants from these collected plant fragments in sediment and water collected from Loch Leven in the greenhouses at UKCEH Edinburgh. Since then, this stock population of Slender Naiad has continued to germinate new plants from seeds formed in situ (see inside front cover). This is the first time, as far as we are aware, that the Slender Naiad has been grown ex-situ, despite a number of previous attempts. Consequently, a follow-up project was set-up last year, with funding from NatureScot, to expand the Slender Naiad population being cultivated in the UKCEH greenhouses. If the up-scaled propagation of the Slender Naiad is successful, then it offers the real potential to translocate Slender Naiad plants into new loch sites identified in the site prioritisation exercise. The successful propagation and translocation of Slender Naiad plants could directly help redress the contraction in the species' range on mainland Scotland, and help Scotland contribute to reversing the decline in freshwater biodiversity that we see globally.

Iain Gunn, Phil Taylor and Laurence Carvalho
(UK Centre for Ecology & Hydrology, Edinburgh)
Nigel Willby (University of Stirling), Ewan Lawrie (NatureScot

The Slender Naiad Habitat Quality Assessment report, led by Phillip Taylor, has just been published online by CREW:

Taylor, P., Carvalho, L., Gunn, I.D.M. and Willby, N.J. (2021) Slender Naiad *(Najas flexilis)* Habitat Quality Assessment – Site Prioritisation. CRW2018_27. Scotland's Centre of Expertise for Waters (CREW). https://www.crew.ac.uk/publication/slender-naiad-najas-flexilis-habitat-site-prioritisation

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Codeword 6

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 cryptogams). 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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THE FOLIAGE FRATERNITY, A LOCAL BOTANY GROUP IN THE LOTHIANS AND FIFE

After a hiatus due to covid restrictions, Lothians/Fife local botany group "The Foliage Fraternity" is back in action.

This is a group that supports anyone keen on plants to develop in their learning, especially in the stages between absolute beginner and intermediate botanist, but also providing practice for those who are already pretty sharp to become ace. This involves some time to sit down and key things out; a pace that allows note-taking and photography; trips focusing on particular groups of plants; training days to acquire new skills; friends that you can ask about anything you do not know; and help with biological recording for keen plant-spotters who do not yet submit records of their sightings to any recording scheme. On the more beginner days, we may not go much further than 100m but recording trips are usually a little bit faster-paced.

I try to complement the groups and societies already offering botanical excursions by adding events to the calendar that (as far as possible) do not conflict and by feeding the confidence and enthusiasm of beginners to join in with these and other organisations. I like to encourage students early in their botanical careers so students at all levels and all institutions are very welcome. We tend to go out a couple of times a month from June to August with occasional winter and spring meetings as well.

We are connected to the Botanical Society of Britain and Ireland (BSBI) in that I am BSBI Vice-County Recorder for West Lothian and plant records made on our excursions will be submitted to the BSBI database; however, we are very much not restricted either to BSBI or to West Lothian. We go out in West Fife, where I live, and in Midlothian where many of us live and/or work. We also contribute records to the BSS Urban Flora project.

Email me with any questions about the group or if you would like to join us. I would love to hear from those with knowledge to impart as well as from beginners/improvers keen to learn. I use the website/app Spond for organising events so if you ask to join the group or join the mailing list for events, I will send details about this.

On 25th June 2021, five of us (plus my wee toddler on my back) spent a morning in Dunfermline recording for the BSS Urban Flora project. We made 185 records of 146 taxa, all vascular plants except for one lichen and one liverwort, reflecting our main area of expertise. Most of our records were from a single, fairly ordinary, residential street: we looped round a few short streets and surveyed the other side of the street, adding eight species that we had not seen on the other side of the road, pleased that pavement edges had not (yet) been weeded or sprayed along most of our short walk.

Interesting finds included pirri-pirri-bur (*Acaena novae-zelandiae*) in a pavement crack (only the third record from Fife). This, sometimes invasive, alien was first introduced as a wool contaminant (unsurprising when you look at the barbed spines on the fruits) but also escapes from gardens by seed and rhizome and can establish itself from discarded garden waste. We found dwarf mallow (*Malva neglecta*) and wood small-reed (*Calamagrostis epigejos*) as garden weeds and both cultivated oat (*Avena sativa*) and wheat (*Triticum aestivum*) in the pavement despite being about 2km from arable fields.

We also found some time to practice finding glumes and counting florets as an aid to grass identification and pointed out the distinctions between common genera such as *Lolium* (rye grass), *Elymus* (=*Elytrigia*) (couch) and *Poa* (meadow-grasses). A brisk walk through Rex Park on the way back added lots of records to our list and there are probably more here to find. While hurrying back to the train station at the end, we spotted Italian toadflax (*Cymbalaria pallida*) in a mortared wall – the fourth record for Fife. This species may be more widespread but overlooked, assumed to be the more common *C. muralis*. *C. pallida* has larger flowers, which made us notice it, and is shortly hairy, in contrast to glabrous *C. muralis*.

These and all of our records are uploaded to iRecord in the BSS Urban Flora project where all those registered for the Urban Flora project can browse them.

Jay Mackinnon

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"MOLLY HAS HAIRY KNEES" AND OTHER CURIOUS WAYS TO REMEMBER PLANTS

For the beginner, whether on a university course, training day or group excursion, learning botanical identification can sometimes feel like an overwhelming challenge. So many characteristics to remember and each must be linked to the correct scientific and/or common name! In teaching botany, we strive to impart the most knowledge possible during our always-too-short time together in the field. Learning to key out an unfamiliar specimen is crucial, of course, but we also want to remember many plants without looking them up (again!) and for our trainees to do the same.

We find that beginner botanists respond well to off-the-wall word play: rhymes, alliteration and jokes associating some characteristic of a plant with its name. The slightly rude ones seem to be the most memorable! It injects a bit of extra fun into the learning process - surely a good way of attracting and retaining new botanists of all ages - and provides a little step up to help learners remember a little bit more of what they were shown on that field trip, or means that one only has to key out *Veronica persica* six times instead of seven and more.

We plan to build a resource of these *aide-mémoires* and make it available to learners and teachers. Do you have any silly or fun ways of remembering a specific plant, recognising a member of a plant group or telling the difference between similar species? For example, the classic:

'grasses are round and sedges have edges'

Or for species another oft-repeated:

'Molly has hairy knees' to distinguish *Holcus lanatus* (Yorkshire fog) and *H. mollis* (Creeping soft grass). *H. lanatus* wears striped pyjamas, because of the pink stripes on the basal leaf sheath and is hairy all over, while ***H. mollis*** has a bare stem with hairy nodes, hence **Molly** has hairy knees.

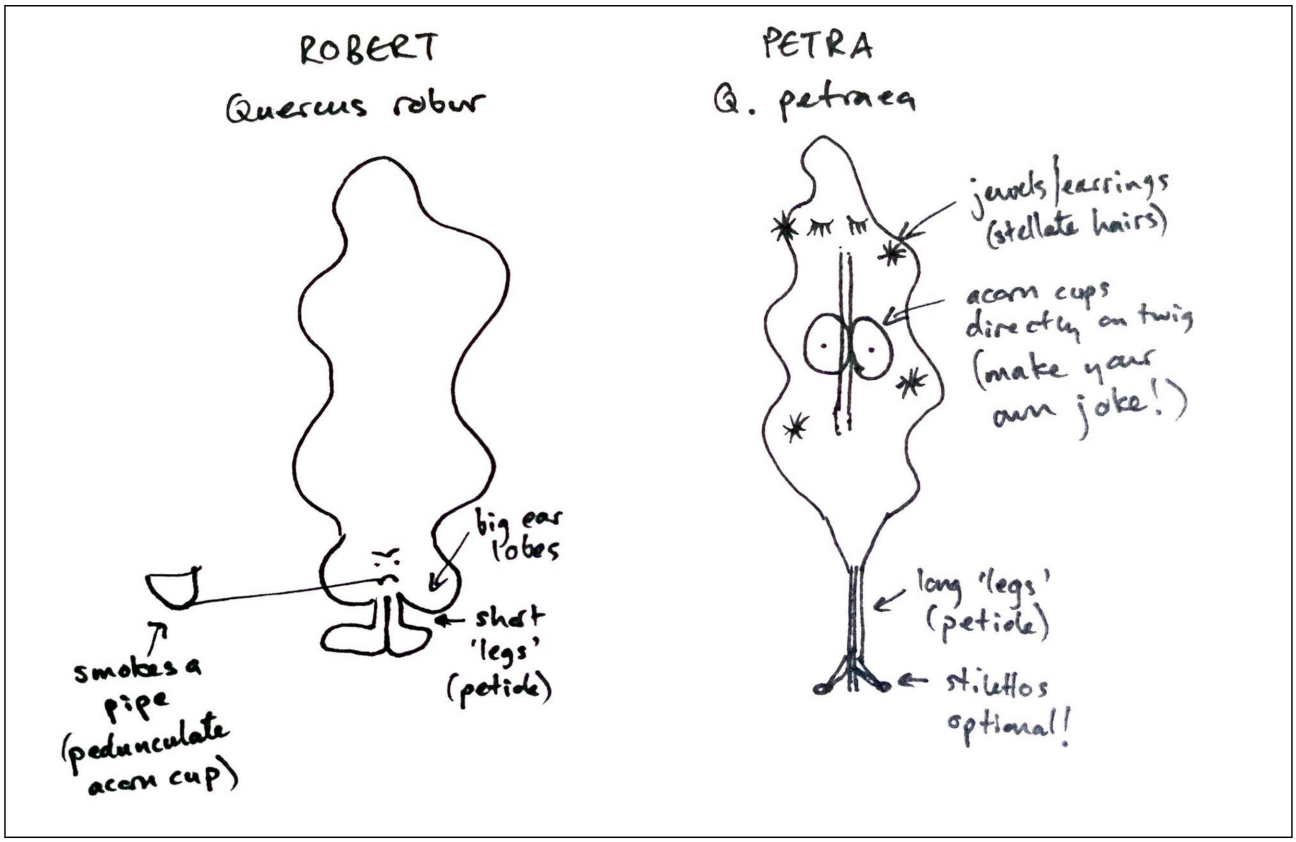
Less famous but equally useful:

> *Dryopteris filix-mas* (Male fern) looks superficially similar to *Athyrium filix-femina* (Lady fern) but by describing the male fern's circular sori as being like 'balls', while lady fern's sori are curvy, identification is easier. Furthermore, lady fern edges are dissected and 'frilly' while male fern pinnules are nearly entire. Hence, male ferns have balls and lady ferns are frilly.

Widening the topic to mosses and telling apart common species of *Rhytidiadelphus*:

> ***R. loreus*** has the leaves curved upwards on one side and downwards on the other. To us this translates as '**Laura** has a comb over'.

Sketches are even better, since looking at the characteristics of plants lends itself to visual memory: see this diagram by J.M. As you can see, minimal or no artistic ability is required!



We have made up many of these over the years, but many others must have done likewise so if you have any aids that help you remember plants and would like to share them, please email them (sketches can be photographed and emailed as image files) to Kathy Velander or Jay Mackinnon (email addresses below) or post to Jay Mackinnon. Include your full name and the source of the meme (if known, and not made up by yourself) so we know who to attribute this to in every reproduction of the resource. We plan a poster for the Scottish Botanists' Conference in November 2021 and, longer-term, an online resource. Contributions for the poster will need to be received before 15 Oct 2021, to be Included.

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(Jay Mackinnon, 47 Spinnaker Way, Dalgety Bay, KY11 9GH)

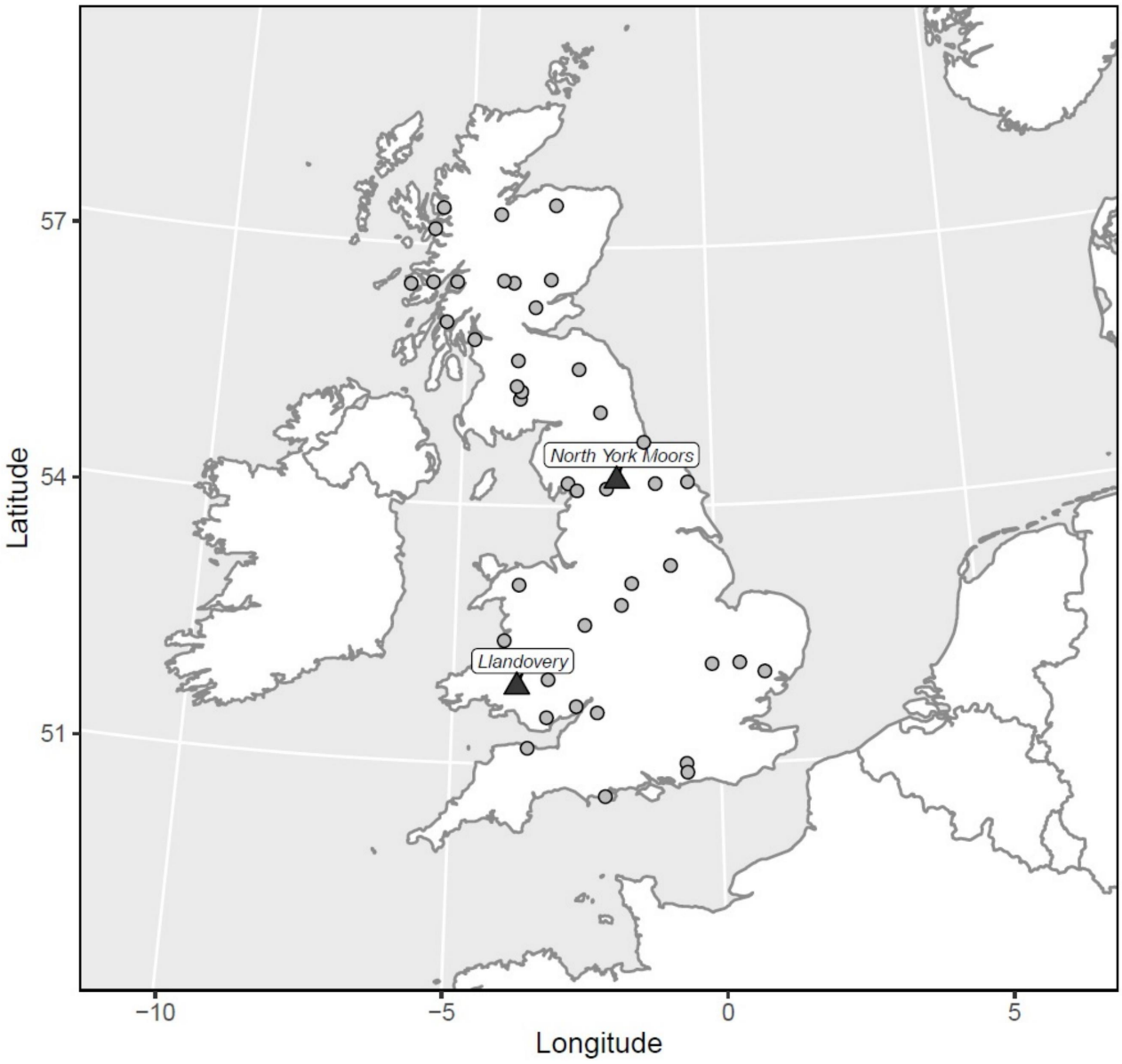
GENETIC DIVERSITY AND PLASTICITY FOR LEAF PHENOLOGY IN BRITISH ASH POPULATIONS

Study found a latitudinal pattern in adaptive traits (leaf phenology, growth and stem form) in British ash populations.

Common ash (*Fraxinus* excelsior L.) has been in the public eye for nearly a decade, when ash dieback was first found in Great Britain (GB). Before ash dieback became widespread, we studied natural populations of British ash in two field experiments. The findings of this study (recently published in Rosique-Esplugas *et al*., 2021) gave us some understanding of the existing genetic diversity in British ash and its potential for plasticity and adaptability.

Methodology: Seeds were collected in natural stands of ash distributed evenly across GB, in total 42 different ash populations, see the map on the next page. In 2007, 1-year-old seedlings were planted in two replicated common garden experiments. These were located in two climatically contrasting sites; one experiment was in South Wales (Llandovery) and the other in the North of England (North York Moors). There were about 100 trees for each ash population in each experiment. The design of the experiments allowed us to compare the ash populations growing together in the same location, and also to compare each particular ash population growing in two different locations. The phenotype of a tree corresponds to its physical qualities, and it is a product of the interaction of its genotype (genetic material) and the environment where the tree grows.

In each experiment the ash populations were grown under the same environmental conditions, and as the environment was a constant, the differences observed among ash populations were due to genetic differences. We also compared each ash population growing in the two experiments, as the genotype was a constant between the two experiments, the differences observed were due to the environment. These variations in phenotype due to environment are known as phenotypic plasticity.



The trees in the experiments were measured before they became naturally infected with ash dieback. We measured the following traits (phenotype) in the trees at both experimental sites: height, stem diameter, stem form (number of forks in the main stem), and spring and autumn leaf phenology (time when leaves flushed, and time when leaves change colour and fell).

Results and discussion: We found significant differences among the ash populations for all traits, and these differences followed a latitudinal pattern. The northern populations were shorter, had a smaller diameter, were less forked and had a shorter growing season (their

leaves flushed later and fell earlier) than the southern populations. All of these differences among the populations were found in both experimental sites, except for stem forking, where differences among populations were only found in the North York Moors

We also found phenotypic plasticity when comparing the populations across the two experimental sites. All populations grew more (height and diameter) in the southern site. For leaf phenology the results were particularly interesting, there was very little plasticity for leaf flushing, but greater plasticity for timing of leaf fall. Despite the difference in climatic conditions, the timing on leaf flushing was very similar between both sites for all populations. On the other hand, the ash populations in the northern site lost their leaves earlier than when growing in the southern site, up to 22 days difference.

This could mean that ash timing of leaf flush in the spring is determined strongly genetically, does not change much by annual climate variation, while autumn leaf phenology varies more according to the climatic conditions. An explanation could be that ash has become more conservative to avoid spring frosts, which can be more damaging for tree survival than autumn frosts.

The predicted warming of the climate in Britain could result in the lengthening of the annual growth period for trees, as the warmer temperatures would potentially trigger earlier leaf flushing and later leaf senescence. However, the risk of exposure to late spring frost or early autumn frosts might remain the same, as current data shows for mainland Europe (Vitasse *et al.*, 2018). This risk is greater for ash, than other tree species, as it is not frost tolerant (Thomas, 2016), being one of the trees in GB to flush later in spring. Ash trees have a terminal bud above a pair of lateral buds so that loss of the terminal bud inevitably results in forking (fig. 21, outside back cover), poor form and ultimately a reduction in survival (Kerr, 1995). The ash populations differed significantly in amount of forking when grown in the northern site (North York Moors), showing that the southern populations, which flushed earlier, had higher stem forking. We found a significant positive correlation between tree height, early flushing and higher stem forking incidence. This shows the trade-offs between maximum exploitation of the growing season (long period in leaf leading to greater annual growth rates, but greater incidence of damage) and conservative growth

(shorter period in leaf, lower growth rates, but less frequent frost damage).

The future of ash across Europe is uncertain due to the devastating effects of ash dieback. It has been proposed (Landolt *et al.*, 2016, among others) that early leaf senescence may be linked to resilience to ash dieback due to shortening the window in which infection can take hold and invade stem tissues. We found consistent earlier leaf senescence in northern populations when planted at the southern experimental site. In ash dieback mass screening trials in East Anglia (Stocks *et al.*, 2017) ash trees from Central Scotland showed lower ash dieback susceptibility scores.

On a hopeful note, the clear geographical pattern of genetic variation we found in British ash suggests that the species has responded efficiently to natural selection. Ash is considered to have become common in GB after 5000 years BP (Rackham, 2006). Genetic variation, coupled with the species' capability for plastic responses, offers some hope for the long-term persistence of ash in the landscape.

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CAPTIONS TO CENTREFOLD PICTURES, pp 31 - 34

1 *Astragalus danicus* at Monifieth (article page 11). Photo © Brian Ballinger.

2 *Vicia lutea* at Monifieth (article page 11). Photo © Anne Reid.

3 *Cerastium arvense* at Muir of Ord (article page 12). Photo © Brian Ballinger.

4 *Dactylorhiza purpurella* at Muir of Ord (article page 12). Photo © Brian Ballinger.

5 *Silene flos-cuculi*, Ragged-robin, photographed at a botanically-rich abandoned industrial site at Kinross (article page 9). Photo © Brian Ballinger.

Figures 6 to 18 are all © Peggy Edwards, illustrating her article on p.35. Plants collected by Scottish Botanists, or named after them.

6 *Berberis aquifolium* Oregon Grape, collected by both Archibald Menzies and Lewis & Clark in the Pacific Northwest, brought into general cultivation by David Douglas. (photo Santa Cruz County, California)

7 *Cornus nuttallii* - Pacific Dogwood, introduced by Archibald Menzies. (photo Tuolumne County, California)

8 *Erythranthe (Mimulus*) *cardinalis*, Scarlet Monkeyflower, specimens and seeds sent to Hooker in 1831. (photo Tuolumne County, Sierra Nevada, California)

9 *Iris douglasiana*, Douglas iris, introduced to Britain by David Douglas. (photo S.F.B. Morse Botanical Reserve, Pebble Beach, California)

10 *Rhododendron occidentale*, Western azalea, discovered and described by Archibald Menzies, seed sent to Veitch Nursery, England in 1850 by William Lobb. (photo Fort Clatsop, Astoria, Oregon)

11 *Ramalina menziesii*, Lace Lichen. California state lichen, named after Archibald Menzies. (photo Randall Morgan Sandhills Preserve, Scotts Valley, California)

12 *Sambucus nigra* ssp. *caerulea* (*S. mexicana*), blue elderberry, first collected by Thomas Nuttall (photo Santa Cruz Mountains, California)

13 *Ribes menziesii* Canyon Gooseberry fruit, named after Archibald Menzies. (photo Scotts Valley, California)

14 *Linum lewisii*, Prairie flax, collected by David Douglas and named for Meriwether Lewis of the Lewis & Clark Expedition. (photo Mono Lake, Sierra Nevada, California)

15 Female cone of Monterey pine, *Pinus radiata.*

16 *Pinus lambertina,* Sugar pine, observed by Douglas in the southern Oregon in 1826 and in the Santa Lucia Mountains in 1832. (photo Tuolumne County, Sierra Nevada, California)

17 *Sequoia sempervirens*, Coast redwood, named Taxodium sempervirens, by David Don; holotype collected by Archibald Menzies along the San Lorenzo River in 1794. (photo Henry Cowell Redwoods State Park, California)

18 Shoots and female cones of *Pseudotsuga menziesii*.

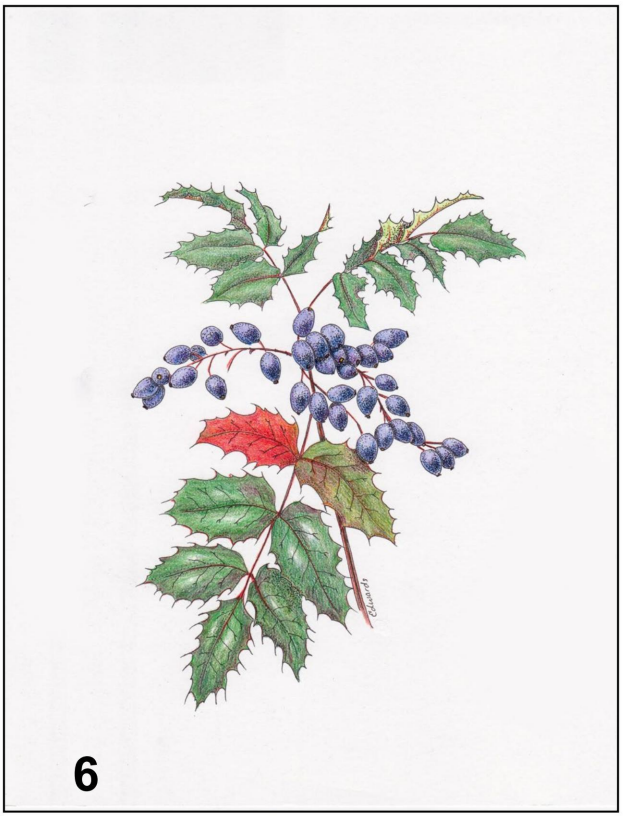

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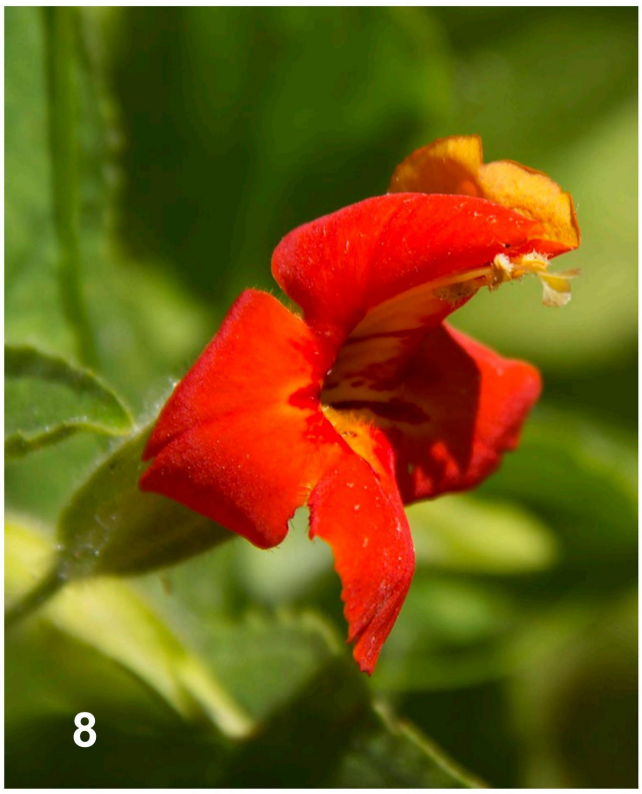

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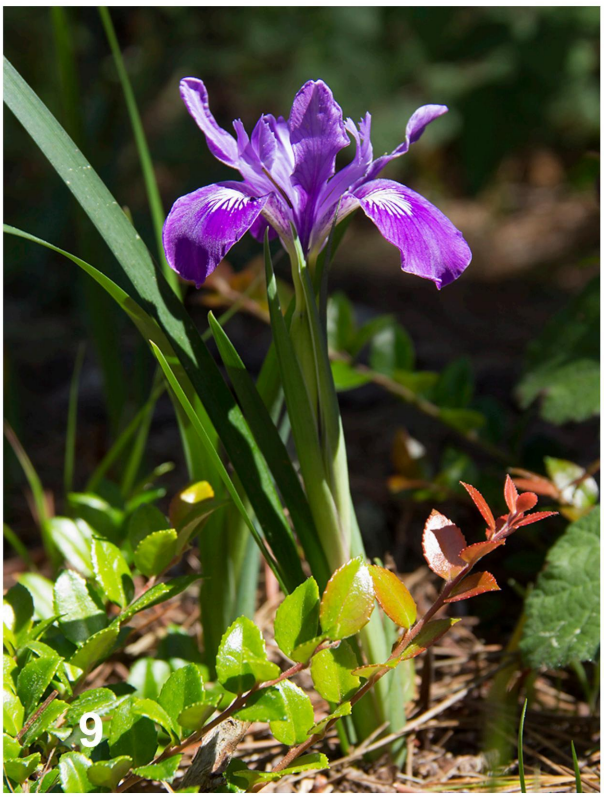

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DISCOVERIES OF THE SCOTTISH PLANT HUNTERS IN CALIFORNIA AND THE PACIFIC NORTHWEST

When I was a young teenager developing a passion for plants, my grandfather gave me his well-worn copy of George B. Sudworth's *Forest Trees of the Pacific Slope*[1]. First published by the US Department of Agriculture in 1908, this book contained detailed information as well as beautiful pen and ink drawings of many of the trees that surrounded me in the Santa Cruz Mountains of California; trees with names such as Douglas fir, *Pseudotsuga menziesii,* (fig. 18 centrefold, and drawing page 37) and Pacific madrone, *Arbutus menziesii;* names that kept appearing a few years later in my botany classes at the University of California, Berkeley; *Menziesia menziesii, douglasii* (now *Rhododendron*), *Douglasia*[2] *coulteri*, *scouleri,* and *jeffreyi*. Photographs and drawings, by Peggy Edwards, of the many species collected by early Scottish botanists, or named after them, illustrating this article, appear in the centrefold. It was not until I had worked in the field that I began to learn about and appreciate the lives and adventures of the British explorer/botanists who gave their names to these species and who first discovered and collected the plants of California and the Pacific Northwest.

Early Expeditions[3]

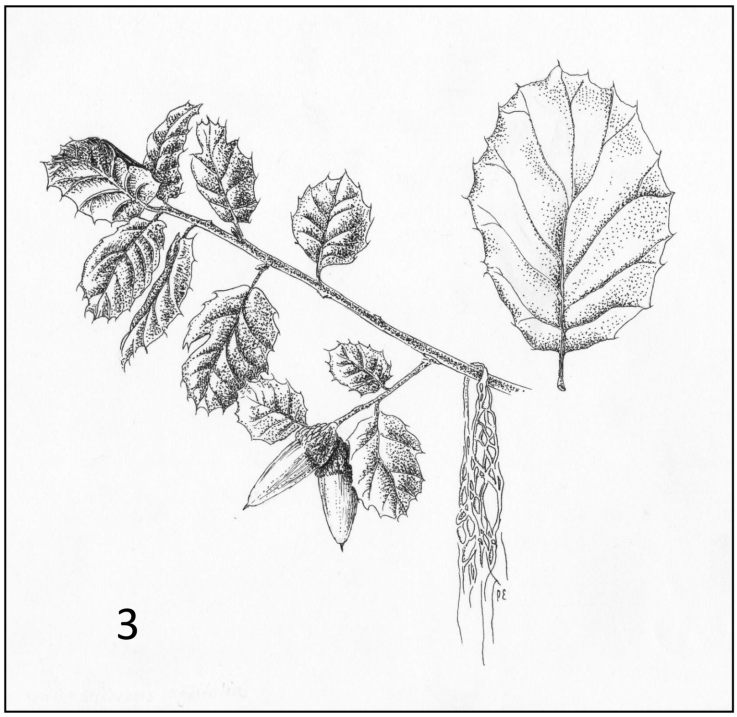
The first seeds to leave California to be planted in Europe were those of the sand verbena, *Abronia umbellata,* collected by the French gardener-botanist, Nicolas Collignon, who sailed to the Pacific coast with the French La Perouse Expedition. The verbena seeds were sent to the Jardin des Plantes in Paris and later described by Lamarck. Collignon also sent a pinecone to the Jardin from which twelve Monterey pines, *Pinus californica*, were grown. The expedition's ship was last heard from at Botany Bay, Australia, although relicts from the voyage were later found on one of the small islands of New Hebrides. Thomas Coulter, of Coulter pine fame, gave the Monterey pine the name we use today, *Pinus radiata* (page 36 and fig. 15 centrefold). *Pinus lambertina* is illustrated in fig. 16, centrefold.

In 1791 the Malaspina Expedition explored the Pacific coast where botanists Thaddeus Haenke and Luis Nee collected the seeds of the

coast redwood, *Sequoia sempervirens* (page 36 and fig. 17 centrefold), which may have been the source of the first coast redwoods





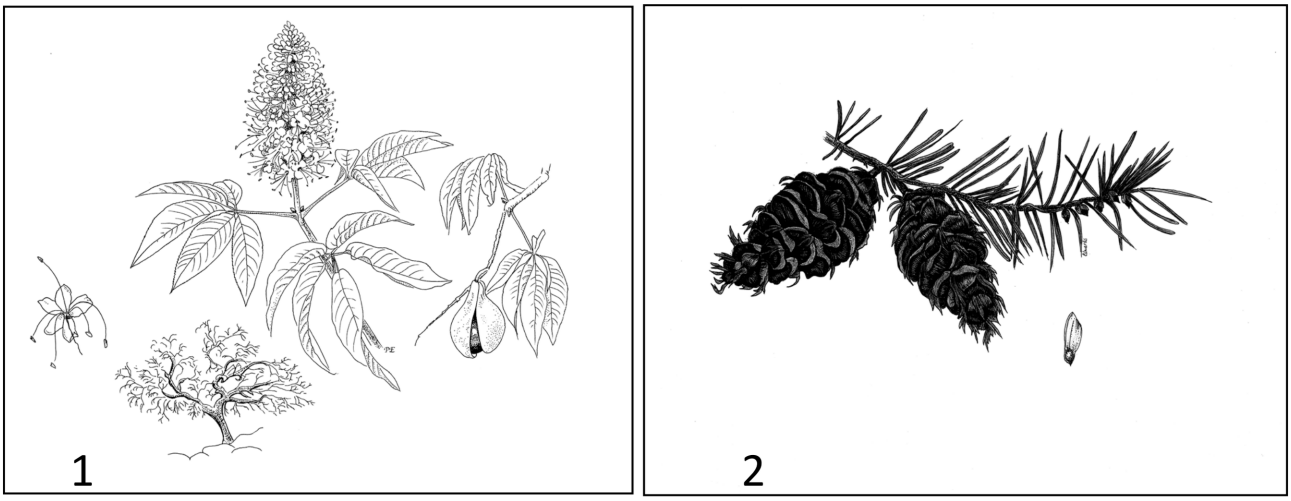




Drawings of (1) *Pinus radiata*, female cone, (2) *Sequoia sempervirens*, shoot with female cone, (3) *Quercus agrifolia*, shoot with fruit, (4) *Scrophularia californica*, flowering shoot. Drawings by and © Peggy Edwards.

planted in Europe at the Palacio de Generalife, Granada; and at the Casitadel Príncipe in San Lorenzo de El Escorial, Spain. Haenke also collected seeds of California fuchsia, *Epilobium californicum* (previously known as *Zauschneria californica*); and Nee bestowed names on the coast live oak, *Quercus agrifolia,* and the Valley Oak, *Quercus lobate* (currently *Quercus lobata).*

In 1815 the scientists, Adelbert von Chamisso and Johann Friedrich Eschscholtz under Captain Otto von Kotzebue of the Kotzebue Expedition collected plants mostly in the San Francisco area. Some of the plants named by or for them include the California poppy, *Eschscholtzia californica*, the state flower of California; California coffeeberry, *Rhamnus californica* (now *Frangula californica*); blue witch, *Solanum umbelliferum;* and the California bee plant, *Scrophularia californica.*



Drawings of (1) *Aesculus californica*, (2) *Pseudotsuga menziesii*, shoot with female cones. Drawings by and © Peggy Edwards.

Archibald Menzies and the Vancouver Expeditions

One of the earliest explorers to bring plants from the Pacific Coast of North America to the notice of the British Empire, was the Scottish surgeon and botanist, Archibald Menzies. A Scot born in Easter Styx, Perthshire and a graduate of the University of Edinburgh, Menzies joined Captain George Vancouver's *HMS Discovery* Expedition (1790-1795) sailing to the Pacific Coast and landing in San Francisco Bay in November of 1792. Although this was not the most ideal time of year to botanise in California's Mediterranean climate, Menzies was at least

able to record the conifers he found, including Douglas Fir, *Pseudotsuga menziesii* (drawing page 37 and fig. 18 centrefold).

While in California, Menzies became the first botanist to record the Pacific madrone, *Arbutus menziesii.* He sent seeds of the coastal bushlupin, *Lupinus arboreus,* back to England; documented the Monterey cypress, *Cupressus macrocarpa*; toyon or Christmas berry, *Heteromeles arbutifolia* and California buckeye, *Aesculus californica*; and was the first person to gather coast redwood, *Sequoia sempervirens,* specimens including the holotype now housed in the Natural History Museum in London (see BSS News No. 115 *Archibald Menzies' Holotype*). According to Alice Eastwood author of '*Early Botanical Explorers on the Pacific Coast and the Trees They Found There'*, "Menzies' specimens were not always named at once, and many species first collected by him were named from collections made later by others. Indeed, some of Menzies' specimens today are in the Herbarium of the British Museum still unnamed." Interestingly, because Frederick Pursh in his '*Flora Americae'* (1814) focused more on the findings of Lewis and Clark's 1804-1806 expedition than those of Menzies, the two later explorers were credited with the discovery of some species that Menzies had in fact discovered nearly 10 years earlier. While in the west, Menzies discovered 390 new plant species including 326 varieties of flowering plants; 24 varieties of mosses; 18 varieties of lichens; and 22 varieties of marine algae.

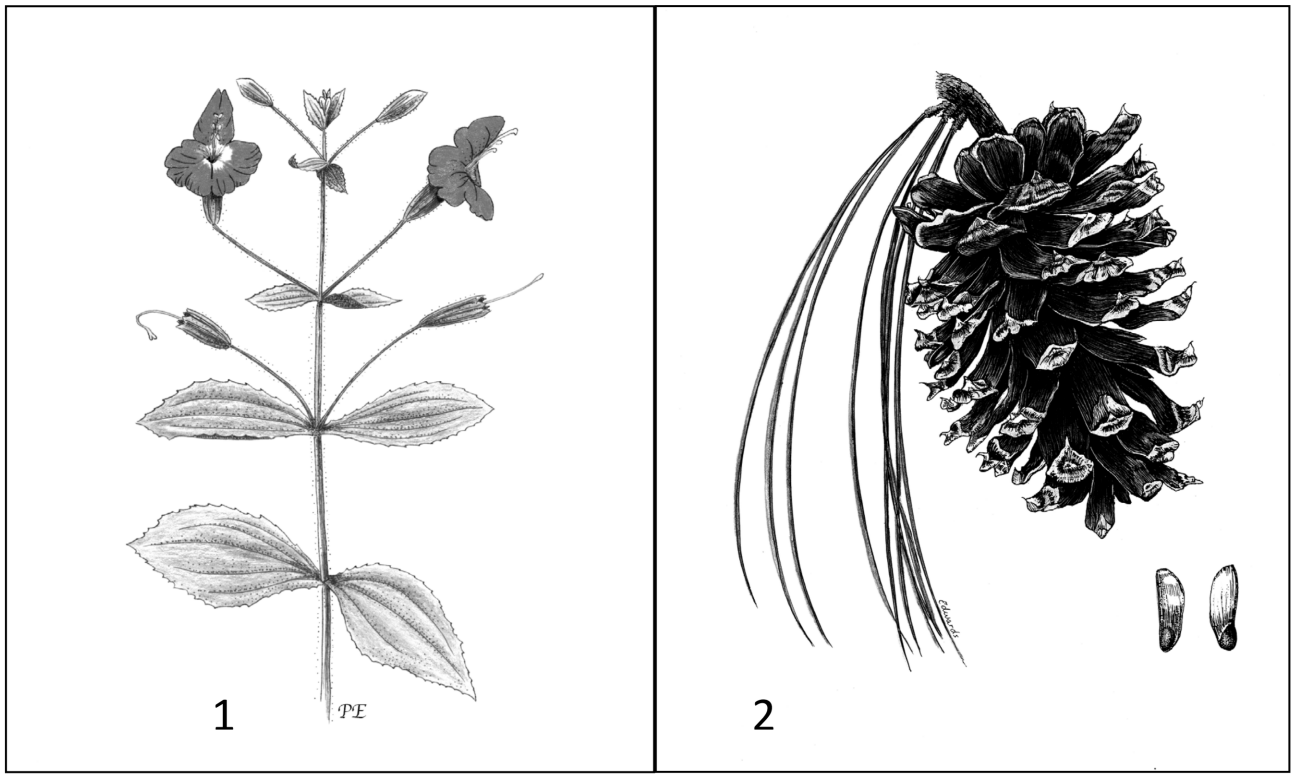
When the Vancouver Expedition overwintered in Hawaii in 1794, Menzies became the first Scottish botanist to climb the volcano, Mauna Loa. Forty years later David Douglas became the second. Douglas learned that the Hawaiians remembered Menzies as the "red-faced man who cut off the limbs of men and gathered grass."[4]

David Douglas "*undaunted courage*"[5]

A few years after the Kotzebue Expedition David Douglas, born in Scone, Perthshire, met Sir William J. Hooker, Professor of Botany at Glasgow University while working at the Botanic Garden in Glasgow. After Douglas accompanied Hooker on a botanical excursion to the Scottish Highlands, Hooker became so impressed with Douglas that he recommended him to the London Horticultural Society to send on an expedition in search of new plants for the gardens of Great Britain.

Consequently, in 1824 and again in 1829 Douglas travelled to the Columbia River of the Pacific Northwest. In 1830, Douglas made a journey south to Monterey, remaining in California until August 1832. While in California Douglas created what have been called the “most important collections on the Pacific Coast.”[6] *Pinus lambertina,* observed by Douglas. is illustrated in fig. 16, centrefold.

While enduring innumerable hardships during his explorations - sickness, foul weather, and lack of food - Douglas still managed to build his collections while striving to keep his seed and specimens from spoiling. In 1826, he wrote about his encounter with a few local Native Americans while attempting to collect cones of the sugar pine, *Pinus lambertiana*. “They were all painted with red earth, armed with bows, arrows, spears of bone, and flint knives, and seemed to me anything but friendly. I endeavoured to explain to them what I wanted and they seemed satisfied and sat down to smoke, but had no sooner done so than I perceived one string his bow and another sharpen his flint knife



Drawings of (1) *Erythranthe cardinalis*, (2) *Pinus ponderosa*, shoot with female cones. Drawings by and © Peggy Edwards.

…". "To save myself I could not do by flight, and without any hesitation I went backwards six paces and cocked my gun, and then pulled from my belt one of my pistols, which I held in my left hand"[7]. Fortunately, the encounter ended peacefully with Douglas trading tobacco for three of the long cones.

In 1827 Douglas met Thomas Drummond who had been with Sir John Franklin's Arctic expedition. Drummond looked after a box of Douglas' herbarium specimens for a time and in October of that year they returned to England together where Douglas was made a fellow of the Geological and Zoological Societies of London. After presenting his detailed journals he went north to Scotland where he planted Douglas-fir seeds on the grounds of Scone Palace where the Scone Douglas fir can be seen to this day.

Douglas' second voyage has been said to rank "among the great botanical explorations of a heroic generation."[8] During this expedition, Douglas spent eighteen months in California from December of 1830 through mid-August 1833. There he collected over 500 species, sixty of them new to science, eighty eventually containing the specific epithet, *douglasii,* and many among those he sent back to Britain where they became popular garden herbs, trees, and shrubs. In Monterey, it took several weeks for him to be able to obtain permission from the newly independent Mexican government to explore the region. He found and described Monterey pine, *Pinus radiata* and Monterey cypress, *Hesperocyparis macrocarpa*, but it was in the Santa Cruz Mountains that Douglas first encountered the coast redwood, which he called "the great beauty of California vegatation."[9]

One of the most stunning flowers collected by Douglas was *Erythranthe (Mimulus) cardinalis*, scarlet monkeyflower, which would become a favourite of British gardeners. Douglas gathered specimens and seeds of this species. writing in a letter to Sir William Jackson Hooker on 23rd November 1831, "To *Mimulus* I have added several, among them the magnificent *M. cardinalis*."[10] Hooker noted in Curtis's Botanical Magazine that "Of the several species of *Mimulus* discovered by Mr. Douglas on the fertile shores of N. W. America, this was among the last, as it certainly is the most beautiful, of the whole."[11]

Douglas's collections also included the Pacific yew, *Taxus brevifolia*; mountain juniper, *Juniperus occidentalis*; beach pine, *Pinus*

contorta; western white pine, *Pinus monticola*; ponderosa pine, *Pinus ponderosa*; gray pine, *Pinus sabiniana*; Monterey Pine, *Pinus radiata*; blue oak, *Quercus douglasii*; tanbark oak, *Notholithocarpus densiflorus*; and a maple called boxelder, *Acer negundo*.

Other Explorers

Other Scottish naturalist/surgeons who visited California were Alexander Collie from Insch, Aberdeenshire, aboard the HMS Blossom (1825-28); Thomas Edmonston from Shetland, aboard the HMS Herald (1845-46); John Scouler a Glaswegian and colleague of David Douglas, who travelled west on a Hudson Bay Company ship; and John Jeffrey from Forneth, Perthshire, who travelled from Scotland to British Columbia and then south to San Francisco for the Scottish Oregon expedition. John Jeffrey collected plants such as the California pitcher plant, *Darlingtonia californica*; California milkwort, *Polygala californica*; *Chamaecyparis lawsoniana*; and, of course, the Jeffrey pine, *Pinus jeffreyi.* He was also the first botanist to discover the foxtail pine, *Pinus balfouriana*; Port Orford cedar.[12]

Two more British botanists certainly worthy of mention are Thomas Coulter and Thomas Nuttall. Thomas Coulter from Dundalk, County Louth, Ireland, met David Douglas in Monterey, California in 1831 and explored with him until Douglas left for Hawaii, where Douglas was to meet his untimely death in 1834. Coulter's California collections included Santa Lucia fir, *Abies bracteata;* Coulter or bigcone pine, *Pinus coulteri*; and bishop pine, *Pinus muricata.*

Thomas Nuttall came to the United States in 1808 from Yorkshire, England, arriving in California in 1836 and collecting in Monterey, Santa Barbara and San Diego. His California collections included the California sycamore*, Platanus racemosa;* blue elderberry, *Sambucus nigra ssp. cerulea* (fig. 12, centrefold); and California buckeye, *Aesculus californica (*initially collected by Paolo Emilio Botta).

These are just a few of the intrepid plant hunters who sailed to California and the Pacific Northwest, explorers who sometimes paid a high price for their successes. In 1834 David Douglas fell into a pit trap in Hawaii where he was mauled to death by a bull; Thomas Edmondston was killed in 1846 along the coast of South America by an accidentally discharged gun; and John Jeffrey vanished somewhere in the Colorado Desert in 1854.

Yet despite the hardships they encountered many of these explorers were able to amass extensive collections of specimens and seeds sending them home to further the cause of science and enrich British and European gardens.

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LINKS GOLF IS NOW THE MAIN DIRECT HUMAN PRESSURE ON SCOTLAND'S COAST

Things have moved quickly on since my article in BSS News March 2021. Coul Links remains a major news issue and a scramble for new golf development and extensions within coastal sites is underway elsewhere in Scotland, at a time when national policy is emphasising biodiversity restoration and carbon emissions reduction.

Another golf planning application is now certain at Coul Links. Looking back, local golf support for a ‘world-class championship’ course retrenched and planned ahead shortly after planning permission was refused in February 2020, aided by lockdowns and people’s attention being diverted by the pandemic. That support has not accepted the government decision and has reorganised effectively.

I have pieced together the following timeline using Freedom of Information releases, newspaper articles and local events. The first move by golf support in April 2020 was to lambast the opposition as having nothing new to contribute whilst the local economy was misrepresented as struggling desperately. Later, a local councillor, involved as a co-developer in 2017, made a planning scoping request after engaging the 2017 development consultants (Sports Turf Research Institute, STRI) to design an additional 14-hole par 3 pitch and putt course close to Embo village. That was submitted for scoping along with the 2017 Championship course, as a ‘new’ proposal. At the same time STRI approached NatureScot and asked if it could grant permission for some trials on habitat translocation. Nothing appeared to come from the request but The Highland Council stated that no new application for golf would be considered until two years had elapsed since last refusal. February 2022 therefore looks like the start of a new formal struggle via the planning system.

A local pro-golf ‘community’ group was formally incorporated as Communities for Coul (C4C) in January 2021 and quickly developed a professional website and presence on social media. The directors are a mix of local luxury golf accommodation owners, the Brora golf club president and leading lights in Embo and Golspie. Their aim is stated as making a new planning application for a world-class course, which would then be constructed by a golf developer, with C4C being responsible for

management of the land beyond the golf footprint (i.e., the Coul sector of Loch Fleet SSSI). A drip feed of weekly newspaper articles then followed, which covered redevelopment of local hotels. The 2017 billionaire golf resort tycoon Mike Keiser re-emerged as the developer who would fund golf course construction, the Coul landowner announced he was leasing land to C4C for habitat management, followed by his own plans for a luxury ecolodge hotel located outside, but overlooking the SSSI. The hotel planning application was made two weeks ago (21/02644/FUL on the Highland ePlanning portal). The documents include a statement that the hotel and its potential for local jobs and a supply chain would not be developed unless permission was granted for the championship golf course.

The C4C group then set about winning a local mandate to construct an 'environmentally sensitive world-class golf course' at Coul Links. Four 'Townhall' Zoom meetings were scheduled for local communities to be told about the benefits from golf and hotel development at Coul, as well as the opportunity to ask questions. All sessions ended early, stating there were no more questions when in fact some opposition queries were not posed. A ballot requiring Yes or No to golf at Coul was then distributed to people on the electoral roll in only three local postcodes, each with a large and vibrant golf course. It came with a paper that only listed the job and economic benefits of development, with no information on the environmental reasons for planning refusal in 2020. Households in those postcodes also received a four-page free newspaper on benefits, which was full of misinformation. In short, the whole process was biased and large parts of the local area to supposedly receive economic benefits did not receive ballot papers and were thus disenfranchised.

The ballot (electoral roll 4812) had a 44% turnout, with 69% of votes (1479) cast as Yes. This result has been taken by C4C as sufficient community backing to prepare a planning application for a golf course at Coul. The golf course opposition view is that the ballot result has no standing in law and is no more than a very controlled and partial opinion poll. Some recipients were so angered by the biased ballot questions and process that they declined to vote. 70% of the carefully restricted electoral roll either voted No (658) or did not return a ballot.

An independent account of this struggle at the local level has been maintained since 2016 (https://www.coullinksgolf.com) and it has more detail than my account above. There is also commentary on a local Facebook group (https://www.facebook.com/groups/266150027087512). Apart from a few letters in the local newspaper, opposing views have otherwise been suppressed by simply making little reference to opponents by name, plus no mention of the protections applying to Coul or the environmental issues that were settled by the 2019 Coul Inquiry. None of my own letters to the local newspaper since 2020 have been published.

The effort to take more dune habitats in Scotland for golf now seems relentless and is being presented as beneficial to the environment – just small amounts of land will be taken in return for sympathetic management beyond the golf lawns. Further afield, more land is wanted for golf at Machrihanish within an SSSI on a site where earlier negotiations with SNH were protracted before being allowed to establish only small tees and greens, managing machair fairways using only mowing. The golf club at Southerness on the Solway Firth is seeking to construct tees and a fairway within protected (Special Area of Conservation, SAC) grey dune and dune heath.

Local to me, a new ‘world-class Championship’ course named ‘Culzean Dunes’ is now proposed on unprotected climbing dunes at Nigg in Ross-shire. The area had a golf course, which fell into disuse in the 1960s. It has completed scoping (21/01767/SCOP on the Highland ePlanning portal). That application is being handled by the same planning consultancy as the refused 2017 Coul development (STRI) and the course design submitted is a type favoured by the tycoon Mike Keiser, so there is speculation that Nigg will be the first step in achieving a Keiser multi-place golf resort in the Moray Firth, with Coul as step number two. The Nigg scoping documents show that STRI is doing the work back to front: the ecological surveys were completed in 2020 using the same consultancy as at Coul in 2016 to 2019, well before receiving scoping advice on what had to be collected from statutory agencies (SEPA, NatureScot).

Looking back at the de-notification of the Foveran Links SSSI following golf development at Menie from 2009, it is now clear that the golf developer there put tremendous effort via lawyers attempting to

refute the case made by SNH/NatureScot (https://theferret.scot/trump-lawyers-flood-of-complaints-to-stop-golf-course-losing-conservation-status). Hundreds of emails were sent and several failed high-level complaints were made in an attempt to retain SSSI status and the illusion that golf can only be good for the natural environment. The time and resources taken up by NatureScot on this single site and single issue reflects the importance of the matter to a principled statutory agency.

BSS personnel continue to help gathering evidence against golf development at Coul Links. Can I ask now for BSS indirect help? The environmental case was won overwhelmingly at the 2019 Coul Inquiry and needs only some extra targeted work. However, opposition to a second planning application will need to confront new cases on job numbers, economics, golf course design, sustainable development and alternative proposals. Expertise on these fields is not available locally and BSS members might have contacts who would be willing to offer their time in a professional capacity. If so, please get in touch.

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A QUICK LOOK AT *Welwitschia mirabilis* Hook.f.

The extant Gnetopsida (sometimes called Gnetales) comprise three genera, Ephedra, Gnetum and Welwitschia. *Welwitschia mirabilis* is the only species in the Welwitschia genus. Its current taxonomic status is the same as Hooker's original designation: it even has its own family, Welwitschiaceae, in which some extinct species have also been placed. Bornman et al. 1972 provide a description of the plant, and see also KWCSPF.

The history of Gnetopsida goes back a long way: they are the survivors of a lineage that goes back to the Permian, Triassic, or possibly Jurassic age (299-200(-145) Mya) (Bowe et al. 2000; Rydin et

al. 2006). Although they are undoubtedly all related, their taxonomic relationships are unclear, but it is fairly certain that *Welwitschia* and *Gnetum* are more closely related to each other, than either is to *Ephedra* (Crane et al. 2004; Bowe et al. 2000; Gugerli et al. 2001; Rai et al. 2008; Ickert-Bond et al. 2009; Judd et al. 2008; Ickert-Bond & Renner, 2015; Mundry & Stützel, 2004). *Welwitschia* is tetraploid (Khoshoo, 1959, Khoshoo & Ahuja, 1962, 1963). *Welwitschia mirabilis* is sometimes referred to as a 'living fossil', though its evolution is relatively recent.

Welwitschia mirabilis is endemic to the Kaokoveld Desert (van Wyk & Smith, 2001), which lies within the Namib Desert (Spriggs). The population is distributed southwards from the Bentiaba River in southern Angola, to the Kuiseb River in Namibia (Kers, 1967), and up to 100 km inland of the coast (Bornman, 1978). The area is extremely arid: the coast is recorded as having almost zero rainfall, while less than 100 mm of rain falls annually below the escarpment in the wet season from February to April (van Wyk & Smith 2001). Populations tend to occur in ephemeral water courses, indicating a dependence on ground water in addition to precipitation from fog (Henchel & Seely 2000): the root system facilitates this. *Welwitschia* is very well adapted to this habitat, but the large area of the amphistomatic leaves, and the lack of dense hairs around their stomata, are in sharp contrast to the adaptations of most xerophytic angiosperms.

After germination, the seedling produces two cotyledons that grow to 25–35 mm in length, and have reticulate venation (Singh, 2006). Two permanent foliage leaves, decussate to the cotyledons, are produced at the edge of a woody bilobed crown, whereupon the terminal apex aborts, but a peripheral meristem ensures that the diameter of the stem increases but its height does not. The permanent leaves last for the lifetime of the plant (Gifford & Foster, 1959), which can be up to 1000 or even 2000 years (Bornman, 1978). These leaves grow from a basal meristem, like the leaves of many British grasses, which causes them to be parallel-veined and ribbon-shaped.

Welwitschia has been classified as a CAM (crassulacean acid metabolism) plant after reconciliation of some initially contradictory and confusing data (Eller et al. 1983; von Willert et al. 2005). There are, however, some very puzzling aspects to the matter; for example, the employment of the CAM metabolism is very slight, which was part of the

reason that it took so long to establish its presence; it is not understood why this should be.

Reproduction:
Fertilization is often by wind (Kubitzki, 1990; Bolinder et al., 2015), but also by insects including flies, true bugs and, infrequently, wasps and bees. Flies and beetles feed on the pollination droplets of *Welwitschia* (Pearson, 1907; Wetschnig, 1997; Wetschnig & Depisch, 1999). The most common of the true bugs attending *Welwitschia* is a member of the family Pyrrhocoridae, *Probergrothius angolensis*, but a hypothesized role in pollination has, so far, not been demonstrated. At least some of the pollinators are attracted by "nectar" produced on both male and female strobili (Wetschnig & Depisch 1999). Further fieldwork on the pollination of *Welwitsc*hia is desirable.

The female cones of *Welwitschia* are composed of 90–100 ovuliferous units (Endress, 1996). A bract subtends each reproductive unit, and the integument is extended into a micropylar tube surpassing the bract (Carafa et al., 1992; Endress, 1996). Pollination drops (droplets of water that draw pollen grains into the micropyle) are secreted at the tip of the micropylar tube. The female gametophyte has tubular extensions (prothallial tubes) that grow through the nucellus to meet with downward growing pollen tubes (Friedman, 2015); and its megagametophytes lack archegonia (Carmichael & Friedman, 1995; Friedman, 2015). Unlike Gnetum and Ephedra (and angiosperms) there is no second fertilization (Friedman, 2015). The female gametophyte has tubular extensions (prothallial tubes) that grow through the nucellus to meet downward growing pollen tubes (Friedman, 2015), but lack archegonia (Carmichael & Friedman, 1995; Friedman, 2015).

Welwitschia is an exception to the general ‘rule’ that dioecious gymnosperms have fleshy ‘fruits’; its seeds have wings that develop from the bracts, but due to their considerable weight they seldom become airborne (Bornman, 1978), and are dispersed by animals.

The staminate strobili consist of two axillary reproductive units that are fused into a tubular sporangiophore bearing six synangia (each composed of three microsporangia) and a centrally located sterile ovule (Mundry & Stützel, 2004). It seems that the presence of sterile ovules in the male cones is linked to pollinator nectar rewards, and insect pollination may be the ancestral condition in the Gnetales (Jörgensen &

Rydin, 2015; Rydin & Bolinder, 2015; Bolinder et al., 2016). Based on morphological differences in the male strobili and its allopatric distribution, Leuenberger 2001 recognized two subspecies within *W. mirabilis*: subsp. *namibiana* from Namibia and the typical subsp. *mirabilis* from Angola.

The reproductive biology of *Welwitschia mirabilis* differs from that of Ephedra and Gnetum in the following respects: it lacks a second fertilization event (Friedman, 2015); the female gametophyte has tubular extensions (prothallial tubes) that grow through the nucellus to meet with downward growing pollen tubes (Friedman, 2015); and the megagametophytes lack archegonia (Carmichael & Friedman, 1995; Friedman, 2015).

Conservation etc:

The population of *Welwitschia mirabilis* in the wild is reasonably satisfactory at present. Plants in Angola are better protected than those in Namibia, because of the relatively high concentration of land mines in Angola, which keep collectors away (RBGK). Although *Welwitschia mirabilis* is not at present immediately threatened, there being abundant populations over a large area, its status is far from secure; its recruitment and growth rates are low, and its range, though wide, covers only a single compact, ecologically limited and vulnerable area. The remarkable longevity of *Welwitschia* favours its survival through temporary periods adverse to reproduction, but it offers no protection against circumstances of direct threat, such as overgrazing and disease. Fungal infection of female cones by *Aspergillus niger* severely reduces seed viability (Cooper-Driver et al. 2000), reducing already inherently low recruitment. Other threats include injury from off-road vehicles, collection of wild plants and overgrazing by zebras, rhinos, and domestic animals. It has no commercial value except as a botanical and horticultural curiosity. *Welwitschia mirabilis* is depicted in the national coat of arms of Namibia.

Roger West

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URBAN FLORA NEWSLETTER August 2021

Four seasons of Dundee in bloom – Brian Ballinger reports on Dundee.
I have now completed my July visits to 20 locations in Dundee, including cemeteries (five), nature reserves (five) and parks (ten), noting all plant species in flower.

In July the average was 40.7 species per site, the averages being cemeteries (37.6), Nature Reserves (44.2) and Parks (40.6). The overall averages for the other seasons had been February 2.1 species, April 8.2 and November 10.5.

Stannergate and the Riverside Nature Park tied for top place at 57 species each, with the Western Cemetery close behind at 56.

In July the top species were Ryegrass (*Lolium perenne*), White Clover (*Trifolium repens*) and Creeping Buttercup (*Ranunculus repens*) with a grand total of 163 species altogether.

I have reported some interesting finds before, including Meadow Saxifrage (*Saxifraga granulata*) in two cemeteries and orchids in several places. It was interesting to see some heathland plants such as Tormentil (*Potentilla erecta*) and Heath Bedstraw (Galium saxatile) in several places in Balgay cemetery, making me wonder what this site might have been like before development.

Evening visit to Dalkeith, incl. Ironmills Park, 16th June 2021
We met at 7 pm in Morrison's Car Park and, observing Covid Level 2 social distancing, our small group walked the short distance to the North Wynd, OS Grid ref. NT 329 673. It is a lane with a few offshoots and two car parks, occupied by light industry, a Chapel and some residential housing. We wandered about, not just on the Wynd itself, but also delving into its offshoots. The area has some old walls and at its lower car park it borders on gardens. We found 71 species, most of them being familiar ruderal members of the urban flora. There were four Asplenium ferns on the tall wall at the east end of the Wynd*: A. adiantum-nigrum, A. ruta-muraria, A. scolopendrium* and *A. trichomanes*, accompanied by stray members of the wayside flora and of course the Butterfly Bush (*Buddleja davidii*) and the occasional Wall Lettuce (*Mycelis muralis*). Next to someone's door was a fine specimen of Great Mullein (*Verbascum thapsus,* see back cover), in full flower. It was clear to us that the Dalkeith Council's herbicide man had not been

around for some time. Where the car park abuts garden, we found escaped *Antirrhinum majus* and the boundary hedge had honeysuckle, snowberry, hawthorn and bittersweet. We found *Veronica hederifolia* as well as the ever-present *V. arvensis*.

We moved to Ironmills Park. Access from the Cemetery via a footpath is no longer possible (despite the prominent sign-post) as the bridge is closed, and so we drove all the way down Ironmills Road. The Park itself is large, mostly closely mown grass but with several uncut patches. The original mill-buildings have been converted to residential housing. We parked under the majestic old pine trees and explored the river's edge. Bordering the grassland, we came across *Lamium album*, *Lapsana communis*, *Alliaria petiolata* and many tree species. In damp shade we found *Carex pendula*, *Luzula sylvatica*, *Allium ursinum*, *Heracleum mantegazzianum, Petasites hybridus*, *Impatiens glandulifera*, and quite a lot of Leopard's-bane (*Doronicum pardalianches*). There was a tall horsetail, which was later identified as *Equisetum telmateia*. Purple toothwort (*Lathraea clandestine*) was also present, in full flower. In a partially-shaded area we found the stately Pyrenean Valerian (*Valeriana pyrenaica*), a species which is becoming well-established in Scotland but is rare in England. By the weir, against the wall was Fringe-cups (*Tellima grandiflora*). In the grassland there was much *Stellaria graminea*, some of it confusing us as it was infected by a smut fungus and we thought it was a different species. We also found Field Scabious (*Knautia arvensis*), just coming into flower in the long grass.

In the midst of plant-hunting we stopped to admire the view of the Dalkeith Water-tower (built in 1879, no longer used as a water-tower). The low sun picked out and burnished the old brickwork.

Our powers of observation were waning by 9.30 pm, and the midges were biting. Although there was still plenty of light and other areas of the park to visit, we decided to go home. In the park we had found 90 species, some of them not previously recorded here. Altogether, we made 162 records and found 134 species.

Report on the Urban Flora Blog Site

The blog site is in its second year. We have blogged over 100 times and Plant of the Week has continued every week since May 2020. The site is viewed by many people and the audience is global. But who are

all these people? We only know those few who leave comments, and usually only by their nom de plume. Many of them are not botanists at all – they are people who just like pictures of plants. If you have not looked at the blogs, please do so. As I write this, 'Plant of the Week' is *Daucus carota* subspecies *carota, sativus* and *gummifer*. Only 24 hours after its launch, we have had 62 'views'. Also, a comment from someone who has found the rare subsp. *gummifer* near Port Seton. You can access all Plants of the Week, and view useful information for beginners by clicking the 'LEARN' tab. Here is the address of the blog site: https://botsocscot.wordpress.com/

Edinburgh Streets – John Grace's hypothesis about Multiple Deprivation

Last year I walked the length of over 50 Edinburgh Streets recording the species within 1 metre of the pavement. I tried to control my sampling to capture different types of housing i.e., Georgian, Victorian, tenements, post-WW2. This year I am trying strictly controlled sampling by using the Scottish Index of Multiple Deprivation. It is an Index that stratifies the whole of Scotland into data zones. In the last two weeks I have sampled those with residents of low income, fewer resources/opportunities. I am going to contrast the floristics of these streets with those from middle-class and highly privileged areas. Early signs are that deprived areas are also deprived of species. This is a testable hypothesis. They lack many of the common alien species that adorn middle class areas, although there are occasional surprises (last week I found what I think is *Lactuca serriola*, rather rare in Edinburgh although abundant in Glasgow). The species that are absent or rare in these deprived area streets include *Mycelis muralis*, *Cymbalaria muralis*, *Campanula portenschlagiana* and *C. poscharskyana*, all abundant in streets elsewhere. I do have some thoughts about the reasons for this difference – perhaps I will write more in the next Newsletter.

Some Joint Field Meetings 2021: Brian Ballinger writes:

I have been involved in organising five joint mainly urban field meetings this year. There have been three evening meetings with the Dundee Naturalists' Society, and all-day ones with the Perthshire Society of Natural Science and the Botanical Society of Britain and Ireland. We visited Keptie Pond Arbroath on 18th May, Balgay Hill Dundee on 3rd

June, Kinross on 9th June, Monifieth on 17th June and Muir of Ord on the 24th June.

The average attendance was 12, ranging from 7 to 17, dividing into smaller groups when necessary to comply with Covid regulations.

In Arbroath we recorded 99 species, at Balgay Hill 98 and in Kinross 93 and 89 in the two main squares visited. The Monifieth total was 99 and at Muir of Ord the totals in the two squares were 97 and 99 – the 100 total always seemed to elude us.

There were some interesting finds including *Dianthus deltoides* (Maiden Pink) and *Vicia lutea* (Yellow Vetch) at Monifieth. *Geranium columbinum* (Long-stalked Cranes-bill) was a very good discovery at Kinross. On the Muir of Ord day, *Cerastium arvense* (Field Mouse-ear), so easy to miss, was located.

Meeting reports are in this issue, on pages 7 - 12.

Data stored on iRecord

As most of you know, our data sets have been entered on the website iRecord, where they are completely safe and we can download data whenever we wish. Now there are 55,678 records (with many others still in recorders' notebooks I suspect) and it is time to have a look at what we have found. As a 'taster' you may be interested in seeing the 'top 50' i.e. the ones most often seen. My download this morning reveals the ranking (see the table below). Daisy comes top. "Not surprising", I hear you say. That is true, but in my browsing of older lists I find that recorders of yesteryear did not write down the common species. For example, some lists do not show the daisy. Any attempts by researchers to detect change over many years are frustrated if recorders only bother to record the plants that interest them, or the rarer ones.

For most of the 2043 species in the data set there is also information on habitat, abundance and location, and so we will be able to determine habitat preferences and frequency across the country. We can also use the data bases PLANTATT and BRYOATT to identify the known attributes of most of the vascular plants and bryophytes in our lists.

You may be interested in which species are the rarest. Some 638 species have been recorded only once, but the true picture is not as

simple as it seems. A few people have recorded subspecies and microspecies, and that swells the list. The list also contains bryophytes (5,706 records), fungi and lichens, which have not been recorded as intensively as the vascular plants (47,111 records).

When we find species that are completely unusual, we notify the appropriate BSBI recorder and other experts known to us. They can then confirm or refute the identification by scrutiny of photographic images or visits to the site.

All the data we have are eventually assimilated into the UK national data base (the BSBI Digital Data Base), but only after they have been scrutinised, usually by a BSBI Vice-County Recorder. This of course is a big task. You can find a map of our iRecord records and some illustrations on the back cover.

Table of the 50 most frequent species recorded in the Urban Flora Project, and their frequency.

Bellis perennis	922	*Heracleum sphondylium*	424
Senecio vulgaris	809	*Buddleja davidii*	418
Poa annua	736	*Anthriscus sylvestris*	408
Ranunculus repens	708	*Sagina procumbens*	406
Galium aparine	689	*Lolium perenne*	405
Urtica dioica	688	*Sonchus asper*	376
Trifolium repens	651	*Hedera helix*	375
Chamaenerion angustifolium	632	*Geranium robertianum*	371
Taraxacum agg.	625	*Lapsana communis*	363
Plantago lanceolata	619	*Aegopodium podagraria*	361
Epilobium montanum	605	*Achillea millefolium*	353
Rubus fruticosus agg.	599	*Matricaria discoidea*	344
Jacobaea vulgaris	593	*Asplenium ruta-muraria*	342
Dactylis glomerata	572	*Capsella bursa-pastoris*	332
Rumex obtusifolius	547	*Cymbalaria muralis*	327
Sonchus oleraceus	515	*Arrhenatherum elatius*	324
Cirsium arvense	483	*Myosotis arvensis*	318
Plantago major	477	*Cardamine hirsuta*	317
Stellaria media	468	*Sambucus nigra*	305
Geum urbanum	455	*Cytisus scoparius*	302
Arabidopsis thaliana	445	*Trifolium dubium*	288
Acer pseudoplatanus	440	*Asplenium trichomanes*	280
Holcus lanatus	438	*Sisymbrium officinale*	258
Cirsium vulgare	437	*Ulex europaeus*	252
Cerastium fontanum	436	*Ilex aquifolium*	249

John Grace

The Botanical Society of Scotland SCIO
Financial Statement for the Year to 30 April 2021

Statement of Receipts and Payments		**2020-21(£)**	**2019-20 (£)**
Incoming resources, Voluntary Income:			
Subscriptions		4,992.49	5,058.55
Bequest	Note 5	-	19,416.82
Donations		118.00	284.00
Card Sales		73.88	-
Total		**5,184.37**	**24,759.37**
Incoming resources, charitable activities:			
Editorial Subvention		3,380.00	3,380.00
Royalties,- Journal (Taylor & Francis)		4,617.10	4,971.84
Total		**7,997.10**	**8,351.84**
Interest - Bank		-	0.57
Interest - CCLA Deposit Fund (C)		31.51	181.83
Interest - CCLA Ethical Income Fund (AA)		3,719.77	2,978.90
Bank &Total		**16,932.75**	**36,264.11**
Payments: Costs of generating funds			
Journal, Members' Copies & Edit. Meeting	**Note 6**	**-**	**8,020.22**
Charitable activities:			
Directly allocated to activities:			
Lecture Expenses (incl. pending/hospitality)		200.00	1,321.24
Printing Newsletter		1,127.57	2,056.29
Student Essay Prize	Note 7	200.00	400.00
Student Grants	Note 8	-	400.00
Astley Ainslie Bioblitz – Expenses	Note 9	-	250.00
Total		**1,527.57**	**4,427.53**
Support costs:			
Printing		-	266.90
Insurance	Note 10	133.00	-
Total		**133.00**	**266.90**
Total - Charitable Activities		**1,660.57**	**4,694.63**
Governance costs:			
Accounting Fees		165.00	160.00
Officers' Expenses (incl. postage)		122.24	43.96
IT Zoom Expenses		137.40	-
Total – Governance		**424.64**	**203.96**
Total Net Resources Expended		**2,085.21**	**13,052.61**
Net		14,847.54	23,345.50
Purchase of Investment	Note 11	(45,000.00)	(15,000.00)
Net surplus/(deficit) on unrestricted funds		(30,152.46)	8,384.90
Net surplus/(deficit) on restricted funds	Note 11	-	-

Statement of Balances	**2020-21 (£)**	**2019-20(£)**
Closing balances at bank, 30 April	45,807.74	75,960.20
Opening balances at bank 1 May	(75,960.20)	(67,614.70)
Gross Surplus/deficit (-) for the financial year	**(30,152.46)**	**8,345.50**
Movement on unrestricted funds	(30,152.46)	8,345.50
Surplus/(deficit) for the financial year	**(30,152.46)**	**8,345.50**
Cash		
Closing Bank Balance	36,887,94	45,749.68
Cash in hand	-	42.00
Cash in CCLA reserve fund	8,919.80	30,168.52
Total	**45,807.74**	**75,960.20**
CCLA Investments (AA - Ethical Income Fund)	**167,745.48**	**101,273.56**
Net Assets	**213,553.22**	**177,233.76**
Reserves (restricted) Funds		
Symington Grieve Trust Fund	500.00	500.00
Urban Flora Project	2,342.00	2,342.00
Total	**2,842.00**	**2,842.00**
General (unrestricted) funds	**210,711.22**	**174,391.76**
Total Funds	**213,553.22**	**177,233.76**
The Notes below form part of these financial statements that have been approved by Council. [redacted] Signed, David Chamberlain, Treasurer		

Notes to the Statements of Receipts & Payments

Note 1 - Accounting Policies

- **Receipts and Payments**
  These accounts are presented as receipts and payments
- **VAT**
  The Society is not registered for VAT, and accordingly expenditure includes VAT where appropriate
- **Unrestricted funds, Revenue**
  The funds of the Society that the Council are free to use are in accordance with the Society's objectives. Any unrestricted revenue surplus is transferred to the unrestricted capital fund.

Note 2 - Council members remuneration
Council members do not receive any remuneration in their role as council members.

Note 3 – Taxation
The Society is recognised by the Inland Revenue as a Charity. No charge for taxation arises on the results for the year.

Note 4 - Commitments and contingent liabilities
There are no contingent liabilities at the 2020-21 year end (for 2019-20, £nil). Editorial Subventions provided by the Publishers, Taylor & Francis since 2016 total £20,212. This sum is available to cover editorial costs incurred by the Journal Editor or the Society, including the promotion of the Journal at International Conferences.

Note 5 – Bequests in 2020
a. B. Ribbons Bequest final payment - £1,986.96
b. S.M. Reid Bequest - £17,429.86

Note 6 – Members' Copies of the Journal
The Taylor & Francis 2018-19 invoice for the production of the Society's Journal, and despatch to Subscribing Members, was received during the 2019-20 session.
a. 2018-19 session - £4,058.22
b. 2019-20 session - £3,962.00
c. Royalties - £4,971.84

The invoice for 2020-21 has still to be received and is expected to be £4,010.11 and the printing costs are expected to be £936.72. These will be included in the 2022 accounts once settled.

Note 7 - Student Essay Prizes
a 2019-20 Session – S. Barber £200 and Ishbel Hayes £200.
a. 2020-21 Session – L. Morton £200

Note 8 – Student Research Grant
a. 2019-20 Session - R. Bromley £400

Note 9 – Astley Ainslie Bioblitz
Contribution to Joint Running Costs

Note 10 – Zurich Liability Insurance
In 2020. account settled by Treasurer; invoice presented in 2021. 2021 has still to be settled.

Note 11 – Purchase of Investment
£45,000 transferred to CCLA
These notes above form part of these financial statements, as approved by Council.

Independent examiner's report to the council members of Botanical Society of Scotland

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

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

Independent examiner's statement
In the course of my examination, no matter has come to my attention
1. which gives me reasonable cause to believe that in any material respect the requirements:
- to keep accounting records in accordance with section 44(1) (a) of the 2005 Act and Regulation 4 of the 2006 Accounts Regulations, and
- to prepare accounts which accord with the accounting records and comply with Regulation 9 of the 2006 Accounts Regulations

have not been met, or
2. to which, in my opinion, attention should be drawn in order to enable a proper understanding of the accounts to be reached.

D Millar, accountant - redacted signature ***…*** [redacted] ***……***

D. Millar, Edinburgh …… 2021

Solution to Codeword 6

26 R	12 I	10 B	25 E	32 S		14 C		4 A					10 B
	32 S		2 P		17 J	4 A	14 C	1 Q	7 U	12 I	5 N	12 I	4 A
	11 O		25 E			26 R		7 U			25 E		32 S
	2 P	11 O	27 L	30 Y	25 E	21 D	26 R	12 I	11 O	2 P	32 S	12 I	32 S
	3 T		4 A			7 U		31 F			27 L		12 I
13 V	25 E	26 R	26 R	7 U	14 C	7 U	27 L	11 O	2 P	32 S	12 I	32 S	4 A
	26 R		16 G			32 S		27 L			4 A	25 E	
22 Z	30 Y	16 G	11 O	21 D	11 O	5 N		12 I				2 P	
	16 G		5 N	2 P			17 J	4 A	2 P	25 E	20 W	12 I	4 A
	12 I	25 E	12 I	12 I	13 V	4 A		14 C	11 O			2 P	
10 B	7 U	24 X	7 U	32 S				25 E	4 A			30 Y	
	15 M	12 I	15 M	7 U	27 L	7 U	32 S	4 A				24 X	
		21 D		15 M			5 N	25 E	11 O	3 T	3 T	12 I	4 A
14 C	6 H	12 I	15 M	11 O	5 N	11 O	10 B	4 A	15 M	10 B	7 U	32 S	4 A
22 Z	20 W	4 A	14 C	23 K	6 H	12 I	11 O	15 M	30 Y	14 C	25 E	32 S	

BSS NEWS – GUIDELINES FOR CONTRIBUTORS

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

Receiving editor: Dr Jill Thompson:
news@botanical-society-scotland.org.uk
All contributions should be sent to the Receiving Editor

Coordinating editor: Cameron Diekonigin.

Aims and scope of BSS News
The 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, for example:

- Reports of field excursions
- Descriptions and recommendations of botanical sites to visit
- Articles of current or historical interest
- Biographical profiles of botanists.
- Botanical notes, poems, news, announcements, reports, correspondence, event advertisements.
- Book reviews, crosswords and quizzes
- Illustrations, including paintings, photographs and line drawings

Guidelines for Contributors
Please follow the guidelines and use the template at https://www.botanical-society-scotland.org.uk/content/bss-news-newsletter-botanical-society-scotland. The space for colour images is limited to the cover and centre pages, please use black and white and greyscale for items within the text. Contact the Receiving Editor for help and advice.

The deadlines are **15th January** and **15th July** each year. Earlier submission is appreciated.

Captions to back cover pictures

19 Fork in branches of an Ash tree, *Fraxinus excelsior*. Photograph and © by Dr. Cristina Rosique-Esplugas, illustrating her article on page 24.

Images 20 – 22 see John Grace's article page 53.

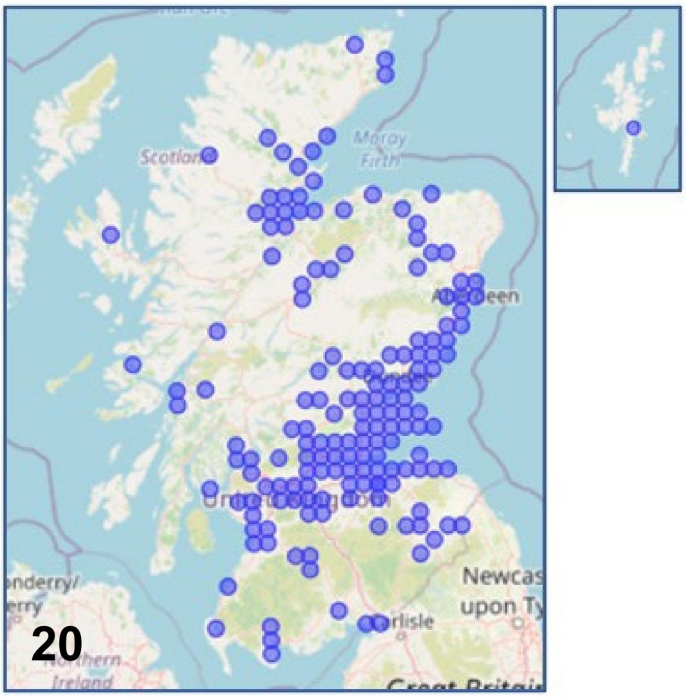
20 Map showing location of all records so far entered to iRecord.

21 Masses of buttercups, Victoria Park, Dundee (image: © Brian Ballinger)

22 *Verbascum thapsus*, 'is there anyone at home?' Dalkeith (image: © Chris Jeffree)



19


Scotland
Moray Firth
Aberdeen
Newcas
upon Ty
Carlisle
Northern Ireland

20



21


21
22