AUSTRALASIAN PLANT SOCIETY
NEWSLETTER

# PENTACHONDRA

ISSUE 54 MAY 2015



***Gastrolobium rubrum*, Stirling Range, Western Australia**

# AUSTRALASIAN PLANT SOCIETY

**Promoting the cultivation and conservation of Australasian plants, and their closest relatives, in northern hemisphere gardens**

## Newsletter Number 54

## MAY 2015

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# APS NEWS

## Meetings

### Sheffield, 4 July

The day will start at Sheffield Botanical Gardens, renowned for their gardenesque landscape and historical and architectural importance. APS members Peter and Trish Kohn, volunteers at the Gardens, will show us round, and the curator, Ian Turner, is hoping to join us. The 19 acre site showcases plants from all over the world (for more information go to www.sbg.org.uk/); of most interest for Australasian enthusiasts are the Mediterranean Climate Garden (Peter has written about plants growing here in Pentachondra, most recently in issue 52) and the Pavilions, which hold collections of Southern Hemisphere plants.

The Gardens are one mile southwest of the city centre, and free to enter. We will meet at the Thompson Road entrance (**not** the main entrance) at 10.30 am. If travelling by car go via Ecclesall Road (A625); for satnav users the postcode is S11 8RB. We hope to get permission to bring cars into the gardens but if not, according to the website, parking is possible nearby. The website also provides details of buses from the city centre to Ecclesall Road. If you do come by public transport there will be space in Judy's car for travel to APS members' gardens later in the day.

We will have lunch in the Gardens, departing around 3 to visit two members' gardens. First we visit Sue Kohler, who has kindly offered to provide refreshments. Then it's off to visit George Smith's garden, aiming to get there by about 5.30. Bring plants to swap; we will find time during the day for this.

**If you intend to come please let Judy know in advance** (editor@anzplantsoc.org.uk or telephone/text 07724 045701) so that you can be informed about parking and/or in the unlikely case of last minute changes. Any further information will also be posted on the members section of the APS website.

### West Sussex, 22 August

The day will start at 11 am when we meet at the Haywards Heath home of APS member Gary Firth and his wife Maria, who have kindly agreed to open their garden to us. They hold two Plant Heritage National Collections: one of Myrtaceae (tribe Myrtaceae) which includes species and cultivars of *Lophomyrtus* from New Zealand, and another of *Gongora*, an orchid genus found in tropical America. There are lots of other plants of interest, and plants for sale too. A £3 donation to Plant Heritage will be appreciated.

Then it's off to Borde Hill Gardens (www.bordehill.co.uk/), a five minute drive away, for lunch. Borde Hill is reputed to have a good cafe or you can bring your own food. But we are not going just for lunch. Borde Hill has a fine collection of plants from early plant hunters and it will be interesting to see what we can find.

Nymans (www.nationaltrust.org.uk/nymans/) and Wakehurst Place (http://www.kew.org/visit-wakehurst) are both near by. If there is enough interest in making a weekend of it we could meet up again

on Sunday 23rd to visit either or both. There's a report on last year's visit to Wakehurst in Pentachondra issue 53; it's a place I never tire of. Nymans has a Chile Garden as well as many plants from Tasmania.

Gary and Maria's address is 9 Harlands Close, Haywards Heath, RH16 1PS. **If you would like to attend please let Judy know in advance** ((editor@anzplantsoc.org.uk or telephone/text 07724 045701) so that you can be informed of any changes, and especially if any advance arrangements are made for Sunday 23rd. Any further information will also be posted on the members section of the APS website.

### Is transport a problem?

You'd like to attend a meeting but don't drive? Or don't have a car? Contact the organiser to see if a lift can be organised, part or all of the way.

## AGM 2015, November

The 2015 Annual General Meeting will be held in November at Lullingstone Castle, Eynsford, Kent. Further details will be posted on the website and included in the quarterly e-newsletter. If you do not use electronic communication please contact Judy and she will ensure that information is mailed to you.

## Welcome!

The APS would like to extend a warm welcome to new members Mona Abboud, Martin Batchelor, Sean Boast, Jerome Boiziau, Tim and Gillian Burr, Jane Cuckney, Adam Green, Filip Hermans, Malcolm King, Jori de Leeuw, Mark Paviour, Craig Ratcliff, M. J. Scoble and Tracy Shingler.

## New! E-newsletter

Many of you will already know that Robbie, our chairman, is compiling a quarterly e-newsletter because you received the first one back in March. If you didn't get it and you think you should have it's probably because we don't have your correct email address. To notify the society of any changes contact Ben (webmaster@anzplantsoc.org.uk ).

The e-newsletter includes updates of information about APS meetings and events and Australasian plant news from around the world. Don't miss it!

### Contacts wanted

Morwen Tregudda would like tips and advice from members who have successfully grown *Atherosperma moschata*, *Dodonea viscosa*, *Lagarostrobus franklinii* and *Melaleuca alternifolia*. She would also like to hear from anyone interested in and/or growing Australasian medicinal plants. Please write to: Morwen M Tregudda, Long Row, Sheffield, Paul, PENZANCE TR19 6UN.

## Website

A new section on the website entitled 'what's growing' features pictures of plants from members' gardens. We need more of them, so if you have any pictures of Australasian plants in your garden that you would like to share, please send them to Ben at webmaster@ anzplantsoc.org.uk. Ben also provides usernames and

passwords for the members' section of the website.

## Have you ordered your seeds yet?

Where else could you get up to 20 packets of unusual and difficult to get hold of seeds for jus £4? Only from the APS seedlist: the current one is enclosed with this newsletter, along with an application form. Janet Miller has taken over the post of seed manager and you can order seeds at any time through the year, whenever it suits you. The seedlist is also posted on the members area of our website.

## Notes on the annual accounts

The 2014 accounts enclosed with this newsletter should be more or less self-explanatory, but if any member has any queries, please feel free to contact the Treasurer, Jeremy Spon (contact details inside the back cover.) Membership rose slightly over the course of 2014, from 113 to 117, with new members exceeding those whose membership lapsed.

## Contribute to Pentachondra

There wouldn't be a newsletter without members' contributions, so as always many thanks to everyone who has contributed to this issue.

Articles for Pentachondra are welcomed from all members, from the most longstanding to those who've just joined. Any item, short or long, that has at least a passing connection with Australasian plants and their allies will be much appreciated. Maybe you can recommend a book, or a place or a garden or a nursery that you enjoyed visiting. Or perhaps you could share your experience of growing particular species, or write about a favourite plant. The deadline for the next issue is **15th October**. Don't hesitate to contact me if you have any questions about contributing; I'll be delighted to hear from you.

### Have you paid your subscription?

If you have not yet paid your 2015 subscription you will find a polite but firm reminder to do so with this newsletter. If you have paid between the editor receiving the membership list and the publication of this newsletter then please ignore the reminder. And if you would like to pay by standing order in future please contact Jeremy Spon to obtain a form to send to your bank.

# GROWING GROUND ORCHIDS NEAR LYON

Tim Darrington

Apart from Tony Entwistle, I do not know of any other APS member who has tried to grow Australian ground orchids. I am surprised, because in orchid societies around Europe there are some growers, and I have even discovered one who lives only about a kilometre from us!

My interest in Australian ground orchids stems from my visit to the

Stirling Range (Western Australia) in August 2007 where, amongst some of the most specialised banksias (including ex-dryandras), many ground orchids grow. If I can grow the banksias, I thought, I can grow the orchids which grow in their shade. Actually things are not quite as simple as that, as I discovered.

Spurred on by the acquisition in summer 2010 of a copy of **Cultivation of Australian Native Orchids**[1] I started looking for suppliers of tuberoids. This monograph is no doubt a top class introduction to their cultivation on mainland Australia, but requires some modifications for European conditions.

In January 2011 I obtained three species/crosses of *Thelymitra* from Laneside Hardy Orchids. They were already growing in shallow plastic pots, on a mainly perlite substrate, and so already accustomed to the northern hemisphere calendar. Soon after this I bought, from Paul Christian in Wrexham, five other species (*Caladenia*, *Cyrtostylis*, *Diuris*, *Leptoceras* and *Thelymitra*) which were imported from Australia and thus dormant.

I grow my orchids in a lean-to greenhouse on the east side of my house, with forced ventilation, using air from the basement of the house. In winter this gets sun only until about 11 o'clock in the morning and in summer the greenhouse is partially dismantled so that there is no significant greenhouse effect (that is, the temperature inside does not get significantly hotter than ambient temperature).

These early attempts were met with failure. First, it is said not to be easy to turn round orchids from southern to northern hemisphere seasons. Second, and more importantly, I am now sure I was watering my orchids far too much and so, of the orchids supplied by Paul Christian, only *Diuris sulphurea* made it through 2011. In July 2011, I bought some *Caladenia*, *Diuris*, *Thelymitra* and *Pterostylis* from Heinrich Beyrle near Augsburg. (There is some excellent information about growing ground orchids in Europe on his website, www.myorchids.de.) The third reason for failure was an extremely cold spell in February 2012 (and some damage to my lean-to greenhouse) which led to a general freezing of both my greenhouses to lower than -5°C and the loss of all orchids and indeed nearly two thirds of all species of Australian plants.

From new stock brought in summer 2012 from Heinrich Beyrle, *Diuris amplissima*, *Thelymitra nuda*, *T.* 'Cinderella' and *T.* 'Melon Glow' produced flowers in spring 2013. However of these only the *Diuris* and *T. nuda* survived the summer of 2013. Then in spring 2014, *T. nuda* flowered again (photos page 9) and, from new stock, I had flowers on *T.* 'Sleeping Beauty', *T. luteocileum* and *Myrmechila truncata*. All three *Thelymitra* and *Myrmechila* produced seed heads with pollination assisted by a cocktail stick.

So, to summarise, I can presently get some orchids to flower, mainly *Thelymitra*. However, only *T. nuda* and *T. granitora* x *T. rubra* have significantly increased in number by vegetative means, and the latter has

refused to flower despite getting the banana skin treatment each summer[2]. *Pterostylis curta* and *Myrmechila truncata* have increased vegetatively very well (by 4x in one season) but all *Diuris* and *Caladenia* are reluctant to flower and increase very slowly, if at all.

The main step towards my mow modest successes since 2012 was to get the watering and moisture levels in the substrate right and for this I am indebted to Darren Sleep, an orchid enthusiast who lives in Lancashire and whose judicious comments can be read on the Scottish Rock Garden Club blog[3].

**Substrate required**

As far as the substrate is concerned, the rule is drainage, drainage, drainage. ANOS (Australasian Native Orchid Society) recommends in their monograph (page 50) 2 parts of coarse sand, 1 part of rich loam, 1 part of wood chips and 1 part of leaf mould, which, in my opinion, is far too little "grit" (only 40%) for European conditions. On his website, Heinrich Beyrle recommends 60 to 70% perlite and 30 to 40% wood fibre (Toresa). Darren Sleep's "*usual Australian terrestrial mix*" comprises 20% Toresa, 40% Seramis (moler clay cat litter) and 40% perlite, to which he adds "*a bit more humus in the form of fine composted bark*" for *Corybas* species (which require more humid conditions than most other ground orchids).

The really important thing is to use a mix which is at least 70% grit and up to now I have generally used a mix of 18% granite chippings (4-10 mm), 18% pouzzolane[4] (4-10 mm), 36% perlite, 18% composted pine bark[5] (4-10 mm) and 10% of leaf mould or Toresa (purchased from Heinrich Beyrle; it is unobtainable in France, and, so it seems, in the UK). I am however beginning to experiment with mixes with 80% grit for *Diuris*, *Thelymitra* and especially *Caladenia*.

I also use extremely long and drained square 0.6 litre containers for smaller orchids and extremely long and drained square 1.4 litre containers for larger ones, into which I put a few centimetres of coarser granite chips at the bottom over a piece of plastic shade netting before adding my substrate. Equally, up to now I have repotted my orchids each summer which maintains a non-compact airy mix, but in future I will experiment by repotting only every other year, as some authorities suggest that some species (especially *Diuris*) like being undisturbed and crowded[6].

Although much has been said about mycorrhizal symbiosis and its necessity for orchid growth, novice growers only need to ensure that the substrate is correct, as the specific mycorrhizal fungi usually come on the dormant tuberoid which is the natural host.

**Watering**

Australian ground orchids require surprisingly little water. The ANOS monograph shows a photo (page 58) of someone watering them with a hose with a rose which suggests far too much water! However Darren Sleep once again indicates the secret for successful European cultivation on the SRG blog (7th May 2011):

> *Watering is identical to my bulbs - a big watering in September, followed*

*by another in October. Kept just frost free in winter. Leaves usually appear in October but growth slows down a lot in cold weather and they get enough water to keep them moist until about late Feb when things speed up again and watering is frequent until early May. I generally feed with Tomorite at 1/4 strength every few weeks.*

*Apparently the critical time is around now (flowering time) - the tubers can rot if kept too wet when the weather warms up so I aim to keep just moist again until the last flower fades then I stop watering - usually before the end of May.*

I have found that watering is the most critical factor. All my orchids are kept under glass for the whole year, **in order to keep rain off**, except in early autumn (between say 20th August and early October) when they go out in order to cool them down, and to let the first major rains of autumn thoroughly rewet the substrate. Once well wetted and cooled, they go back into the greenhouse and are watered **very sparingly** using a 60 ml syringe.

Generally, orchids in 0.6 litre containers get 15 ml of rainwater (more exactly 25% Tomorite solution) and those in 1.4 litre containers get double this amount, at a frequency of (say) once every two weeks from October to mid-November, then once every four weeks from mid-November till mid-February, then once every two weeks again until flowering is nearly finished when all watering is completely stopped. The exception is *Caladenia* which get half the stated amounts for other orchids. In winter, between waterings, the leaves are lightly sprayed with Tomorite solution about once a week.

When the substrate gets above about 20°C for any length of time, the slightest moisture can cause most tuberoids to rot. I believe I have even lost some species by too much water in warmer than average Septembers. On the other hand, I believe that particularly those species that have the smallest tuberoids can suffer from complete desiccation in a hot French summer because in cultivation I plant them shallower than in nature and being in pots, the substrate gets absolutely bone dry. Thus in summer 2014 I experimented by a) storing several pots in my study (north facing in the basement so it never gets hotter than about 27°C); and b) by injecting extremely small amounts of water (1 or 2 $cm^3$) into the substrate about 5 cm underground near the corners of the pots once every 2 weeks, in July and August. However I am not sure this would be necessary with normal British summers.

I do have two species which are exceptions to the general watering regime. These are *Thelymitra cyanea* (from Tasmania) which is watered all year and is only dormant (without leaf) for about a month from late July to mid-August; and *Pterostylis pulchella* x *P. abrupta* (from Queensland) which requires water from mid-May, then flowers in early September before dying down by mid-October when watering is stopped.

In the growing season, gastropods should be kept well away by use of

slug pellets, and dryish conditions help. Many ground orchids only produce one leaf per season and it is rather heart-breaking to see this become a slug's dinner.

**Light requirements**

At present, I am happy to have been able to more or less master keeping orchids from one year to another and to get some of them to flower sporadically. However the relatively poor performance of all *Caladenia*, all *Diuris* and many *Thelymitra*, is, I believe due to insufficient light in the growing season (winter)[7]. I have come to this tentative conclusion (or rather hypothesis) because:

a) I have been collecting data on monthly average temperature and hours of sunlight in Lyon.
b) My now upgraded lean-to greenhouse gets very few hours of direct sunlight in winter (east facing).
c) I have been reading the ANOS monograph on light requirement for various genera and comparing with their performance *chez nous* in the last few years.

- The ANOS monograph recommends 50% shade (cloth) for colony forming *Pterostylis* and *Myrmechila*, both of which multiplied up by about a factor of four last winter.
- It recommends 25% shade for *Diuris* and *Thelymitra*, which (averaged over a number of species/crosses) are struggling to flower and have not increased very fast vegetatively.
- It recommends 25 to 50% shade for *Caladenia* which have yet to flower and have only increased very timidly vegetatively.

So, seeing that my greenhouse can only receive direct sunlight for a few hours in the morning, in early October 2014 I installed a 54W Sunblaster 4000°K tube about 35 to 40 cm above the surface of the substrate in which my orchids grow, to improve growth rate. I have slowly ramped up the number of hours the light is on to 3 per day. I believe I can already see improved leaf growth, and I hope to see an improvement in both flowering and vegetative increase of all species[8]. As I write two *Pterostylis curta* (photo page 9) are sending up flower buds, and it looks as though buds are forming on *Caladenia* 'Harlequin' x *C. flava* and *C.* 'Harlequin' x *C. speciosa*, so early signs are encouraging.

**Conclusion**

I would like to see more people in Europe attempting to grow these jewels of the Australian bush, while legal stocks are still available. As far as I know Heinrich Beyrle is the only commercial producer in Europe and it is getting increasingly difficult and expensive to import ground orchids from Australia[9], as the CITES fees are now exorbitant. I regret that Paul Christian has not offered any Australian ground orchids for sale since 2011, because I feel that I am now better prepared to attempt to turn imported orchids round to European seasons. I would also like to see more contacts forged between the APS and members of UK orchid societies who grow Australasian ground orchids. Maybe we could invite Darren Sleep to speak at one of our meetings?

**Notes:**

1. Richards H.,Wootton R., and Datodi, R. (1988) **Cultivation of Australian**

**Native Orchids**, (Second Edition). Australasian Native Orchid Society (ANOS), Victorian Group Inc.

2. The tuberoids are stored in the presence of a banana skin for 2 weeks: this is recommended by numerous sources. The banana is supposed to emit ethylene which stimulates flowering.

3. Australian native terrestrial orchids, www.srgc.net/forum/index.php?topic=3299.45.

4. Pouzzolane is a basaltic volcanic rock with an alveolary structure in some ways similar to pumice: it is relatively light and airy being full of bubbles.

5. Composted pine bark is made by putting layers of pine bark and grass cuttings in a plastic composting bin, like a lasagna. I also added a bit of lime, but early on (after just one year of composting) I was regretting this because the pH was too high. Now after 3 or 4 years the pH is about 5 which is OK. To grade it, I pass it through a garden shredder, and sieve it using a 10 mm sieve and then a 5 mm sieve.

6. The other problem with *Diuris* is knowing which way up to plant them. I have already planted *D. amplissima* and *D. magnifica* upside down. On both occasions, not seeing them emerge, the error was corrected at the end of October, but this has led to the root and leaves being broken off from the tuberoid. Surprisingly it was the piece without the tuberoid which survived.

7. As I write, I am in the UK for the New Year, and just with my eyes I reckon that the UK has much darker winter days than near Lyon (not surprising, as Lyon is 6° further south than London and 13° further south than the north of Scotland) so lack of (winter) light may be even more of a problem in the UK.

8. At planting or repotting I measure the tuberoids with a micrometer (height and diameter) to be able to estimate the volume, and I record the size of the leaf (leaves) of each species on 11th November each year.

9. I should add 'or New Zealand'. A friend of mine went on holiday to NZ in November 2014 and he reports seeing about 30 species in their natural habitats.

**Editor's note:**

Synonyms for two orchid species included in Tim's original text have been placed here for eased of reading. *Diplodium pulchellum* is a nomenclatural synonym for *Pterostylis pulchella* and *Chiloglottis truncata* is a nomenclatural synonym for *Myrmechilla truncata*.



# AUSTRALIAN SPRING

Tim and Gillian Burr

When we visited Australia in October last year, a main aim was to experience the spring flowers in the 'Mediterranean' zones of Western and South Australia. We stayed at Yallingup for the Cape Naturaliste-Leeuwin National Park, at Albany for the Torndirrup and Porongurup National Parks plus the Stirling Range, then back to Perth where we went to Kings Park. After a two-day train journey to Adelaide, which took in the Nullarbor Plain, we went down to Kangaroo Island, then back to Adelaide and on to Clare. A planned visit to the Mount Remarkable National Park had to be called off as the bush fire risk was by then 'severe', and the thermometer at 36°C. But overall, we probably spent more of our three week visit in park and bush than anywhere else, having no Australian social or family connections to distract us! What follows will hopefully give a sense of the impression made by this unique flora on a pair of interested amateurs making a first-time visit.





above
***Thelymitra nuda*,**
**April 2014**

right
***Pterostylis curta*,**
**January 2015**





above: **Cape Naturaliste clawflower**

below: ***Lechnenaultia biloba*, set off by a single bloom of *Chorizema rhombeum***



For us it was definitely a 'Botany Bay' experience, confronted as we were by a quite unfamiliar vegetation. Our strategy was to take macro photographs of the more striking blooms, while buying enough books to have some hope of identifying them afterwards. (We can particularly recommend Jane Scott's newly revised colour guide to the wildflowers of the Cape to Cape track[1].) What should be stressed, however, is that the flora form a vast and varied assemblage, the whole being more than the sum of the parts – a point which can be lost by undue emphasis on collecting individual plants, or photographs of them. In overview the texture may be subdued but in passing through these landscapes the arresting encounters with changing patterns of form and colour are almost kaleidoscopic in effect. Our first walk, to Cape Naturaliste, never reached its destination – we were so fascinated that we ran out of daylight!

The palette includes massed blooms of pink *Pimelea ferruginea*, orange *Kennedia coccinea* touched with pink and yellow, jasmine sprays of flowering *Acacia myrtifolia* and *A. littorea*, drifts of blue *Scaevola crassifolia*, and *Stylidium* sp. covered in pinkish flowers, each with a larger and a smaller pair of petals, like tiny butterflies. Then there are the clusters: indigo for *Hardenbergia comptoniana,* yellow for *Hibbertia cuneiformis*, gold and silver sparklers for *Melaleuca systena*, and the deathly pale, purple-streaked petals of *Isotoma hypocrateriformis* (Woodbridge poison!). Not to be trifled with are the wicked spines of *Davesia divaricata*, protecting its amber pea flowers. Less vicious, but still uncomfortable, are the leaves of the prickly yellow cottonhead, *Conostylis aculeata*. Prickles also pimple the leaves of *Thomasia triphylla*, and these, with the mauve flowers, present a pleasantly crumpled texture. There's a thrill, too, in finding the Cape Naturaliste clawflower, *Calothamnus graniticus* subsp. *graniticus*, which only occurs in that area (photo opposite). Another is to witness the intense blue of massed *Lechenaultia biloba* in its natural habitat (photo opposite**)**.

Not that the individual flowers are to be overlooked. Readers of Pentachondra will be familiar with fringed lilies (we recorded both mauve and unusual white forms of *Thysanotus manglesianus*); but what about the blue grass lily (*Agrostocrinum* sp.**[2)]**, with its white and yellow centre and six blue perianth segments (photo page 19)? Or the hooded lily, *Johnsonia lupulina*, its showy 'flowers' actually formed of bracts (photo page 19)? By this time we had reached Nannup, a great place not just for lilies but for orchids too. Cowslip (*Caladenia flava*), spider (*Caladenia* sp.), purple pansy (*Diuris longifolia*), donkey (*Diuris* sp.) and purple enamel (*Elythranthera brunonis*) orchids were spotted (and snapped) in the neighbouring woodland, as was the peerless scented sun orchid *Thelymitra macrophylla* (photo page 19). Other striking blooms included cow kicks (*Stylidium schoenoides*) and the hairy jug-flower (*Adenanthos barbiger*).

Amongst the panoramic scenery of the Stirling Range, it is again the

great carpet of olive greenery that takes the eye, surmounted by imposing peaks (photo page 20). Here we were less successful in identifying individual species – there are 1,500 flowering plants to choose from in the Stirlings[3]. Our main triumph was to pin down *Gastrolobium rubrum*, the striking red flower with fluffy white socks on (photo front cover). Further 'fluffy' blooms were white *Leucopogon obovatus*, and the heads cushioning the deep blue flowers of *Dampiera wellsiana*. Other identified flowers included the bright yellow *Glischrocaryon aureum*, and the Australian bluebell (*Billardiera fusiformis*[4]).

Kangaroo Island seemed to have more koalas than kangaroos. It stretches for nearly 100 miles from end to end. A large area of bush at the western end lies within the Flinders Chase National Park, not to be confused with the Flinders *Range* on the mainland 250 miles to the north. An extensive fire ravaged the Park seven years ago, but subsequent regeneration has been remarkable. As well as an extensive flora, the Park is also home to a significant platypus population, originally moved there from mainland Australia for their own protection. Being nocturnal they are difficult to see, but we visited some of the stream pools where they live. Those of us who grow Australian plants can only envy the three-hectare bush garden created by John and Carol Stanton near Stokes Bay on the north side of the island, and open to visitors from August to May. Within an advertised total of more than 1100 named plants, it contains "*75 different Banksias, over 45 different Dryandras, over 145 different Grevilleas*". Unlike a botanical garden such as King's Park, Perth, the planting was mixed rather than thematic, more like the bush but in a cultivated setting. An illustrated guide to the island's native plants is available for use in the field[5].

In the country north of Adelaide good tracts of bush are harder to find, having been supplanted by vines and, further north, by wheat fields. Not to be missed, however, are two "conservation parks": Spring Gully near Clare, where we found blue *Wahlenbergia gloriosa* and the gracefully pendulous flax lily *Dianella revoluta*; and Red Banks near Burra. The latter was an evening visit in search of wildlife, which turned up emus, a shingleback skink (or sleepy lizard), and dozens of kangaroos, though not the hoped-for wombat. Flower hunting was impractical in the twilight, but a daytime visit to this area of "*scented Mat-rush Tussock Grassland and Mallee Box Woodland*"[6] would doubtless be productive.

Back here in Sussex, we are continuing our new-found acquaintance with Australian flowering plants with the aid of a 9 by 5 metre frost-free glasshouse, sheltered to the north by a 20 metre *Eucalyptus gunnii*. It won't recreate the bush, but hopefully we will be able to grow a small assemblage of selected shrubs to something like their full size. But that's a topic for another article in a few years' time …

**Notes and references**

1. Scott, J. 2014. **Find that Flower**, 2nd edition. North Fremantle: Cape to Cape Publishing.

2. Editor's note: In 2004 the genus *Agrostocrinum* was revised and is now considered to comprise two species *A. hirsutum* and *A. scabrum*. They are not easy to tell apart and both could have been seen in the area visited. See G.J. Keighery (2004), *A taxonomic review of the genus* ***Agrostocrinum*** (Phormiaceae), Nuytsia, 15(2):245–252.

3. Department of Environment and Conservation, WA. 2009. *Stirling Range National Park.* Information Leaflet

4. Editor's note: See page 23 for more about Australian bluebells.

5. Overton, B. & Overton, D. 2012. **Discover Kangaroo Island's Native Plants**. Kingscote, Environmental Realist.

6. Department of Environment and Natural Resources, SA (n.d). *Red Banks Conservation Park.* Information Leaflet.

# HAKEA VICTORIA

Jeff Layman

*Hakea victoria* (royal hakea) is perhaps the most spectacular variegated plant in Australia, if not the world. Its leaves are coloured red, orange, and yellow, as well as green. As it is an evergreen, the colouration is permanent, and nothing to do with leaf loss in autumn. Quite why it should have such marked colouration is puzzling. It comes mainly from the Fitzgerald River National Park in Western Australia, although it can be found between Albany and Esperance.

On a visit to Fitzgerald River National Park in 1986, I found many specimens of *Hakea victoria*, particularly on East Mount Barren. This peak is about 450 metres high, and less than a kilometre from the coast. The plants were growing in what appeared to be fine white sand, in full sun in very exposed positions. The leaves were tough and prickly. This is a plant well adapted to a testing environment!

I purchased a packet of seeds in Perth, and on returning to the UK tried to grow it in a south-facing conservatory, in a 1:3 mix of ericaceous JI and washed sand (along with several other Western Australian plants). It germinated well, and I soon had several plants. Some grew well and others soon died, but none developed the wonderful variegation seen in habitat. Over the years I tried growing it again. Although it always germinated readily, it never coloured up and I never had any flowers.

About four years ago I thought I'd try again as our society often offered seed of *Hakea victoria*. A couple of plants started growing, with one soon expiring. The other I grew on and brought with us when we moved a couple of years ago. It was put in the new greenhouse in spring 2013 in a similar soil mix to the previous attempts. It grew well, and in November was over a metre high. Shortly after I was rewarded with flowers - the first I had ever had. The flowers are white and fairly small, and somewhat hidden by the leaves (photo page 21). Like previous efforts, it has no variegation.

Why the plant has such marked variegation is open to conjecture. It may be due to a certain concentration of minerals (or lack of them?), or perhaps a very dry climate. It is said that plants which are too humid in winter do not have the variegation.

Maybe I should test that theory by growing a plant in a plastic greenhouse warmed by dry air from a dehumidifier.

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# METROSIDEROS

© Gary Dunlop

The genus *Metrosideros* is a branch of the myrtle family. It is mostly confined to islands around the Pacific Ocean. One species survives in South Africa, which suggests that the origin of the genus goes back to around the time of the break-up of Gondwana. The few species that are best known all come from New Zealand, which has 12 endemic species, out of the 53 species in the genus[1]. Perhaps surprisingly, *Metrosideros* is not native to Australia. Most of the species are not frost hardy; apart from Tresco in the Scilly Isles, only one of the species (*M. umbellata*) can be cultivated in gardens in the more favoured mild part of the British Isles.

A total of six species of the genus were collected by Joseph Banks and Daniel Solander, and illustrated by Sydney Parkinson, who accompanied Lieutenant James Cook on his first voyage around the world in 1768-71. Only three of these species were named by Daniel Solander, but as being in the genus *Melaleuca*[2]. One of the other three was first named by the Prussian father and son, Johan & George Forster in 1775[3]. who were botanists on Cook's second voyage in 1772-5. The remaining two were described and named solely by George Forster in 1786[4]. All the original generic names were subsequently superseded with the establishment of the genus *Metrosideros* (see Appendix A) which was established by Joseph Gaertner in 1788[5]. *Melaleuca lucida* (southern rata ), the original name given to one of these plants by George Forster, was apparently invalid, so the plant was completely renamed as *Metrosideros umbellata* by Cavanilles in 1797[6]. However, the name *Metrosideros lucida* was still in use in New Zealand until at least the end of the 19th century, and in the UK well into the 20th century.

Whilst the vast majority of the species in the genus are trees or shrubs, New Zealand is the only location where the genus includes vines, and indeed the majority of species there are vines, 7 out of the 12 species being vines and only 5 trees or shrubs. These 12 species, primarily the tree species, have given rise to a surprisingly large range of cultivars, many being selections of distinct forms from the wild, and others being hybrids, with the colour of the flowers (actually the conspicuous surrounding stamens; photo page 32) varying from white through pale greenish yellow, yellow, orange and various shades of red[1].

Regrettably, most of the species and cultivars are not reliably hardy or at all hardy in the British Isles, though in 1985 seven species and two cultivars were recorded as growing on Tresco[7], the oldest being *M. excelsa* (photo page 31) planted in 1851. Its Maori name is pohutukawa, meaning splashed by the sea, and it is also known as the New Zealand Christmas tree. *M. robusta* was planted in 1856; it is known as the

northern rata and is the most northerly growing species. In 1914, three further species were added to the collection: *M. umbellata* and two vines, *M. diffusa* and *M. villosa*. 1950 saw the introduction of a cultivar or species "*M. Hallii*" though the status of this name is uncertain. In 1959 another vine species was introduced, *M. carminea*, known as the climbing rata. *M. kermadecensis*, a tree from Kermadec Island, was acquired in 1965, followed by its variegated form in 1977.

More may have been planted since, and probably some replaced after the severe winter in 1987. Whereas the normal minimum winter temperature on Tresco is about 10°C, because of the North Atlantic Drift, snow lay for many days with a low temperature of –8°C but with a lower chill factor caused by strong winds. This event and the subsequent hurricane in 1990 are chronicled by Mike Nelhams[8]. The mature trees of *M. excelsa* were badly frosted and were severely cut back, but fortunately recovered.

In 1911 Sir John Ross at Rostrevor House was growing *M. excelsa*[9] (under an erroneous later synonym, *M. tomentosa*), as well as *M. scandens*. However, they did not seem to survive for long, as a report published in 1917[10] after the cold winter of 1916 made no mention of either of them, though *M. umbellata* (as *M. lucida*) was listed as unharmed and the two vines *M. diffusa* and *M. hypericifolia* were listed as injured but survived.

It seems likely that Sir John obtained the two vine species, and possibly *M. umbellata* as well, from Rev. Arthur T Boscawen, who also recorded growing them in 1923[11]. He introduced many New Zealand plants grown from seed sent by his brother who was in the Forestry Service in New Zealand, and probably also from Mr T.F. Cheeseman, a distinguished New Zealand botanist with whom he corresponded. Mr Cheeseman had published the **Manual of New Zealand Flora** in 1906, some decades after J D Hooker had published the first attempt at such a Flora.

The Rev. Boscawen was an expert raiser of plants from seed and had a significant collection of New Zealand plants in his garden at Ludgvan Rectory. Unfortunately he only wrote the one article, and comparatively little is recorded of his plants and garden, apart from a piece by Frank Kingdon-Ward who wrote a brief article about his visit to the garden, published in 1929[12]. Kingdon-Ward was obviously impressed with the range of New Zealand plants that he saw, no doubt for the first time, though he was apparently not easily impressed, as *Weinmannia trichospermum*, *W. silvicola* and several others were merely mentioned as "*some other interesting plants*". I heard an anecdote many years ago, that in the 1950s he visited Guincho, the 10 acre garden of the late Mrs Vera Mackie, near Helensbay in Co Down. Vera Mackie had a significant collection of uncommon and rare plants, though the garden would have been relatively immature at the time of Kingdon-Ward's visit. Apparently he was unimpressed and considered that the only worthwhile plant that she

was growing was *Vaccineum glauco-album*, which he had collected and introduced to cultivation!

Kingdon-Ward's visit to Ludgvan, was possibly in the summer of 1928, as he commented that there was almost nothing to compare with the brilliance of the *Metrosideros* trees in flower, referring to the three tree species *M. excelsa*, *M. robusta* and *M. umbellata* which all flower in midsummer. *M. diffusa* had still not apparently flowered. Rev. Boscawen mentioned in his article that *M. umbellata* took much longer to start flowering than the more tender *M. robusta*, and recommended that it should be propagated by cuttings from flowering trees. He also noted that young plants of the hardiest tree *M. umbellata* were initially less hardy, though that is not unusual for plants of borderline hardiness, or indeed many hardy ones.

Comparatively little would have been known about the Rev. Boscawen and the plants he grew had not Bishop Hunkin not researched and written about him in 1942, three years after he died[13]. He included three photographs, one a general one of the garden looking back towards the house; one of the Rev. standing beside a large specimen of *Eucryphia* 'Nymansay' in full bloom; and lastly a view south through a gap in the trees to St Saint Michael's Mount. As well as giving background about Rev. Boscawen and a reasonable over view of the plants grown at Ludgvan, he mentioned that the tree of *M. umbellata* had produced its best flowering ever in 1942, but that *M. robusta* had been killed in the bad winter of 1938. He also mentioned that the Rev. Boscawen had managed to flower both *M. excelsa* and *M. diffusa*, but probably long since killed. More recently Ann Boscawen wrote a two page account of the garden, including first two photos mentioned above[14] .

In 1930 Edgar Thurston published a survey of trees and shrubs growing in Cornwall[15], listing the gardens in which each species were being grown. Over and above those gardens already mentioned were *M. umbellata* at Lanarth, Trewidden and St Michael's Mount; *M. robusta* at Trebah, Tregothnan and St Michael's Mount; and *M. excelsa* 30ft high at Lanarth with small plants at Tregye, St.Michael's Mount and Pendrea.

The most comprehensive information about *Metrosideros* published in England was provided in 1948 by Mr W. Arnold-Forster, based on his experience of growing quite a few of them in his exposed garden, Eagles Nest, near Zennor in Cornwall, as well as on the experience of other gardeners in Cornnwall. He devotes seven pages in his peerless book, **Shrubs for the Milder Counties**, to the genus as well as dealing with quite a number of other Australasian plants[16]. Curiously, Thurston seems to have been unaware of Arnold-Forster's garden. Equally if not more informative, from a New Zealand perspective, is Robert Laing and Ellen Blackwell's 1940 book, with additional information about Maori culture[17].

Whilst a wealth of other tender or half-hardy plants have been introduced into cultivation more recently, as discussed in the 2004

publication **Gardening on the Edge**[18], it is surprisingly that *Metrosideros* species barely get a mention, with no encouragement to try growing even the hardiest species, *M. umbellata*, although admittedly it does take about twenty years to start flowering unless it is vegetatively propagated from a flowering tree.

It was surprising then to discover that *M. excelsa*, the least hardy of the three tree species in cultivation, was being grown in the Cotswolds, albeit in tubs for summer display, but no doubt wintered frost free under cover[19]. Kevin Line provides details of how to propagate this attractive and drought resistant plant with silver undersides to the leaves. Woody stems were more successful than those of softer new growth. He also noted that it is now being used as a windbreak plant instead of *Pinus radiata* on Tresco, as it was realised to be remarkably wind resistant, as indeed are *M. robusta* and *M. umbellata*. He was also propagating the slightly hardier *M. umbellata* which he discovered needed much more watering. His rooted cuttings apparently took a little longer to start flowering than those of *M. excelsa*, but obviously came from a flowering tree. In cultivation *M. umbellata* has evolved to produce aerial roots if it is not getting enough moisture from the ground, but they are only effective in climates with relatively high humidity.

Tresco is the only garden in the British Isles where a number of different tender species can be seen, but *M. umbellata* is grown in a number of gardens the length of the British Isles. The champion tree of *M. umbellata* grows in Ilnacullin garden on Garnish Island off the southern coast of Co Cork[20]. There are, no doubt, some specimens growing in gardens in Cornwall. In a separate report[21] Owen Johnson identified where other specimens were being grown. Further north there is a good specimen at Logan Botanic Garden (photo page 21), though it is considerably larger than he suggests, probably about 7m tall and with a considerable spread. It sets seed. There are two good specimens at Mount Stewart and one at Ballywalter Park several miles further south on the Ards Peninsula, Co Down. There is smaller one at Inverewe, with its climate moderated by the North Atlantic Drift, though it seem to grow in a sheltered location, judging from the photo in **New Trees**, which shows it flowering well, and with foliage right down to the ground[22].

The two trees at Mount Stewart are also about 6-7m tall; both used to have clear trunks and branches, but the one facing south west has in the last 10 years, produced considerable new growth down to ground level, which encroaches over the adjacent path. Both were planted close to the walls surrounding the family graveyard, Tir-na- Nog (land of the ever young), which overlooks the lake from the top of the hill at the opposite end from the house. As they apparently don't get as much moisture as they require from the ground, they have produced thick bunches of aerial roots (see photo page 32). They are particularly noticeable on the broader spreading tree on the south east side of the graveyard.

Many flowering plants in New Zealand have white flowers, in contrast with the colourful and spectacularly flowering *Metrosideros.* It is regrettable that most are so tender, and thus cannot be more widely grown in the British Isles. However, as Kevin Line has shown, the most tender tree also makes a good pot or tub plant, provided it is kept inside in winter.

## Appendix A

| Banks Florigeum | Current name established |
|---|---|
| 441 *Metrosideros albiflora* | (Sol.) Gaertner 1788 |
| 442 *Metrosideros diffusa* | (G.Forst.) Sm. 1797 |
| 443 *Metrosideros perfoliata* | (J.R. Forst. & G.Forst.) Druce 1916 |
| 445 *Metrosideros excelsa* | (Sol.) ex Gaert.) 1788 |
| 446 *Metrosideros umbellata* | (G.Forst) Cav. 1797 |
| 447 *Metrosideros fulgens* | (Sol.) ex Gaertn.) 1788 |

The numbers refer to the illustrations in Ebes, H. 1998: **The Florilegium Cook – Banks – Parkinson 1768-71**. Melbourne: Ebes Douwma Antique Plants & Maps.

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**Spring in Western Australia**

left
**Blue grass lily, *Agrostocrinum* *sp*.**

below
**Hooded lily *Johnsoniana lupulina*, showing the wooded setting in which it grows.**





**Plants carpet the Stirling Range in Western Australia. The red blooms just visible in the left foreground are *Gastrolobium rubrum,* the flower shown on the front cover.**



**Fruits of "Billardiera heterophylla, possibly".**



left
**Royal hakea, flowering in Jeff Layman's greenhouse**

below
**Southern rata, *Metrosideros umbellata*, at Logan Botanic Garden, showing the considerable size this species can achieve.**





**Mona's Garden**



**Corokia cotoneaster in flower**

# MONA'S GARDEN

Hidden behind a 1930s terrace in North London, Mona Abboud's fifth-of-an-acre garden is home to a huge variety of plants with many Mediterranean and Australasian trees and shrubs, including an extensive collection of *Corokia*. The first section of the garden comprises a clipped box hedge surrounding the centrepiece stone fountain and framing the Mediterranean-type shrubs and trees (photo opposite). The long and narrow garden then flows through an archway leading to a meandering path flanked by two 30 m long mixed borders of soft-textured grasses and perennials punctuated by a variety of shrubs, trees and bamboos. This opens out onto a wider but more intimate area, enclosed by willow hedges and containing a small rockery, bog garden and border which surround the existing rose and *Corokia* beds. For more information visit Mona's website, monasgarden.co.uk.

Mona is working towards Plant Heritage National Collection status for her *Corokia* collection. The New Zealand species comprise three evergreen shrubs, namely *Corokia macrocarpa*, *Corokia buddlejoides* and *Corokia cotoneaster* (photo opposite), plus the hybrid *Corokia* x *virgata* from which many cultivars have been developed. Mona is constantly searching for plants to add to her collection. Can you help her? Her website contains a list of the taxa she already has; maybe you have a plant she doesn't have and could provide a cutting, or advise her of nurseries which might be good sources of corokias?

Mona will be opening her garden under the National Garden Scheme on Saturday 16th May and Sunday 17th May, from 2 pm to 6 pm and on Sunday 16th August from 2 pm to 5.30 pm, and in aid of the British Red Cross on Sunday 31st May from 2 pm to 6 pm. She also opens by appointment and APS members are more than welcome to visit from May onwards. Her garden is near Highgate underground station at 33 Wood Vale, N10 3DJ. She can be contacted by phone (0208 883 4955) and email monaabboud@hotmail.com).

Compiled by Judy Clark from press release and website information



# AUSTRALIAN BLUEBELLS

Judy Clark

In their account of their visit to Western Australia (page 8) Tim and Gill Burr mention seeing *Billardiera fusiformis*, the Australian bluebell. This species is a very close relative of the plant still known in the UK as *Sollya heterophylla*, Australian bluebell creeper. In fact, Australian botanists split *Sollya heterophylla* into two species a few years ago, and gave it a name change to boot.

Until quite recently *Billardiera fusiformis* was known as *Sollya fusiformis*, and it was generally considered to be the same species as *Sollya heterophylla*. Now, except in South Australia, the two are regarded as different species, with *S. heterophylla* being given the name of *Billardiera heterophylla* [1,2]. So far, so good, if a bit confusing nomenclaturally.

Having more or less got my head round the names, I decided to see if I could work out the identity of my white-flowered plant (not a "blue"bell), bought several years ago as *S. heterophylla* from County Park Nursery. For Australian plants authoritative botanical descriptions are found in the Flora of Australia, but the family to which *Billardiera* belongs , Pittosporaceae, is not available online, and I don't have access to the paper by Cayzer et al.[1]. Failing such sources, as both species are Western Australian natives I turned to the Western Australian government website FloraBase[3]. Unfortunately the publicly available descriptions are a bit lacking in detail: *B. fusiformis* is described as a sturdy climber with blue, white or pink flowers and *B. heterophylla* as a woody, rounded shrub with blue, white or pink flowers!

My plant is a shrub rather than a climber; it would flop if it wasn't supported and there's no sign of any special structures that would allow it to climb or cling to its support. So the Florabase descriptions provided some evidence for my plant being *B. heterophylla*. But I didn't consider it sufficient. When it comes to plant identification I like to examine the flowers and/or fruits as, in my experience, I'm then less likely to make a mistake. Fortunately, FloraBase includes photographs of *B. fusiformis*, the most useful of which shows the fruit with a distinct protuberance at the apex, a feature not present on the fruits on my plant (photo page 20).

Unfortunately FloraBase doesn't provides any photographs of *B. heterophylla* fruits for comparison, so my next step was a bit of web browsing. I found two sites that one would hope might be reliable. Weeds Australia[4], supplied a factsheet for *B. heterophylla* and a Queensland government site[5] provided one for *B. fusiformis*. The latter included more photographs of *B. fusiformis* fruits showing the small protrusion at the apex, while the former has a not very good photograph of *B. heterophylla* fruits which seem to lack any such feature.

These two sources also describe the fruits. *B. heterophylla* is said to have cylindrical fruits that are 2 to 4 cm long. *B. fusiformis* is said to have fruits that are less than 20 mm in length and which narrow at each end (that is, are somewhat spindle shaped or fusiform). Fruits on my plant are longer than 2 cm, and while they vary in shape they do look more oblong than fusiform. So is it *B. heterophylla*?

Well, I'm still not quite sure. As I read the factsheets more closely I ended up rather confused. For example, one[5] describes the adult leaves of *B. heterophylla* as being slightly toothed and borne on short stalks, whereas the leaves on my plant are more consistent with the description of those of *B. fusiformis*, entire and stalkless. In fact, if I were relying solely on the factsheets I'd describe my plant as a bit in-betweeny. Nor was my confidence in them was not boosted by some disparity as to which plant is the environmental weed of temperate bushland outside its native range. Or maybe both are?

For the moment I've decided to call my Australian bluebell plant "*Billardiera heterophylla*, probably", should I have to give it a

scientific name. The caveat is for two reasons. First, as I've already explained , I'm not fully confident in my conclusion. Second, using this name means accepting the near scientific consensus of Australian botanists that there are two species not one. But as I noted earlier, in South Australia this split is not accepted. Maybe one day the consensus will return to a single species concept. (It might surprise readers that such a matter isn't cut and dried. But while there are rules about naming plants[6] there are no rules to arbitrate between different taxonomic concepts: in this case to say definitively whether one species or two species is right.)

Does all this matter, especially in the northern hemisphere? Probably not, except to a few eccentrics like me who get a bit obsessive about such matters. But I think this story is an interesting example of how name changes come about, or not, and possibly a bit of a cautionary tale where identification is concerned.

Meantime I would not expect the name used in the UK to change anytime soon. The RHS PlantFinder has Australian bluebell (creeper) down as one species, *S. heterophylla*, with both *B. heterophylla* and *S. fusiformis* as synonyms. And commercially it would be a pain if there were a name change, more so if two species were recognised. However, if there are two species it wouldn't surprise me if *B. fusiformis* is lurking somewhere in the UK. because the distributions in Western Australia overlap and *B. fusiformis* is actually the more widespread[3]. Go check those fruits!

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6. For any one interested in plant nomenclature Hortax have compiled an excellent booklet, *Plant Names: A guide for Horticulturists, Nurserymen, Gardeners and Student*. It can be downloaded from their website www.hortax.org.uk/hortax-booklet.html.




# WHAT MAKES EUCALYPTS FROST-TOLERANT, AND HOW CAN WE HELP?

© John Purse

Eucalypts are widely-grown in parts of the world that experience frosts. In many such areas, eucalypts form the basis of significant and successful industries. But every few years, exceptionally severe winters or out-of-season frosts cause damage to the trees. In some cases, this damage has been severe, and further planting has

been curtailed or hardier but less valuable species planted instead. I have been interested in cold-tolerance of eucalypts for many years, and have had much experience of attempting to grow species that are only marginally hardy in Britain. I've also taken a close interest in similar situations elsewhere in the world, and attempted to learn from them. By training, I'm a plant scientist, and I've spent time looking at academic publications on cold-tolerance and frost damage in plants generally. I've found that these findings help to interpret what happens in real situations in the field. In this article, I'll analyse what appears to happen to eucalypts when they are damaged by sub-zero temperatures, and what we might do to help to mitigate the damage. I should say at the outset that there are no 'magic' solutions, but awareness and appropriate preparation may help to avoid some potential problems. I will try to explain the scientific aspects using non-specialised language as far as possible.

**What happens when plant tissues are exposed to freezing temperatures?**

If the living contents of a plant cell freeze, that cell normally dies. Plants that are adapted to survive sub-zero temperatures have a variety of mechanisms to prevent such freezing. However, plants and especially trees are not just constructed of living cells. The 'living' and freeze-susceptible parts of cells are enclosed within a cell membrane; outside these membranes are all the cell walls (which in trees form the wood) and much of the water-conducting tissue; the latter is in the sapwood in the stems of trees. These extracellular tissues are normally saturated with water. This water outside of the cell membrane is the first to freeze if any freezing starts, but many plant species and tissues have mechanisms to prevent such freezing. Extraordinarily, some plant species can be exposed to temperatures as low as -40°C without any of their water freezing. The mechanisms are not fully understood, but the production of particular extracellular proteins that inhibit the formation of ice crystals appear to be important.

In other plants and tissues, extracellular water does freeze, though often at temperatures well below 0°C. This tends to draw water out of living cells, through the cell membrane, to augment the growth of the ice crystals. If uncontrolled, this would be lethal, so the cells of cold-tolerant plants have mechanisms to reduce such outflow and cope with the consequences of any water loss. Again, the processes are complex and not well understood, but seem to involve at least two distinct mechanisms: a) progressive changes to the cell membranes so that water does not pass through them, and b) the production of chemicals such as sugars that will cause water to be retained within the cells (an osmotic effect). In addition, cells also may produce proteins that inhibit ice crystal formation. These are the processes that underlie the hardening of plants.

**How plants protect themselves from freezing – hardening and de-hardening**

It is well-known that most plants that are hardy in winter are much less

hardy in summer. This is why unseasonal frosts are so feared by growers. The process of acclimatisation to winter conditions during late summer and autumn is referred to as hardening. The reverse process in spring is referred to as dehardening. As well as inducing tolerance of freezing, they normally involve reduction or cessation of growth as well, which in turn may lead to dormancy.

Temperate tree species native to the northern hemisphere frequently stop growth and become hardened as a result of shortening days in autumn. It is frequently assumed that this is the sole or predominant trigger of hardening, but a detailed study on Scots Pine (*Pinus sylvestris*) indicates that the controls are more complex, and that low temperatures appear key to inducing maximum hardening. The hardening process in Scots Pine needles is initiated by the onset of short days in autumn, but the rate of hardening increases following exposure to sub-zero temperatures. Using young plants in growth chambers allowed the researchers to demonstrate that just two consecutive frosts of -4°C under long days (that is, summer daylengths) were sufficient to induce a rate of hardening of 0.86 degrees per day. This is close to the maximum rate of hardening observed in this species. This hardening continued for approximately 2 weeks at temperatures below 10°C before dehardening started to occur. Further consecutive frosts did not alter this rate of hardening, but further frosts within the 2 weeks period following the first exposure allowed the hardening to continue. Just 6 frosts within a month caused frost tolerance of -32°C to be attained. Dehardening commenced when day temperatures exceeded 10°C for one week.

This example illustrates the surprising insights that can be obtained from experiments conducted in growth chambers, as well as the complexity of the underlying processes. Such studies have been conducted with eucalypts, though the conclusions are not so clear-cut; this in part reflects the different types of frost and frost damage that can occur, and probably is also a consequence of different responses of different eucalyptus species to hardening conditions.

**Types of frost, and types of frost damage in eucalypts**

In their native habitats in Australia, eucalyptus species that are subject to frosts normally experience radiation frosts. Such frosts generally occur under clear skies, and in largely windless conditions. Under these conditions, solid materials radiate heat to the sky, so that their temperature drops below that of the surrounding air. This leads to condensation of moisture from the air onto the solid surfaces. Once the temperature of the solid surfaces drops below 0°C, the condensed or condensing moisture freezes, leading to a visible white frost. If the air is very dry, visible frost may not form but solid surfaces may still drop below 0°C.

An important consequence of this for plants is that the leaf and stem temperatures will tend to be several degrees below that of the surrounding air during a radiation frost. Therefore, measurements of air

temperature will give an under-estimate of the temperatures that cause tissue damage under these conditions. For example, in *Eucalyptus pauciflora* at the timberline in the Snowy Mountains of Australia, leaves were on average 3.7 degrees colder than the average minimum air temperature of minus 8.9°C during radiation frosts. During a radiation frost, air close to the cold ground becomes colder and hence denser than air higher from the ground. Because of the greater density of the cold air, the cooling effect of the ground on the air in windless conditions is self-

reinforcing. Consequently quite marked vertical temperature gradients can develop and be maintained in the air close to the ground. Under such conditions, the air temperature within a Stevenson screen (the traditional box used to hold meteorological instruments outdoors) is typically 2.2 degrees warmer than that on the ground (this figure does vary). If this effect occurs on a slope, the cold air will flow downhill and 'pool' in any depression. This is the basis of 'frost hollows'; the minimum air temperatures close to the soil in such locations are significantly lower than on surrounding hillsides and even on adjacent mountain tops hundreds of metres above. The depth of cold air in these hollows is also much greater than in surrounding areas.

Frost damage also occurs when plants are exposed to masses of air at sub-zero temperatures. Such conditions can occur anywhere at high elevations in temperate regions, but are also common in parts of the northern hemisphere that are periodically exposed to cold fronts and anticyclones that bring air masses from Arctic regions. These conditions are rarely severe in lowlands in Australia, because the surrounding seas warm any air originating from the Antarctic, though the drops in temperature can still be sudden, and damaging to unhardened or unadapted plants. These air masses can move rapidly, causing sudden and severe drops in temperature. This is the reason why eucalypts generally survive at most only for a very few years outdoors in much of continental Europe, and why they thrive best on lowlands in the maritime fringes of Europe.

Different tissues within eucalypts vary in their sensitivity to frost, often to a surprising degree. Leaves are the most studied tissues, for obvious reasons. The effects of hardening on leaves is well-documented, though it has proved difficult to relate cold tolerance of leaves as measured in growth cabinets to cold tolerance and damage observed in field conditions. I will outline possible reasons for this, later in this article. The implication of a number of separate observations is that the leaves on larger trees can be intrinsically more frost-tolerant than the leaves of seedlings and smaller trees.

Of course, tissues other than leaves may be damaged by cold. Key ones include the cambium (the living tissue between the bark and wood, which forms new wood and has a host of other essential functions), the bud primordia situated close to the cambium, and the roots. Furthermore, the freezing of water in the sapwood may lead to desiccation

of leaves and shoots, because water lost from leaves cannot be replaced by water taken up by roots. Field evidence suggests that all these aspects can lead to damage of eucalypts that is distinct from any direct damage to leaves by frost, and evidence from scientific studies supports this.

In many cases in which leaves of eucalypts are lost as a result of cold damage, the trees produce new shoots on branches and/or trunks a few months later. This indicates that the buds and associated cambium were not damaged by the cold conditions. I have seen this effect many times myself, and it has been documented quite widely. In cases in which shoots re-sprout from small branches, it is reasonable to think that the cambium, outer stem tissues, and associated buds are hardier than the leaves. Studies using controlled conditions confirm this point for some species. In cases where shoots sprout from the trunk following cold damage, one could also argue that the relatively thick bark on older trees may insulate the cambial and associated tissues, particularly if the damaging cold is of short duration. However, young trees can also recover from frost damage in this manner, so any insulating effect of bark may provide additional resilience in larger trees.

Roots also influence cold tolerance in eucalypts. It is generally assumed that eucalyptus roots do not survive being frozen. This provides the most plausible explanation for the death of many young hardened eucalypts whose shoots were exposed to non-lethal natural frosts in an experiment in Scotland; they were in ground that froze to a depth of 20 cm. However, such ground freezing is exceptional in Australia and many other locations, because prolonged cold conditions are usually associated with snow cover that insulates soils and keeps virtually all the soil profile above 0°C. Nevertheless, water uptake by eucalyptus roots is curtailed in soils close to freezing (the effect is marked in soils at 2.5°C compared with soils at 8°C), while the evergreen habit of eucalypts means that there is still potential for water loss by leaves during winter. This will particularly apply if leaf temperatures rise during daytime because of increases in air temperatures, or through the heating effect of sunshine. The latter effect can lead to leaf temperatures being far warmer than the air temperature in the Snowy Mountains in Australia in winter. This could lead to water deficits in the plants, and hence to tissue damage by desiccation.

In the Snowy Mountains (in the south east of New South Wales), native eucalypts do not appear to suffer water deficits in winter, probably because the soils are snow-covered for several months and hence not frozen to significant depth. However, in the UK I suspect that that damage to young eucalypts through cold-induced desiccation is fairly common. Its symptoms are quite distinctive: it is often manifested weeks after the cold conditions, in warm spring weather, and tends to affect the tops of young trees first. Larger trees in the stands are often less affected than smaller ones, an effect that I ascribe to the root systems of larger trees being more

extensive and deeper. Deeper root systems will exploit warmer soils. The soil temperature at 30cm depth in lowlands in Britain is quite stable during winter and rarely below 6°C; this can be several degrees warmer than soil at 10 cm or shallower.

The snow gums of the Snowy Mountains are damaged by winter conditions, and the realisation that water deficits were not the cause of this was contrary to expectations. The cause of the damage proved to be the intense sunlight following dawn when skies are clear. Under these conditions, the cold leaves cannot photosynthesise efficiently, and the light energy irreversibly damages the photosynthetic mechanisms in the leaves. It seems plausible that such damage also occurs in other locations worldwide.

**Hardening and dehardening in eucalypts**

Hardening, or the lack of it, is a major influence on the adaptation of eucalypts to cold nights and cold winters. Many scientists have tried to unravel the factors that influence the rate and extent of hardening and dehardening in eucalypts, generally using growth chambers to control temperature and daylength regimes. The example of such studies using Scots Pine described earlier demonstrates the insights that can be achieved by this means. A range of eucalyptus species have been studied, but the likelihood that different species have different responses to hardening stimuli must always be kept in mind. Growth chamber studies have confirmed that hardening and dehardening of eucalypts are unaffected by daylength. No work appears to have been done on temperature effects on dehardening of eucalypts, although natural dehardening can be rapid.

Unhardened eucalyptus are usually damaged at temperatures below approximately -4°C. Field evidence following sudden unseasonal frosts suggests that certain species are more tolerant to cold when essentially unhardened. In *E. gunnii*, this effect is quite marked and has been confirmed in two separate studies in growth chambers (unhardened seedlings were 3-4 degrees hardier than species regarded as having little frost tolerance).

Overall, the picture that emerges from a range of studies is that hardening of eucalypts is promoted by low night temperatures. The temperatures required appear to be below 5°C, and temperatures around 0°C seem to be effective. Daytime temperatures appear not to influence hardening. The number of cold nights required for full hardening appears to vary hugely between species, and also appears unrelated to the level of full hardiness that can be induced. It is not clear how frequent the hardening nights have to be for hardening to progress, or for a given level of hardiness to be maintained. Different species may be able to harden at different rates, and evidence from the hardening in some hybrids supports this. The implication is that dehardening will be induced by a series of mild or warm nights.

Such a picture is not unexpected, and broadly accords with the various temperature regimes experienced by eucalypts in different climatic zones



**Pohutukawa, *Metrosideros excelsa*, Tresco Abbey Garden**





**Southern rata, *Metrosdieros umbellata*:**

**Flower showing its conspicuous stamens and an aerial root hanging from a branch.**

of Australia. This in turn would help to explain the relatively good survival of some eucalypts that have been grown as exotics in parts of the world normally regarded as warm and mild, but occasionally subject to sudden frosts. Examples include several species in Sukhumi, on the Black Sea coast of Georgia in January 1950, and *E. neglecta* in Apopka, Florida in 1985-86. The only factor other than temperature that has been shown to influence hardening of some eucalypts is waterlogging, which restricts hardening of species in the sub-genus Monocalyptus including *E. coccifera, E. delegatensis* and *E. pulchella*.

**Genetics**

Within particular eucalyptus species, it has long been recognised that certain seed provenances have better cold tolerance than others. Provenances from the highest elevations are not necessarily the most cold tolerant, and provenances from valleys and depressions that act as frost hollows can be hardier than those from higher elevations. For species with wide natural distribution, the effect of latitude is a further factor influencing hardiness.

Even within provenances, there is frequently much variation in cold tolerance, and this appears to have a genetic basis. Such variation is frequently exploited in eucalyptus breeding programmes around the world, perhaps most notably in south-west France.

***Lessons for those planting eucalypts in frost-prone locations***

For readers who have got this far, it will be apparent that cold-hardiness in eucalypts is influenced by a host of internal and external factors. Couple this with the range of eucalyptus species, and the range of climates in which they grow naturally or are planted as exotics, and one is faced with many uncertainties. It is tempting to just give up trying to understand how eucalypts are influenced by cold, and rely on empirical experience of what generally works well enough when deciding what to plant in any location. I believe this approach is mistaken, even though it is impossible to predict the severity of exceptional frosts.

For people who know the species they wish to plant, because of prior experience locally, then establishment conditions are the key to minimising frost damage. Eucalypts are most susceptible to cold when they are small, so anything that encourages growth prior to the first winter in the field is likely to be beneficial. The establishment factors are all obvious, but nevertheless frequently overlooked:

- Prepare the site in a manner that will permit easy, extensive and deep root growth of the eucalypts. Sub-soiling is frequently beneficial.
- Use good quality, hardened nursery stock.
- Plant in spring, as soon as risk of hard frosts has passed, to make best use of the first growing season.
- Control weeds over the entire root zone, at least until the start of the first winter. Weeds compete very effectively with young trees for both water and nutrients.
- Apply a modest amount of balanced fertiliser around each tree,

within a few weeks of planting, to boost early growth. This is beneficial even on fertile sites, though clearly this is a waste of effort and fertiliser if weeds are present.

It is natural to consider the use of mulches in winter, in order to insulate soil. This is likely to be beneficial in locations where cold periods lasting at least several days can occur. However, the benefit of mulches in locations that are mainly subject to radiation frosts is less certain; the associated sunlight by day may warm bare soil around small trees, and radiation from bare soil during a radiation frost can help protect the aerial parts of young trees.

When planting eucalypts in locations where there are no precedents for consistent success, then it is prudent to start on a modest scale. It is well worth taking advice on the species to try. Also, surviving eucalypts from older plantings in the locality are often a good guide to what is worth trying, though expert advice may be needed to identify them accurately and to suggest other species with similar characteristics. It may be necessary to raise the stock from specified seed sources, as simply planting whatever happens to be available is a recipe for problems. If space is available, small-scale planting in successive years will enable experience to be gained over several winters, and allow the most appropriate species and seed sources to be identified.

One final point concerns eucalypts kept in pots over winter. If the pots are exposed to temperatures close to but above zero, there is potential for damage to the roots, and hence slow recovery in the spring. This applies whether the plants are planted out in spring, or kept in the pots. If the pots freeze, then the roots are likely to be killed, even though the aerial parts of the plant may be hardened and able to survive. Whether the plant later dies will depend on whether it can generate sufficient fresh roots to support survival of the shoot. So it is well worth putting eucalypts in pots into a frost-free greenhouse during cold weather. And if you are buying pot-grown eucalypts, have a good look at the root systems before making your purchase – ones with a moribund-looking root system are best avoided!

*This article is an abridged version of one originally published in the Eucalyptus Action Group newsletter of the New Zealand Farm Foresters Association. The original article, including all the references to sources of information, is available on the APS website.*



# CULINARY AND MEDICINAL APPLICATIONS OF SOME MYRTACEAE

Gary Firth

*Myrtus*, *Lophomyrtus*, *Luma* and *Ugni*, all members of the Myrtaceae family, have been used by native people as food sources and for their medicinal properties for millennia. Recent scientific studies have confirmed that the fruit and leaves of many of these plants contain volatile

bioactive compounds with a range of antimicrobial, anti-oxidant and cytotoxic properties:

The ripe berries of ramarama (*Lophomyrtus bullata*) were eaten by the Maori people of New Zealand and it has been suggested that these and other native fruit contributed to the low incidence of non-infectious disease in these people. Recent studies have demonstrated a high concentration of anthocyanins (which give the berries their deep red colour) in these fruit. Other active compounds extracted from this shrub have been shown to be active against the bacterium *Bacillus subtilis* and also to have cytotoxic activity against certain human cell lines when grown in tissue culture.

The Mapuche people in Chile used extracts of *Luma apiculata* to treat wounds and inflammations and this has also been supported by recent scientific studies which examined the direct blood inhibition of these extracts. There is also evidence to support the centuries old use of murta (*Ugni molinae*) extracts by native Chileans to treat gut and urinary infections. These extracts have been shown to be very rich in vitamin C and phenolic compounds.

The essential oil extracted from the common myrtle (*Myrtus communis*) has been used for centuries. Recent studies have shown it to have activity against *Mycobacterium tuberculosis*, the causative agent of tuberculosis in man. When rubbed on the skin the oil has also been shown to have some repellent effect against the Anopheles mosquito, the carrier of malaria and leishmaniasis. It also has antimicrobial activity against a range of tested bacteria and is being investigated for therapeutic activity against a range of other diseases including diabetes, Alzheimer disease and heart disease.

The fruits of many of these shrubs and trees are edible and plants of *Ugni molinae* (often called Chilian guava) are cultivated specifically for this purpose in New Zealand and Chile. Some commercial 'strawberry flavour' is made from the fruit and it can also be used to make jelly and preserves. It is reputed to have been one of Queen Victoria's favourite fruit and she had it sent by train to London from Cornwall where it was cultivated for her table.

Wines and liquors have been made from the leaves and fruit of many of the species. Natives of Sardinia and Corsica use common mytle to produce an aromatic liquor called 'Mirto'. 'Mirto Rosso' (red) is made from the berries and 'Mirto Bianco' (white) from the leaves. We have found that infusing the myrtle leaves in gin or vodka also makes a very pleasant liquor. Ugni berries can also be infused in gin or vodka using recipes very similar to those employed for making sloe gin.

Needles to say in these health and safety obsessed times I must add the rider 'do not try this at home' unless you are confident of the identification of your plant. Many traditional uses have not been fully backed up by scientific studies and many of the other studies mentioned are still at a preliminary stage.

# BITS AND PIECES

## Growing Sturt's Desert Pea

Sturt's Desert Pea is one of the first ever Australian plants to make it to England. In 1699 the explorer William Dampier made the first known collection by a European on Australian soil, and *Swainsonia formosa* is one of twenty three of his specimens still extant and housed in the Sherardian Herbarium at Oxford[1]. It has the most stunning flowers, as Jenny Stewart's drawing on the back cover shows, but it has a reputation for being difficult to grow.

John Purse reported in Pentachondra 41 (December 2008), that he had successfully grown and flowered Sturt's Desert Pea but that he might have done better had he used a free draining inorganic compost rather than a peat and perlite mix. In 2013 Gary Firth reported[2] that he too had successfully grown Sturt's Desert Pea, in pure perlite in a deep 2 litre rose pot; it is his original plant in Jenny Stewart's drawing. Gary obtained his seed in Australia, purchased from Wildflowers of Australia. He later told me that, like others in the UK he had been unable to overwinter it and suggests treating it like an annual, starting the seed off fairly early in the year.

In Australia too the desert pea is generally treated as an annual though it its native habitat it can be perennial. However the plants longevity and vigour is reported to be much improved by grafting it onto *Clianthus puniceus* (parrot's beak). The process is described in the growing native plants section of the Australian National Botanic Gardens website[3]:

> *Grafting is normally undertaken at the two cotyledon stage, where the Sturt's Desert Pea shoot is positioned between the two cotyledons of a C. puniceus after the original shoot has been removed, and then held in place with the use of small plastic clips until the graft is established.*

Apparently a similar result can be achieved here using *Colutia arborescens* as the rootstock. Chiltern Seeds offer *Colutia arborescens* and *Clianthus formosus* (the old name for *Swainsonia formosa*) as a 'kit'. Has anyone successfully tried this?

**References**


1. Williams, G. 2013. Naturalists at Sea; from Dampier to Darwin pp 24-25 New Haven and London: Yale University Press

2. Plant Heritage Sussex Group Newsletter no. 86 Autumn 2013 p 3.

3. www.anbg.gov.au/gnp/interns-2011/swainsona-formosa.html


## More on Thysanotus

From Tim Darrington in response to the article in issue 53 about growing *Thysanotus:*

Australian Wildflower Seed Pty. Ltd does still exist, or "at least it did in August 2013 because I bought some of its seeds in Sydney botanic gardens when I was there. I have just got the packet out, and they are no longer at Canning Bridge but at Carlisle South (www.wildflowersofaustralia.com.au). Pat Anderson's

seed packet is the same as mine, that is from Australian Wildflower Seed Pty. Ltd. The instructions are standard germination advice for many of their seeds and not specific to *Thysanotus*.

Finally I am not totally convinced that the appearance of small "toadstools" in the pots are explained by the presence of mycorrhizial fungi. This subject seems to be extremely complex, and I try to follow it for orchids. To quote Heinrich Beyrle (www.myorchids.de/mycorrhiza.htm) who has a doctorate in Mycorrhizal synthesis in orchids in the genus Dactylorhiza, there is a "*high degree of specificity (only certain fungi are able to form a mycorrhiza with certain orchids)*". That said, I am playing with the idea of repotting my *Thysanotus* into my standard orchid mix (new or used - this latter will contain orchid mycorrhiza) but mainly because I believe the *Thysanotus* needs extremely light airy substrate similar to orchids!

## Acacia germination

In his germination notes Jeff Irons recommended that to promote germination *Acacia* seeds should be treated with boiling water, or in a few cases hot water, but he did not mention any other treatments. Therefore I was interested to read, in a recent issue of the ANPSA Acacia Study Group Newsletter (no. 128, March 2015, pp 9-10), that the first preference of three experienced propagators whose opinions were sought was nicking or abrading the seed coat, although in a commercial situation boiling water is preferred because it's quicker.

Alan Gibb prefers the nicking technique, his first piece of advice being not to cut your finger! He recommend s holding the seed with your finger nail and using a small, very sharp knife to nick the rounded end of the seed (not the pointy end which could damage the embryo). And that's it; no hot water soaking at all. Bigger seed is easier but the same approach can be used with smaller seed.

Phil Price prefers abrading for any seed big enough to hold between thumb and forefinger. He rubs one of the long sides on a fine emery or sandpaper until a white patch can be seen, which means you have gone through the seed coat. He leaves the treated seeds on a damp paper towel overnight to check they have swelled up, and then plants them into a fairly open potting mix. He finds some seed too brittle to nick and worries about the effect of multiple doses of boiling water with thin and flat seeds.

Joe Wilson advises that, in order, his first preference is to abrade *Acacia* seeds with a medium to coarse sand paper; his second is to use hot water treatment; and his third is to nick the seeds. He notes that you should never nick wet seeds.

## Shining nematolepis

The Millennium Seed Bank runs an adopt a seed scheme to raise funds for its work (www.kew.org/support-kew/adopt-a-seed/). One species on offer is *Nematolepis wilsonii* (shining nematolepis, formerly known as

*Phebalium wilsonii*), an endemic found in the understory of cool temperate rainforest north east of Melbourne. It was thought to have become extinct in the wild when the only known population was wiped out following the 2009 Black Saturday bushfires.

Fortuitously, just weeks before the fires seed had been collected by a team from the Royal Botanic Gardens at Cranbourne as part of the Millennium Seed Bank Partnership.

In addition, RBG Cranbourne had been propagating the species in preparation for the establishment of additional populations in the wild as part of an ongoing translocation programme. (This was initiated not only because of the bushfire threat but also because plants were being seriously damaged by introduced Sambar deer.) Since the fires another wild population has been discovered, but although its future looks to be on the up shining nematolepis remains on the endangered list.

# The Australasian Plant Society

## Minutes of the Special General Meeting Held at Lullingstone Castle, Eynsford, Kent on 15th November 2014

**Members Present:**

Tom Hart Dyke - President
Robbie Blackhall-Miles - Chairman
Ben Ram - Webmaster
Judy Clark - Newsletter Editor
Jeremy Spon - Treasurer/Membership Secretary
John Purse
Robin Drodge
Graham Blunt
Gary Firth

**Guests:**

Maria Firth
Hilary Spon (who took the minutes, for which many thanks)
Sophie Leguil from Plant Heritage

**1. Apologies for absence**

Apologies had been received from Keith Larkin, Tony Entwistle, George Smith, Peter and Trish Kohn, and Christine Yeo.

**2. Growing the Society**

After a welcome from Tom, Robbie asked everyone present to explain briefly who they were and what their main interests were. He then thanked Sophie Leguil for coming and asked her to lead a discussion about the prospects for plant societies, and how the experiences of Plant Heritage and Hortax could help the APS plan future growth in membership and activities. One of the main themes of this discussion was that the expertise and specialist knowledge of APS

members could be of value to Hortax and Plant Heritage, and that being recognised for this was one way to attract new members and persuade more people to grow Australasian plants - both of these being important objectives which we should pursue.

Robbie also asked everyone present what they valued about the APS, and from the responses it was clear that access to a community of fellow enthusiasts was key - to be able to share and find information, plants, seeds, gardens.

There was also a consensus that changes in what people, especially the young, expect from societies like the APS are inevitable, and we have to adapt to these. Increased use of the internet to share information, and greater involvement in conservation issues are two of the most important. Changes in regulations covering collecting and importing plants and seeds could make the role of the APS' members as holders of collections of plants increasingly significant.

**3. Membership**

The cost and structure of membership was discussed, and it was agreed that we should move to a single 'household' membership, rather than separate single and joint memberships. It was also agreed that the cost of membership could reasonably be increased in the next year or two. Costs were continuing to rise, and everyone present felt that membership was excellent value. Provided the objective was both to cover rising costs and to fund expansion of the activities of the Society, it was felt reasonable to consider an increase to £15 for UK members (with the cost for overseas members to be subject to further discussion.) A proposal would be put to the next AGM to implement this increase in either 2016 or 2017.

Robbie said he would like to see a clear statement of the aims of the Society, as this was key to advertising it to potential new members. There was some debate about the exact range of plants we were interested in, but the following form of words was agreed, and will stand as the Society's 'mission statement': "For the promotion, cultivation and conservation of Australasian plants and their closest relatives."

(It was subsequently agreed by the committee to amend this slightly, to read: "For promoting the cultivation and conservation of Australasian plants, and their closest relatives, in northern hemisphere gardens.")

The Society does have a formal constitution, which needs to be reviewed and updated, but it was agreed that it was not practical to cover this during the meeting, and Robbie would look at initiating this process in the coming months.

**4. Seed List**

Robbie raised the question of whether the seed distribution was still meeting the needs of members. There was general agreement that some changes were needed, but that it was unclear whether Richard Christmas was in a position to bring these about. It was agreed that Robbie would approach Richard to ask whether he wanted to try and introduce these changes (improved communication,

earlier distribution of the seed list and the actual seed, a review of the species offered, and their relevance to horticulture in the northern hemisphere, etc.) or whether he would rather hand over the job of seed list manager to someone else. A member had volunteered to take on the job if needed, so this latter option was definitely a viable alternative.

**5. Any Other Business**

Tom reported that the amazing collection of books left to the Society by Brian Halliwell had now been installed in the reading room at Lullingstone, the middle room of the gatehouse, and would be available to members to use with 24 hours notice.

It was agreed that future Annual General Meetings should be held at Lullingstone in November; Judy would put an announcement about this in Pentachondra.

Ideas for events/activities next year:

- Visit to Gary and Maria in East Sussex - 5 minutes from Borde Hill Gardens and near Wakehurst.
- Judy said we should think about staging a display at a garden show; she was willing to volunteer her time. It might be possible to do something in conjunction with Plant Heritage; with forward planning Hampton Court might even be possible.
- Visit to private gardens in Cornwall.
- Visit to Sheffield Botanic Gardens (and other nearby gardens if any are suitable.)
- A Woodland Trust property near Cirencester apparently has greenhouses with many unusual plants.

The meeting concluded with sincere thanks to Tom for his generosity in hosting the meeting, and providing refreshments, and then Tom conducted a tour of his gardens and greenhouses.


## Illustration acknowledgements

Mona Abboud: page 22
Tim and Gillian Burr: front cover, page 10, page 19, page 20 (upper)
Judy Clark: page 20 (lower), page 22 (lower)
Tim Darrington: page 9
Gary Dunlop: page 21 (lower), page 31, page 32
Jeff Layman: page 21 (upper)
Special thanks to Jenny Stewart for permitting the use of her drawing on the back cover.

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**Sturt's Desert Pea**