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Voting in recent elections indicates an upsurge of concern over the degradation of our continent. Australians, particularly the young, are beginning to realise how bad the situation is, how the land we are responsible for and depend upon for our prosperity, is disintegrating.

This Society does not pretend to provide answers to all these problems. We confine our activities, nationally, to specific areas of critical importance, the conservation of the Australian flora and the creatures that depend upon it.

Bush picking is seriously affecting the long-term conservation of our flora and desperate measures are needed. Penalties already exist for many species but lack of conviction and resources has failed to stop the vandalism. Many species, being bush-harvested to approaching extinction, are not protected and governments are reluctant to stop an activity that generates huge export incomes and provides some employment. What can we do?

Plantation cultivation is a preferred option as it produces a reliable supply of a better quality product at a consistent price. This Society has encouraged research into cultivation practices and the development of the best forms of plants. This has been so successful that the wild picking of Christmas Bells was halted over the 2000 season, the only flowers marketed being cultivated.

This issue features the extensive study being made of flannel flower cultivation. Note the range of areas of Australia where growing trials were carried out. We will learn a lot, not only how to grow flannel flowers and to stop their bush picking, but how to grow many other 'difficult' wildflowers.

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Front cover: *Epacris impressa*, the floral emblem of Victoria and also a wildflower of Tasmania. There is a form with a double row of petals as shown on page 109 and many colour variations. Its cultivation has not been easy but advice on pages 104 & 106 may help you to grow these plants. The photograph by Bruce Fuhrer is from the book, *Wildflowers of Victoria* by Margaret Corrick and Bruce Fuhrer (Bloomings Books - RRP \$59.95).

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Flannel flowers

Cultivation for cut flower production is possible!

L. von Richter and C. Offord

The Horticultural Research Section at Mount Annan Botanic Garden (Royal Botanic Gardens Sydney) has been working on aspects of the cultivation of flannel flower (*Actinotus helianthi*) for a number of years. The cut flower research on flannel flower cultivation was funded by the Rural Industries Research and Development Corporation (RIRDC) between 1995–1999 and was conducted in two stages. Firstly, we assessed the feasibility of cultivation of *Actinotus helianthi*, concentrating on overcoming problems with propagation and establishing the basic parameters for field production. The second part of the study was a trial with growers around Australia comparing selected varieties under different cultural and environmental regimes. The following is a summary of these results.

Propagation

Actinotus helianthi can be propagated from seed, vegetatively by cuttings, or by tissue culture. Flannel flowers are prolific seed producers but the seeds often exhibit dormancy. The degree of dormancy varies with the provenance of the seed and the time elapsed since maturation on the plant. In general, seeds left for several months in dry conditions at room temperature ('after-ripened' seed) have a higher percentage of germination than fresh seeds. Germination of fresh or after-ripened seed may be enhanced by dormancy breaking treatments such as gibberellic acid or smoke, direct or applied as water. Smoked water and 'Smoke Plus', a smoked filter paper that when soaked in water releases chemicals, are both available commercially. Seedling flannel flowers exhibit significant variability and therefore clonal propagation methods were investigated.

Flannel flowers can be propagated from cuttings particularly during autumn once the summer growth flush has hardened-off. They are typical of many grey-leafed plants in that they do not like high levels of moisture on the leaves especially during propagation. In our trials the highest strike rate was achieved using IBA at 3000ppm under light mist. Although cuttings are a good way of perpetuating selections, they sometimes exhibit poor root systems and extra care is needed when potting up. We have developed a system for propagating flannel flowers by tissue culture and this is currently in use commercially.

Flannel flowers used in the national trial were mostly tissue-culture propagated as this was the only method available to produce large enough numbers of the individual cut flower varieties selected. The varieties produced in this way were stable and uniform and recognisable at each site even though they were grown under very different conditions.

Editor's note: While this study was directed at the commercial production of flannel flowers as a cut flower crop and the development of a good form for the adoption as the NSW Federation Flower, the spin off for all growers is the more reliable growing of flannel flowers in gardens and public places.



Fig 1: ♂ Flannel flowers, Mt Annan Botanic Gardens preferred selection, with large blooms and symmetrical bract arrangement with distinctive green tips.
All photographs on this page are by Lotte von Richter



Fig. 2: The plant has long straight stems and bushy growth.



Fig. 3: Water filled plant guards provide shelter from frosts, strong winds & animals

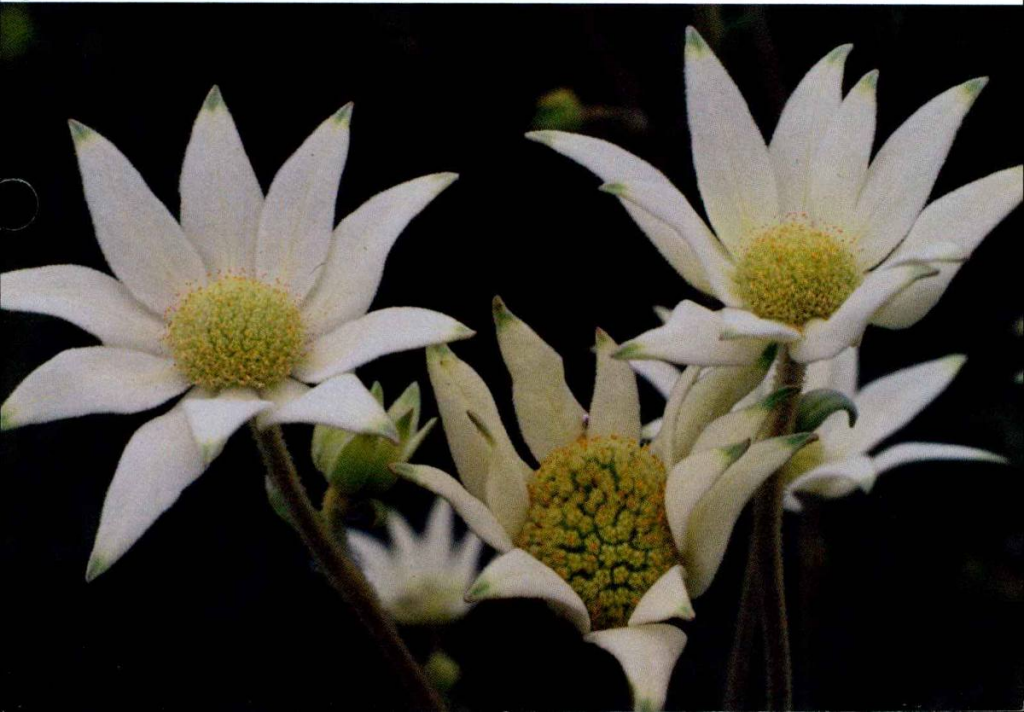


Fig. 4: ♂ *Actinotus schwarzii* in flower, the large blooms to 100mm diam.

Lotte von Richter

Fig. 5: ♀ *Actinotus* 'Starbright' the Federation Flower for NSW

Jaime Plaza



Production by tissue culture may not be commercially viable because:

- Cost of tissue culture propagation is much higher than by seedlings.
- The incidence of failure during the acclimatisation phase has been a problem up to this time both in the research stage and commercially.
- Flannel flowers are likely to be grown as annual or biannual crops and there the cost of replacing plants so often is a serious concern to growers interested in large plantations.

The future for flannel flower propagation may therefore lie in the establishment of 'seed' farms to produce uniform lines of seedlings at a lower cost than tissue culture production. For this to succeed, uniform seed lines need to be developed in situations where uncontrolled cross-pollination cannot occur. At this stage flannel flower types cross readily when grown in close proximity and therefore 'seed' farms need to be located away from natural populations to minimise contamination of the selected seed lines and more importantly to protect the genetic integrity of the natural populations. The challenge with relying on seed for the further development or establishment of flannel flower crops is to overcome the documented germination irregularities and to determine whether dormancy is under genetic or environmental control. The ultimate aim of any flannel flower propagation system is to produce large numbers of uniform plugs at a realistic price, which grow to produce a consistent, marketable and profitable cut-flower crop.

Trial sites

Conducting a national flannel flower trial involved advertising for growers willing to participate for a two-year period and grow 100 plants under their 'usual' management practices. The main objective in site selection was to have a wide range of soil and climate types around Australia.

Plant selections trialled by growers during 1998/1999 indicated that flannel flowers can be grown in many areas of Australia (Table 1). The most promising sites were at Mundijong (WA), Longford (VIC), Castlemaine (VIC), Lockyer Valley (QLD), Peachester (QLD), Kempsey (NSW), Craven (NSW), Bobs Farm (NSW) and Myola (NSW). At Humptydoo (NT) and Bowhill (SA) the climate and soil are likely to be unfavourable for flannel flowers. The failure at Bundaberg (QLD) was due to flooding and we feel that under other, less extreme weather conditions, the area could produce flannel flowers. Some sites, like Coorow (WA), Cobram (VIC), Robertson (NSW) and Dareton (NSW), may be marginal in their suitability for flannel flower production but further trials would be needed to confirm this. Some other sites like Denmark (WA) and Crows Nest (QLD) did not have a high survival rate at the end of the trial period but the remaining individual plants were healthy specimens allowing the conclusion to be drawn that the site is suitable. Had these growers received plants at the optimal planting time and stage of growth, without transport problems, the results may have been better. Each site has its own issues and these can be found in the full research report.

Table 1 (opposite). Flannel flower trial. The results given refer to the survival and quality of flannel flowers at each site, giving an indication of the suitability of the site for growing flannel flowers. %S = % of plants surviving at this site and

PI. Q = Plant quality ranked 1–4, with 4 being the highest quality

Table 1

Site	% S	Pl. Q	Comments	Soil type pH if known	Other crops at this site
Coorow WA	54	1	Very exposed site, plants did not thrive, drainage good, transportation a problem	Sand over gravel	Geraldton Wax, Kangaroo Paws, <i>Banksia</i>
Mundijong WA	61	4	High stem numbers but plants needed support and weed control. Fertigation appears useful on flannel flowers	Sand 6-6.5	Kangaroo Paws, <i>Boronia</i> , Geraldton Wax
Denmark WA	21	4	Losses due to transport problems and autumn planting. Good plant support	Gravel loam sandy loam 5.2	<i>Banksia</i> , <i>Dryandra</i> , Riceflower, <i>Thryptomene</i>
Cobram VIC	23	2	Very cold / frosty site, autumn planting unsuitable and transport a problem. Plant guards successful	Sand and sandy loam 6.5	<i>Banksia</i> , <i>Eucalyptus</i> , <i>Protea</i> , <i>Leucadendron</i>
Longford VIC	45	4	Windy exposed site, transport a problem	Sand 4.5-5	<i>Banksia</i> , <i>Leucospermum</i>
Castlemaine VIC	38	3	Site suitable, losses due to autumn planting and transport problems	Sandy loam, granite soil 6-6.5	<i>Protea</i> , <i>Baeckea</i> , <i>Isopogon</i>
Bowhill SA	0	-	Transport problems, high pH soil	Sandy loam 7.5 - 8	Roses, <i>Limonium</i>
Lockyer Waters QLD	27	4	Site suitable, losses due to transplanting from one site to another.	Loam 6.2	
Crows Nest QLD	60	3	Site suitable, <i>Fusarium</i> sp. identified on site	Decomposed granite 6-6.5	Geraldton Wax, <i>Grevillea</i> , <i>Eucalyptus</i> , <i>Agonis</i>
Bundaberg QLD	0	-	Flooded	Clay 6.4	Chrysanthemums, Christmas Bush, Riceflower
Peachester QLD	85	4	Site suitable, even in wet seasons	Red sandy loam 5.5-6	<i>Protea</i> , <i>Leucospermum</i> , <i>Leucadendron</i> , Waratah, <i>Banksia</i>
Humptydoo NT	0	-	Climate alternately too hot and wet or too dry		Heliconias, Ginger
Dareton NSW	38	2	Plants did not thrive, soil pH maybe too high	Red-brown loamy sand 7.3-8.2	Geraldton Wax
Kempsey NSW	56	4	Grown in bags in a poly-house. Potting mix (70% bark, 10% peat, 20% sand)	Potting mix	Christmas Bush in ground as opposed to potting mix
Craven NSW	67	4	Site suitable, plant support needed	Loam over clay 5.5	<i>Eucalypts</i> , <i>Grevillea</i> , Christmas Bush
Myola NSW	73	4	Ideal site, well protected and suitable soil conditions	Sand 4.5-5.5	Kangaroo Paws, <i>Banksia</i> , <i>Protea</i> , <i>Leucadendron</i>
Bobs Farm NSW	55	4	Site suitable for flannel flowers	Sand 4.5-5	<i>Eriostemon</i> , Waratah
Robertson NSW	21	1	Possibly too damp and cool with heavy soils on the site	Clay loam 6	Lilliums, Nerines, <i>Iris</i> , <i>Proteas</i> , <i>Leucadendron</i>



Fig. 6: Floral mesh used to support plants.

Lotte von Richter

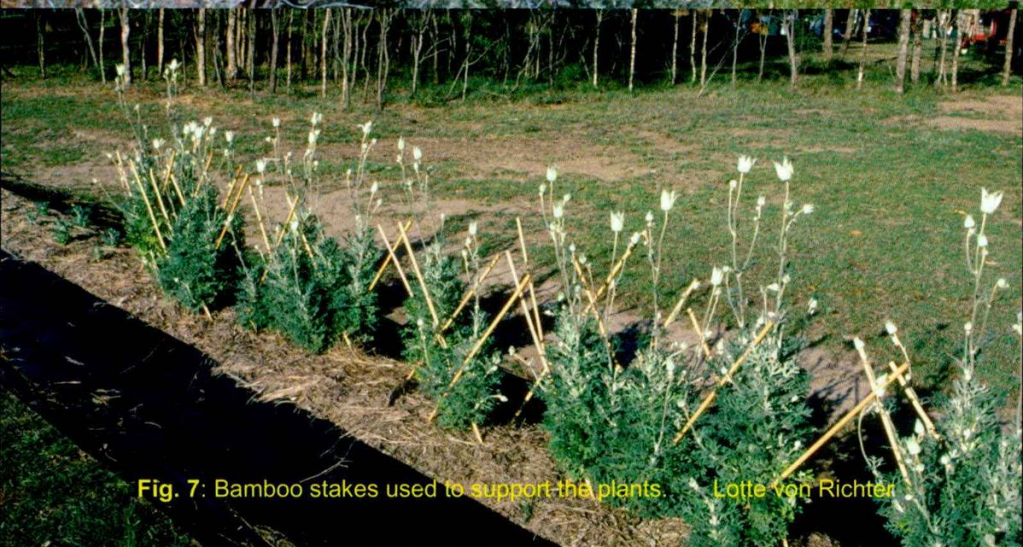


Fig. 7: Bamboo stakes used to support the plants.

Lotte von Richter



Fig. 8: Two different types of plant guards

Lotte von Richter

Varietal performance

Five flannel flower selections were tested during the national trial and one of these is being further developed as a cut-flower variety with export potential. This selection (Figs. 1 & 2) proved to be the most suitable on most of the sites tested. It has long stems averaging 74cm that are strong and straight, and has large blooms averaging 93mm in diameter. The bract arrangement is even, presenting as two whorls of five bracts, the inner ones slightly smaller and narrower. The bracts have obvious green tips that are distinctive for flannel flowers.

Actinotus schwarzii

Another flannel flower tested was a selection of *Actinotus schwarzii*. This species, from the MacDonnell Ranges in the Northern Territory, was grown in pots at Mount Annan Botanic Garden and had caught the eye of several cut flower growers. *Actinotus schwarzii* has large flowers (Fig. 4) approximately 100mm in diameter with a greenish mid-vein ending in a green tip. In cultivation it failed at all sites except one in Queensland (Peachester) and even there it did not thrive. The varied conditions of all the field trials indicate that this species may be restricted to its natural populations in Central Australia where the humidity is much lower than the sites used in this trial. At Mount Annan Botanic Garden two clones of this species have been grown under different conditions: in raised beds with an artificial mix and underground Aquapore watering system; in pots in a polyhouse; and in pots in a controlled environment glasshouse. Only those plants in the glasshouse, where the temperature was regulated and the humidity reduced by the use of fans, produced any noteworthy flowering stems. This species has potential for future breeding as it may impart some useful traits such as large flower size, drought tolerance and hybrid vigour. To reach that stage, the breeding system of *Actinotus* needs to be determined.

Planting time

Planting time is one of the most important considerations arising from this trial. The northern growers (Queensland) were able to establish flannel flowers when planted during May whereas southern growers, particularly in Victoria, had serious losses with May planting. The use of plant guards (Fig. 3) for protection against cold can also provide protection against wind and animals, which were problems during the establishment phase. It is recommended that flannel flowers be planted as relatively young plants as this allows the root system to develop in the soil rather than risk pot-bound plants. Square pots or tubes are more suitable than round pots for young plant propagation. Some propagators selling seedling flannel flowers to the cut-flower industry are now doing this.

Plant spacing

Growers were requested to plant the flannel flowers at a spacing of 30cm. This spacing is suitable for production growing as the closeness provides some support for adjoining plants. Some limiting factors need to be considered including the type of irrigation system used. Any form of raised sprinkler type irrigation could result in the lower leaves remaining too wet and rotting-off with limited air circulation at close spacing. Seedling propagated

plants may be planted at 15cm spacing which decreases the number of stems per plant but increases the yield per unit area.

Wind protection

Wind protection was an issue at many of the trial sites. Flannel flowers appear to have a relatively shallow root system if grown from tissue culture or cuttings and some form of wind protection is necessary to ensure stable adult plants with long straight stems. Some seedling plants when uprooted have a significant tap root that provides stability but at this stage seedlings are too variable in growth habit and flower production to be used as a guaranteed source of quality cut flower. It is still in the industry's interest to use vegetatively propagated flannel flower selections, given that greater gains can be made if they are available. Several methods of wind protection are available to growers and must be determined for each site, the cost and the preference by the grower taken into consideration, but the use of floral mesh and plastic plant guards have been successful on flannel flowers. Floral mesh (Fig. 6) positioned about 15–20cm above the ground is sufficient to stabilise the growing plant and generally the stems do not require extra support if they are vertical at the base of the plant from the beginning. Stakes may also be used with good effect (Fig. 7). These systems are suitable in areas where frost is not a problem. In cooler areas, the use of plant guards (Fig. 8) may be preferable to avoid frost damage and protect against wind but care must be taken to remove the plastic as the plant grows, otherwise high humidity in the sleeve could cause rotting of the lower leaves.

***Fusarium* wilt**

One of the most serious problems arising from this trial was the incidence of *Fusarium* wilt. Two *Fusarium* species have been isolated, *F. oxysporum* and *F. solani*. These are very common soil fungi with a very wide natural distribution that cause plant collar rots and wilting. They are likely to cause plant death when the host plants are under stress from excessive rain or high humidity. At present there are no controls for this but we are currently conducting trials on varieties that may have greater resistance to this fungus.

Transportation

Plant distribution proved to be one of the most difficult aspects in the early stages of the project. This was despite assurances from the transport companies that the plants would arrive in good condition. Transportation to outlying areas was very unreliable, expensive and generally plant material was handled very poorly. Airfreight, although quick, resulted in half the shipments arriving upside down or badly shaken. The cardboard cartons were labelled on all four sides to indicate live plant material and the direction of top and bottom. These cartons were closed at the top and it has been suggested since then, that the tops of the cartons be left open to make the contents more obvious. The difficulties experienced highlight general problems with plant transportation in Australia. In future arrangements of this type it may be preferable for growers to organise their own transportation, as they generally know what works for them.

Seed production trial and commercial release

Seed production is being trialled with a number of growers in NSW and Queensland. We anticipate that seed of the selected variety may be available in the next couple of years, but firstly we must ensure that the seed produced in this way is viable and true to type. This type of commercial production has not been done before for this species or for many Australian species and it takes time to develop the technology. In the meantime a limited number of tissue culture propagated plants of R187, our preferred selection, are available for cut flower producers from Mount Annan Botanic Garden.

Recommendations

Considerable work could still be carried out to optimise flannel flower production in the field. These issues can be broadly grouped as cultural requirements, propagation, breeding and marketing and include:

- Conduct fertiliser and watering optimisation studies in the field
- Improve the use of wind protection in the field
- Assess the benefits of different mulches
- Improve young plant survival in the field
- The industry develops improved varieties
- Develop frost-resistant varieties
- Identify the breeding system of *Actinotus* and explore the use of species such as *A. schwarzii* in a breeding program

Flannel flower cultivation for cut flower production is possible in a wide range of climate and soil types as long as good management practices are followed. This crop needs to be managed intensively like other cut flower crops requiring good soil drainage, sufficient water in dry climates, adequate nutrition and good wind protection. Although flannel flowers have been tested on field sites their performance in artificial mixes under cover could be an alternative production system.

NSW Floral Emblem of the Federation of Australia

This year Australia is celebrating 100 years since Federation. The flannel flower has been chosen as the floral emblem for NSW during 2001. To commemorate this occasion the NSW Centenary of Federation Committee and the Royal Botanic Gardens Sydney have released a range of flannel flowers. Two varieties 'Starbright' (Fig. 5) and 'Parkes Star' are being marketed under the 'Federation Stars'™ label as they are most suited to garden and pot plant cultivation. Information about Federation Stars and how to grow them is found on the RBG website <http://www.rbg Syd.nsw.gov.au>.

Useful References

- Bullock, S., Summerell, B.A. and von Richter, L. (1998). First record of vascular wilt of Flannel flower caused by *Fusarium oxysporum*. *Australasian Plant Pathology* 27:49-50.
- Offord, C.A. and Tyler, J.L. (1993). Flannel Flowers have a promising future. *Australian Horticulture* 91 (12): 50-52.
- Offord, C.A. (1994). The horticultural potential of Flannel Flowers. In 'Proceedings III National Workshop for Australian Native Flowers'. 5 pp. (Gatton College).
- Offord, C.A. and Tyler, J.L. (1996). Flannel Flowers. In 'Horticulture of Australian Plants', (Eds M. Burchett and K. Johnston). pp. 212-217. (UNSW Press: Sydney).

Continued on Page 107

Epacrids from cuttings

Propagation of wildflowers, part 1 _____ by Ross Doig*

Members of the *Epacris* family (Epacridaceae) have generally been considered very difficult to propagate from both seed and cuttings. Problems with collection of seed, the fiddly nature of dealing with such fine seed and difficulties in potting on tiny seedlings with fine, hair roots have led me to eschew seeds in favour of cuttings. I have used (under Sydney conditions) three systems for propagating cuttings, two described follow:

Propagation system 1

Two large foam fruit boxes have the undulating tops cut off squarely. They are then glued together (one box being turned upside down) and, when bonded, a slanting cut is made from back to front giving a height of 390mm at the rear and 230mm at the front (original boxes 570mm by 380mm). Semi-rigid plastic (laminating plastic) is then used to cover the slanting top. The four edges are crimped down to overlap each side to a depth of 6cm. The foam box is kept permanently in semi-shade with minimal morning sun.

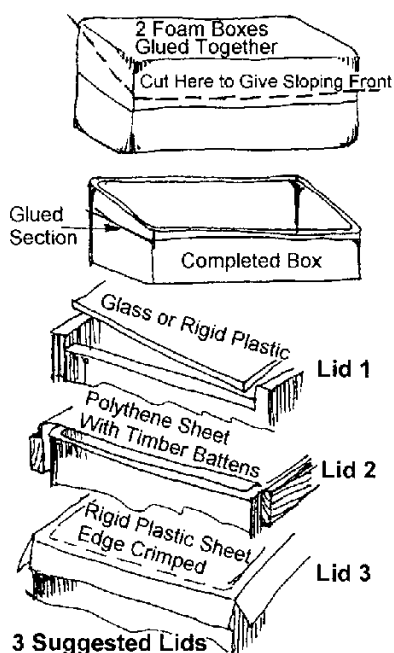
My propagation mix is river sand from the Colo River washed in a bucket to remove silt. You could use crushed sandstone from 2mm size down to just above silt size. Some people add peat moss (coir is now preferred being environmentally friendly) with great success but with this system I have not found it necessary. Each cutting averages between 80mm and 250mm selected from growing tips or side shoots and leaves are left up to half the length of the cutting. The cuttings are dipped in Yellow "Induce" or Yates Hormone Powder and placed in a 50 x 70mm tube, usually 6 cuttings per tube. Firm down with a flat knitting needle end and water thoroughly. Many propagators are now using Clonex Gel but I have not found it better than my old method using a cutting powder.

The pots or tubes rest directly on the base of the box but if the base has holes a polythene sheet is fitted in the bottom. Use tongs to lift out the tubes to water them. Mist or spray once a day preferably late morning when hot (26°C or higher). The box will hold 60 tubes.

Propagation system 2

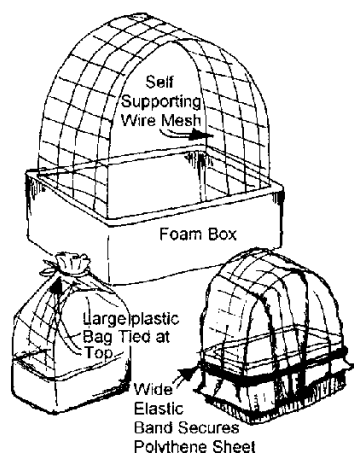
The boxes in system 1 are placed in a dry, plastic-walled, fibreglass-roofed shade-house, with a door and a set of louvers at each end for ventilation. This shade-house is shown on page 132. A shade-cloth blind is used over the roof in the heat of summer. Watering of cuttings is done individually, with minimum wetting of leaves and spraying of cuttings once a day when air temperature rises to 27°C and above. Epacridaceae struck in a period between six and twelve months:

Acrotiche divaricata, *Astroloma pinifolium*, *A. humifusum*, *Dracophyllum secundum*, *Epacris longiflora*, *E. pulchella*, *E. purpurascens*, *E. microphylla*, *E. crassifolia*, *E. obtusifolia*, *Leucopogon microphyllus*, *L. amplexicaulis*, *L. lanceolatus*, *L. setiger*, *L. ericoides*, *L. virgatus*, *Lissanthe strigosa*, *Melichrus procumbens*, *Monotoca elliptica*, *M. scoparia*, *Sprengella incarnata*, *Styphelia tubiflora*, *S. laeta*, *S. longifolia*, *S. triflora*, *S. viridis* and *Woolisia pungens*.

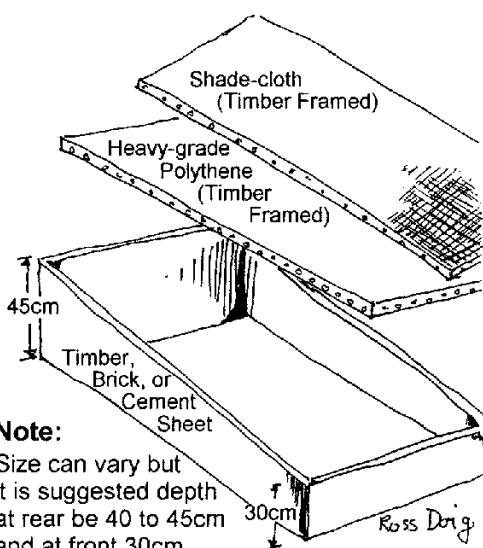


⇐ Propagation system 1, Box 1.

- (a) Cut the tops of the foam boxes to achieve straightness to the sides.
- (b) Glue one box onto the other forming a box without openings.
- (c) Cut the box on an angle as shown. The angled top allows condensation to run off and accommodates cuttings of different lengths.
- (d) Make a cover for the slanting top of either:
 - 1) glass or rigid plastic,
 - 2) polythene sheet stapled to a frame, or
 - 3) laminated plastic with a crimped edge.



↑ **Box 2** is an alternative container that is very successful and simple to make.



Note:

Size can vary but it is suggested depth at rear be 40 to 45cm and at front 30cm.

↑ **Box 3** is similar but fixed in its site.

Failures have been *Epacris muelleri* and *E. rigida*, and *Lissanthe sapida*. Most of the above have been tried once or twice and opportunity for further trial has not arisen. As a result of experience with epacrids the following observations can be made:

- It is possible to take cuttings at any time of the year, to hold them for a year, or longer and with a 'fine watering system', achieve 30% strikes
- With suitable half hardened wood, long cuttings of up to 300mm and cuttings with terminal shoots can be utilised
- Hormone powders of medium strength are suitable
- Care must be taken, in potting on, as roots of most of this family are fine, in fact, hair-like. Either retain as much cutting medium around the roots as possible or ensure that they are spread out. Roots clumped against the stem will cause the plant to die promptly. This applies to all species of this family that I have tried
- Bush sand with leaf mould mixed in and a small amount of sandy clay (tennis loam) to supply iron is an ideal potting mix. Osmocote native plant slow release pellets provide extra food
- After potting up, newly struck cuttings are staged in a foam box with loose cover for two weeks, then placed on an open bench for a further two weeks. They are then put (closely packed) in foam boxes in semi shade until planted out

In general, species of this family make slow top and root growth and can be held in the nursery for up to two years. 100mm and 150mm tumblers and square tubes are therefore suitable for plants up 30cm.

Considering the beauty of many of this family and the long flowering period of some, propagation from cuttings is worthwhile with the added bonus of flowering in the first season in the ground or pots as opposed to at least two seasons to flower from seed.

Further Reading

Burns, Dick, *Epacris: Their Cultivation in Tasmania*, see this issue page 106.

Crowden, R.K., Menadue, Y., *Tasmanian Epacridaceae*, *Australian Plants*, March 2001, page 46.

Gilmour, C.A., Crowden, R.K. and Koutoulis, A., *Heat Shock, smoke and darkness: partner cues in promoting seed germination in Epacris tasmanica (Epacridaceae)*, *Australian Journal of Botany*, 48:603-609.

Should I Grow Wildflowers is a book produced by the Department of Primary Industries, Queensland, RRP \$79.95, in their **Agrilink Series**, "Your growing guide for better farming". A book of 140 A4 pages, it is presented for the country people of Queensland who are contemplating establishing a plantation of wildflowers to produce cut-flowers for export. The book takes a critical look at the problems and investment involved and then devotes a page to each of the 'major traded cultivated species', with good colour plates and comments on production and marketing. These include *Eucalyptus* species, Kangaroo Paw, Riceflower, *Baeckea*, *Banksia*, Christmas Bush, Everlasting Daisies, Flannel Flower, *Grevillea*, *Ptilotus* and *Scholtzia*. Very simply and well presented, it is a valuable acquisition for those contemplating going into cut flower production.

Damp gardening

Don't drain that boggy spot, plant it _____ by Nick Romanowski*

The simplest treatment for a boggy place in the garden is planting it. This reduces erosion and nutrient runoff, which affect wetlands and creeks "downstream". It generally increases the attractiveness of the garden to a wide range of animals from birds to insects, and frogs. It is also a lot easier, cheaper and more attractive than digging in pipes. The most serious objection I have heard to planting wet places is that few plants tolerate such conditions, but that is far from true.

Constructing a bog garden

Not all gardeners are lucky enough to have a naturally boggy area available for planting but it is neither hard nor expensive to create one, even if you do not want to put in a pond as well.

The preparation involved in making a bog garden is nowhere near as much work as that involved in making a pond. With a little care in construction, even inexpensive materials, such as black plastic sheeting, can be used to create a feature that will last for decades, or even a lifetime. The water-retaining parts of bog garden liners should be completely buried, away from the ultraviolet light which rapidly destroys all but the most expensive pond liners, and a rock or tile border will be enough to protect as well as hide their exposed edges.

For most bog plants, a soil depth of 15cm is perfectly adequate for vigorous growth. If you are not around to keep up the water supply through most of the warmer months make it 30–40cm deep, so that there is a long-lasting, deep reservoir of water in the lowest part of the liner. Line the underside of the liner with a thick blanket of wet newspaper to protect it.

Waterlogged soils are completely sodden, so any hole pressed into them will fill with water within a short time. As water displaces air in the soil, cutting off the oxygen supply, plants that survive waterlogged conditions must be able to pump oxygen down to the roots from the leaves up above. They must also tolerate flooding, even for weeks at a time and be able to tolerate some drying out. They will not necessarily thrive in merely wet conditions.

* *Water Garden Plants & Animals* by Nick Romanowski: (UNSW Press).

This book is exceptional value at \$37.95 for anyone who wishes to include a water feature in their garden, establish a bog garden, or has a problem with a wet spot. The book deals not only with native Australian species but all plants that will grow in these conditions in an Australian garden located either in the tropics or anywhere south to Tasmania and is illustrated with 190 colour plates. Nick has contributed many articles for *Australian Plants*. Refer to volume 17, page 143 onwards, vol. 18, page 324 for "Frog-scape Your Garden", and vol. 19, page 358 onwards for "A Garden Water Feature & Building new pools", and vol. 20, page 91 for "Plants for wet areas". These issues feature some 30 species in colour to illustrate the detailed advice given. I try to include an article on wet/water gardening in each volume of *Australian Plants*. However, as the articles in the volumes collectively cover the subject very well, I shall confine this article to the subject of this issue, Epacris, and the problems associated with artificially creating or dealing with a periodic damp situation. Many of our heathland plants have evolved under these conditions and the range of plants that we can grow can be extended. Editor.

A permanently wet but not waterlogged garden

Some books recommend puncturing the newly placed liner so that the pond will not be 'too boggy' but this defeats the point of using it in the first place and will cost dearly in watering during summer. If you want to grow some plants which cannot tolerate being waterlogged for long periods, raise parts of the soil up 5–10cm above the highest level of the liner. To grow mainly plants which will not tolerate being waterlogged, dig the whole liner in about 10cm deeper than for a waterlogged bed, and trim it 10cm below the soil's surface. This will create a 10cm zone of soil which will never be waterlogged, yet gives plants the deep, underlying water-table that most water-loving species need for best growth and flowering.

This is also a way to replicate a heathland situation as enjoyed by many plants including *Epacris*. It is important to allow such plants a drier phase during warmer weather, with only an occasional soaking to keep the buried liner from drying out completely. Waterlogged and wet soils in spring are cold and relatively oxygen rich, while warm, waterlogged soils are anaerobic and can be toxic to plant roots.

Not all *Epacris* species will tolerate being seasonally waterlogged, and none will thrive if their soils remain wet through the whole year. Even within species there are variations. Deep pink and crimson forms of *Epacris impressa* are common on high and well-drained sections of our property. Downhill, white and pale pink forms predominate on poorly drained soils.

Alpine areas are seasonally waterlogged followed by periods of normal weather, which may be locally very hot and dry. These conditions can be artificially created but the plants you can grow could be restricted by the local weather. These plants have evolved in cool conditions and temperatures above 25°C with soil temperatures well below 20°C may be necessary.

Soils and fertiliser

Despite the diversity of habitats from which water's-edge plants come, most prefer similar soils on the acid side, with little or no lime and reasonably rich in organic matter. Most garden soils are suitable as long as they are not largely infertile sand or pure clay though the more water tolerant *Epacris impressa* species will usually thrive in a mixture of 25% peat and 75% sandy soil. If necessary improve the soil using your favourite method.

It is not necessary to improve all the soil used within a liner; only the top 10cm are particularly important for good growth as deeper layers are mainly a water reservoir. Use a sterilised soil for the surface layer or destroy most potential weeds by hand as follows. Spread the soil to be treated about 5cm deep and water it well to encourage seedlings to appear. This will happen within days in warm weather and, while they are still tiny, roll them over and rake them in so they die from lack of light. Keep the soil well watered and a new weed crop will appear just as quickly; treat these the same way. Within a few rakings, most of the seed will have germinated and a blanket of wet newspaper over the surface will kill any remaining within two or three weeks.

A quick flick through my files suggests that there are at least 500 Australian plants that are adapted to seasonal flooding. It is surprising how many will grow if they have the water they need in their season.



Ludwigia octovalvis

Shrub of seasonal tropical watercourses



Milligania densiflora

from high-altitude seepage zones among rocks.

Epacris

Cultivation in Tasmania

by Dick Burns

Epacris barbata is not currently in wide cultivation, but deserves to be. A small species that produces masses of white flowers, it would be an asset in a cottage garden. It copes with dappled shade and prefers well-drained soil.

Epacris curtisii is an attractive delicate species that has, in my experience, proved short-lived in cultivation. In exposed positions it maintains a low growth, but will grow tall and sparse in sheltered sites. Tip pruning is needed.

Epacris exserta can be found in various forms. Often found as a tall open shrub, my specimen is a low rounded shrub that flowers for extended periods. It grows in drained soil and tolerates some shade and dry periods. My plant has lived for twenty years. Photo on page 117, description on page 123.

Epacris grandis has been difficult to propagate in the past, but it is now available. It enjoys some shade and grows in drained soil. It does not tolerate drying out. Tip pruning will prevent lanky growth. Photo on page 120.

Epacris gunnii, when in flower, makes a spectacular display. It is similar to *E. microphylla*, but larger in all parts. Found naturally in the wetter parts of Tasmania, it grows well in a suburban garden, preferring full sun and with regular watering. It is probably more tolerant of poorly drained soils than other species. A good double form is available. Photo on page 120.

Epacris impressa can be found in many different colour forms ranging from white through pinks to red. Flower presentation is varied as well, from single lines of flowers down the stem to several parallel lines of flowers along the stem. This species is long-lived in the garden. It grows in sun or semi-shade and will grow close to eucalypts. Some good double forms are in cultivation.

Epacris lanuginosa is a good choice for those with poorly drained gardens. Prone to growing lanky, regular pruning will produce a dense bush with good floral display. A large form with flowers about twice normal size grows in a few localities on the east coast of Tasmania. Photo on page 108.

Epacris marginata is a spectacular plant from the east coast, easy to grow for some but for others it proves impossible. In the wild, it tolerates a variety of conditions, from full sun to well shaded growing close to sea cliffs and in sheltered gullies. It most frequently grows in clay derived from the rock dolerite and would probably tolerate slight salinity. Possibly it would grow best in well-watered gardens. Photo on page 109.

Epacris myrtifolia is a mass-flowering species with varied forms. In the wild, it can reach over 2m in height. My plant is a low spreading form, growing in full sun and flowering over a period of more than twenty years. It tolerates dry periods. Photo on page 116, description on page 121.

Epacris petrophila is a delicate plant from the highlands, an excellent long-living garden plant. It grows in some shade and benefits from regular watering, maintaining a good shape without pruning.

Epacris serpyllifolia is a low growing species from alpine areas that will grow in cultivation. It prefers full sun and wet peaty soil. Given the right conditions, the floral display of tiny massed flowers would be spectacular.

Epacris sp. 'Union Bridge' is a species of the riverbanks of a few rivers in the north of the State, an upright shrub that will grow in a dry garden. It prefers some shade. It is slow growing but long-lived. Photo on page 117, description on page 122.

Propagation of *Epacris*

Epacris species can be propagated from either seed or cuttings. Some have found that smoke solution increases success with germination. Success with the rooting of cuttings is variable. Because of the fine roots, it is generally recommended that separate tubes be used for the cuttings. Some species strike easily from tip cuttings dipped in liquid or gel hormone. These are placed in a standard cutting mix of 3:1 sharp sand: peat moss.

Flannel Flowers – continued from page 99

von Richter, L. and Offord, C.A. (1996). Flannel Flowers as cut-flowers. In 'Proceedings IV National Workshop for Australian Native Flowers'. pp. 253-258. (University of Western Australia).

von Richter, L.V. and Offord, C.A. (1997c). Development of Flannel Flowers as cut flowers. Rural Industries Research and Development Corporation. Final report RBG-1A. (http://www.rirdc.gov.au/reports/Index.htm#Wildflowers_Native_Plants)

von Richter, L. and Offord, C. (1998a). Flannel flowers. In 'The New Rural Industries, A Handbook for Farmers and Investors'. (Ed. K. W. Hyde). pp. 505-511. (Rural Industries Research and Development Corporation: Canberra).

von Richter, L. and Offord, C. (1998b). Propagation of Flannel flowers. Combined Proceedings of the International Plant Propagators Society. 47: 71-73.

von Richter, L.V. and Offord, C.A. (1999). Factors affecting field performance of flannel flowers. 5th Australian Wildflower Conference, 14-17 April 1999, Carlton Crest hotel, Melbourne pp. 124-125.

von Richter, L.V. and Offord, C.A. (2000). Flannel flower: Development of a production system. Rural Industries Research and Development Corporation. Final report RBG-2A. (http://www.rirdc.gov.au/reports/Index.htm#Wildflowers_Native_Plants)

Cultivation notes for flannel flowers

Extract from RBG Web site by the Editor

At Mount Annan Botanic Garden flannel flowers have been successfully grown in a mix of 40% coarse sand, 40% well composted pine bark and 20% loam. A moderately acid soil mix with a pH of 5-6 is best. Plant support as shown on page 96 may be needed. Fungal problems can be minimised by avoiding wetting of the leaves. The bed at Mount Annan has a 'leaky pipe' (Aquapore™) underground watering system. For best results a slow release fertiliser such as OsmocotePlus should be used. Supplementary applications of a complete liquid fertiliser at 2-3 week intervals may assist plant health. Organic mulch to a depth of 75mm assists moisture retention and temperature control in the root zone. Contact between the stem and the mulch should be avoided. Weeding around the base of the plant may damage the shallow root system, so weeds should be cut off at ground level. After flowering, tip pruning and removal of dead leaves is recommended.



Epacris tasmanica

See page 124

R. Crowden



Epacris corymbiflora

See page 125

R. Crowden



Epacris lanuginosa

See page 125

J. Simmons



Epacris virgata

See page 124

R. Crowden



Epacris barbata R. Crowden
See page 123



Epacris impressa R. Crowden
See page 125



Epacris marginata
R. Crowden
See page 121



Epacris curtisii R. Crowden
See page 121

Pink everlasting daisy

A plant breeding perspective

by Beng Tan, Dept. Environmental Biology, Curtin University

The Pink Everlasting Daisy (*Rhodanthe chlorocephala* ssp. *rosea*, formerly *Helipterum roseum*) has provided a 'meadow of pink' as a backdrop at every Kings Park Wildflower Festival in Perth. Originating as a small impoverished population in Port Gregory in WA, this native daisy has become a popular spring bedding ornamental in landscaped public parks and native gardens. Its increasing popularity has also generated a healthy trade for its seed.

Opportunities abound for the selection and development of novel strains, given the species' copious genetic variability. Anecdotally, samples of the original unselected population were taken to Spain for horticultural purposes and improved strains have found their way back to Australia.

Other members of the sunflower and daisy family (Asteraceae) have had a long history of cultivation, selection and breeding, producing an enormous range of flower colours, shapes and forms, as exemplified by *Chrysanthemum* and *Dahlia*. Compared with these exotic asteraceous cousins, Pink Everlasting and other Australian daisies (e.g. *Brachyscome*, *Helichrysum*) have only recently been domesticated. Given sufficient horticultural impetus and plant breeding they too can undergo impressive transformation. This overview seeks to stimulate such development.

This pink native daisy has received some attention from researchers in the areas of seed dormancy and chemical compaction, the latter with a view to enhancing pot culture. Other aspects worthy of research attention include induced out-of-season flowering and pollination biology. Does the plant require low night temperatures and/or short days to flower? It is still debatable whether the flower is wind or insect-pollinated, although outcrossing is tacitly assumed on evidence of apparent heterogeneity of most populations. Although pollen-collecting insects (e.g. honey and native bees) do visit the flowers, visitations are infrequent. The fact that plants grown in isolation can set seed suggests that some (facultative) selfing may also be involved. A better understanding of the pollination mechanism(s) will obviously have a bearing on seed production, especially in the development of new forms without erosion of plant vigour.

The Flower's versatility

Although flowering is from early to late spring, flower stems and heads can be preserved by glycerine treatment to create fresh looking bouquets; the 'flowering season' and visual pleasure can thus be extended indoors.

Individual flowers open after sunrise and close before sunset. This night-closing behaviour (nyctinasty) is a characteristic of some members of the daisy group e.g. *Arctotis*. Turning on the sprinkler during the day will similarly induce the flower heads to close.

Strain development

Plants raised from commercial seed are typically heterogeneous in respect of plant vigour, flower size and pink hue. Heterogeneity provides genetic resilience in natural populations in events of pest attacks and diseases, as well as providing some physiological buffer to stress in poor seasons. Uniformity, however, is a widely cherished imperative in modern horticulture. The genetic virtues embedded in plant variability are less relevant when plants are pampered by luxuriant cultivation practices and protected by pesticides. Heterogeneity, if desirable on aesthetic ground, can also be presented and managed through seed blending or mixed plantings of 'pure' strains, which can be varied, as in *Petunia*. There are many opportunities for selecting distinct forms of Pink Everlasting from within both cultivated and wild populations. Whether selected variants can be maintained as distinct forms will depend on the underlying genetics of the variant characters, as well as the plant's breeding behaviour. Neither is sufficiently understood, but progress can be made, with educated guesses and observation.

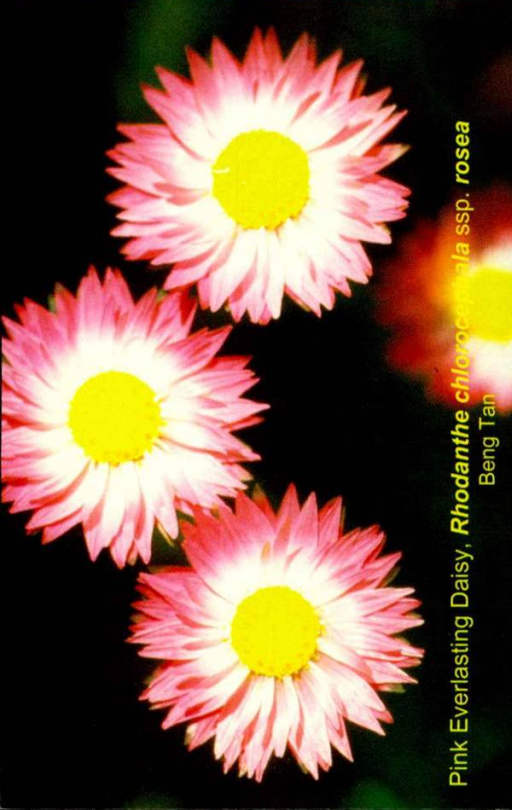
From white to shades of pink

Although pink is the predominant petal colour, the range is actually from pure white to deep pink ("red"), through several shades of pink. A recent study by Ashley Felton of this Department has indicated that two pale pigments (flavones), luteolin and chrysoeriol, are present in all white flowers; these pigments are also present as an undercoat in pink and red flowers which owe their stronger hues to two red anthocyanins, cyanidin and peonidin. White flower is recessive to pink or red, and white-flowered plants grown in isolation will breed true. A white-flower strain can thus be maintained by following this isolation strategy. One can sometimes observe a sprinkling of pink forms in these 'white meadows' suggesting that isolation of seeding white plants has been less than perfect. Visitations by itinerant insect pollinators are probably the cause of this genetic adulteration.

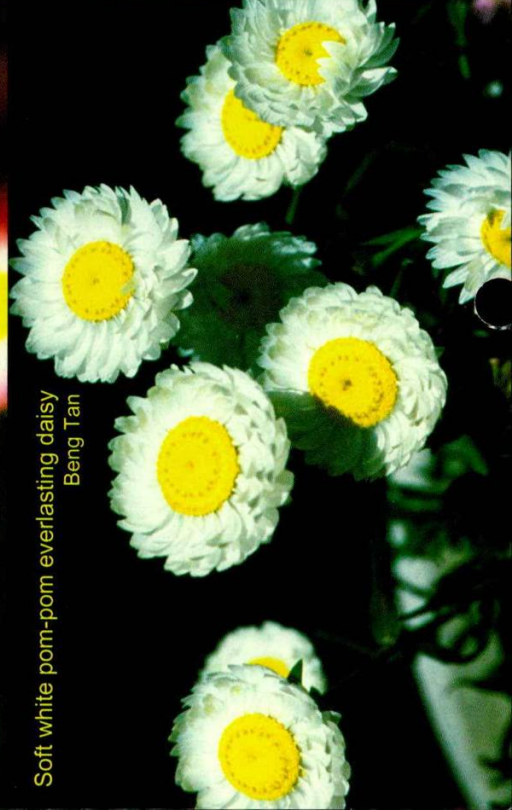
Seeds taken from a single pink flower head can generate a heterogeneous progeny with white, pink and red flowers. This observation highlights the heterozygous nature of pink-flowered individuals, indicating that perpetuation of a homogeneous pink strain may be illusory and elusive, even with isolation. Most red selections will breed true, enabling the development of a red strain via spatial isolation, and indeed commercial seeds of several so-called "red" forms are now available. A tempting conjecture is that red flower colour is conditioned by a single dominant gene with white flower colour as the corresponding recessive. In addition to petal coloration, there are several other flower traits that can be selected for in combination with petal colour.

Pinheads and ox-eyes

The flower's central disk, where fruit and seed formation actually takes place, is typically bright yellow thanks to a tight profusion of yellow stigmas, anthers, sterile bristles and loose pollen powder. A tiny red spot marks the very centre of the disk in an unusual variant. Although generally rare in Australian daisies, such a red pinhead is common in certain hybrid varieties of Federation daisy (*Argyranthemum frutescens*) where the red marking can be a prominent 'red centre' rather than an inconspicuous pinhead.



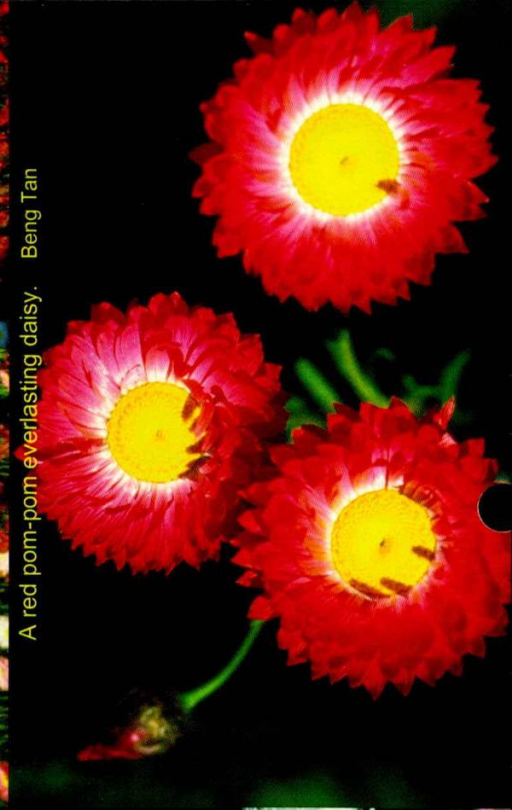
Pink Everlasting Daisy, *Rhodanthe chlorocephala* ssp. *rosea*
Beng Tan



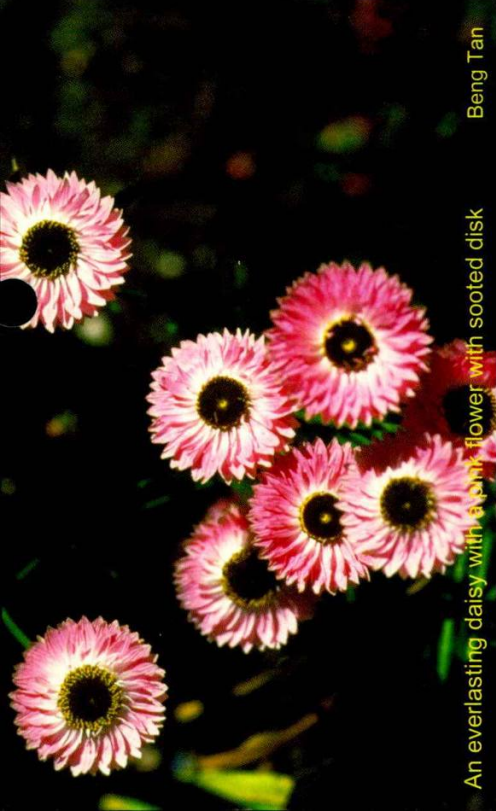
Soft white pom-pom everlasting daisy
Beng Tan



Display of daisies at Kings Park Beng Tan



A red pom-pom everlasting daisy. Beng Tan



An everlasting daisy with a pink flower with sooted disk

Beng Tan

An everlasting daisy, the white flowers with a dartboard disk

Beng Tan



A posy of mini-red everlasting daisies

Beng Tan

Pink pom-pom flower with a central red pinhead

Beng Tan



A more common disk variant has a concentric pattern of yellow and black bands on the floral disk rather like a dartboard. The width of the concentric black band can vary or the disk is entirely sooted. There is no black flower pigment as such. The presence and intense concentration of a magenta pigment in terminal club-shaped cells of sterile bristles are responsible for the black coloration of the floral disk. These bristles are silky hairs that pack tightly around each disk floret which later become the parachute-like dispersal structure (pappus) attached to the mature fruit (achene). In the red pinhead variant, the same pigment is less intense and is confined to a few bristles at the very centre of the disk. Seeds of 'ox-eye' strains are available from specialist native seed merchants, but not as yet the red pinhead form.

Pom-poms

The common petal shape is slightly keeled with sharply pointed tips, but there is a rare white variant with flatter, rounded petal ends giving an overall impression of a softer petal texture. Deriving a true-breeding stock of this white variant will be worthwhile. Inflexed or inward-curved petals collectively assume a permanent half-closed posture and result in a compact 'pom-pom' flower head - a well-known and distinctive floral characteristic found in *Chrysanthemum*, *Dahlia* and *Zinnia*. The pom-pom flower shape is heritable in *Pink Everlasting* as evidenced by its reappearance in the progeny generation but whether it is a single gene trait remains to be elucidated.

Mini flower clusters

An early-sown *Pink Everlasting* plant growing in good conditions will send up to twenty stems with each terminating in a flower head. Each flower stem arises from shoot buds near leaf scars at the base of the seedling's primary stem. There is an unusual variant where mini clusters of flower heads branch off, not from the base of a stem, but from a junction below the floral apex; such a variant will have stems with radiating clusters of smaller flower heads. It is uncertain whether such a deviant morphological development is environmentally conditioned or inherited. A variation to mini flower clusters occurs when smaller flowering stems develop from the upper nodes of a normal flower stem but with each smaller flower terminating at about the same level to give a flat-top floral umbrella or 'umbel'.

A challenge

Pink Everlasting is spring-flowering, and like most native annuals, plants die down after seed dispersal in late spring or early summer, but seeds remain dormant on the soil surface throughout summer. A summer-flowering strain could well be a native annual's answer to *Petunia*. Such a strain would have to be a physiological deviant, an antithesis of the normal spring form. It would probably have to be period-insensitive and floral initiation not inhibited by warm nights. Additionally, seed dormancy must be brief and germination uninhibited by excessively high summer temperatures. Quite a tall order, but these are some of the physiological attributes that any plant breeder searching for a summer-flowering form should be looking for. And, there is no better place to start looking for such an improbable variant than in an irrigated block of late-sown *Pink Everlastings* through summer. Seeds from these out-of-season plants should be retained for further testing under summer conditions.

Prune native plants

Geoff Walker

There is no mystique about this necessary garden job. Pruning is necessary for roses, fruit trees and especially for Australian natives to:

- encourage a more compact shrub
- revitalise an older plant
- get more flowers
- clean up the bush or tree – removal of dead wood

To my cost, when first growing native shrubs, I could not bring myself to cut away part of the foliage of a new purchase. I was to see undesirable growth. Some shrubs, later, were to split in a storm. I wanted a hedge of *Leptospermum petersonii* (Lemon-scented tea tree). By not steeling myself to regularly tip-prune the young plants, I ended up with a row of lanky plants, 3 metres tall. The screening foliage was sparse and there wasn't any privacy. Tip-pruning is snapping off the very tips of the branches before the flower buds can be seen. It is the same as browsing by a wallaby. It forces many branchlets to form and so produce denser foliage and more flowers. Of course, you can tip-prune a hedge speedily with a hedge-trimmer or even (shudder! shudder!) a chain saw. If you have to prune back an older, lankier shrub or tree, examine the lowest foliage first. Do not cut below the existing foliage unless you know the exceptions to this rule. Before the flowering season, tip-prune the ends. After flowering do larger pruning such as removing old wood, re-shaping the profile giving new life to an older plant.

Hard pruning is tolerated by *Grevillea robusta*, *Hymenosporum flavum* and many *Melaleucas*. It follows that the plant, shrub or tree must be very healthy and vigorous. On the other hand, some *Callistemon* suffer if pruned severely. Branches may fail to throw new vegetation (e.g. "Kings Park Special").

Melaleuca and *Syzygium* are survivors. You can cut them almost to ground. I recall backing the car over a metre-high *Syzygium*, smashing the leader. The best lateral was pulled gently upward, month by month, to become the new vertical. Today, this a well shaped, 10-metre lilly pillly. It is safe to prune the stems of *Eucalyptus* because epicormic buds are activated. We see such reactions from *Eucalyptus* after a bushfire. A number of plants within the *Myrtaceae* family are possessed with such lifesaving buds.

Growers tell of *Boronia* in a nursery in Melbourne that have been cut hard for the retail flower trade, annually for 30 years. Each season, over half of the vegetation is removed for sale. Even Hawkesbury River daisies, *Brachyscome*, can be heavily pruned in late autumn. We heavily cut our paper daisies in mid-Summer and new vigour and flowers occur.

Nature is ruthless when its creatures prune native plants. For example, storms strip branches, drought defoliates a plant, animals over-browse and threatened flying foxes overcrowd a small forest and smash its canopy. Compared to those disasters, you will do less damage.



Epacris acuminata
See page 123.

R. Crowden



Epacris mucronulata
See page 122

R. Crowden



Epacris myrtifolia
See page 121.

J. Simmons



Epacris stuartii
See page 124

J. Simmons



Epacris serpyllifolia
See page 107 & 123.

R. Crowden



Epacris heteronema
See page 122.

R. Crowden



Epacris exserta
See page 106 & 123.

R. Crowden



***Epacris* 'Union Bridge'**
See page 107 & 122.

R. Crowden

Tasmanian Epacridaceae

Part 2 _____ by R.K. Crowden and Y. Menadue.

Epacridaceae is represented in all the major ecosystems, heathlands (coastal to alpine), woodlands and forests (including rainforest). Part 2 describes species in the genus *Epacris*. Part 1 described genera 1–6.

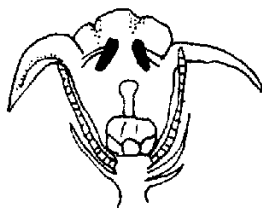
Epacris There are 22 species and 6 unresolved taxa, 23 endemic.

This is the largest and most diverse genus of the Epacridaceae in Tasmania. It is widely represented in all major ecosystems except the densest wet sclerophyll and rain forest. All species have erect woody stems, branching from the base in varying degrees. The flowers are white except for *E. impressa* (white, pink, red) and *E. obtusifolia* (cream). Some species, particularly those with a wide-ranging distribution (eg. *E. impressa*, *E. tasmanica*, *E. virgata*, *E. heteronema*), show considerable morphological variation. At times quantitative variation in certain characters may overlap in different species, resulting in difficulty in defining taxa.

Group 1

Style short, stigma below anthers, anthers on long filament projecting them above the plane of the corolla lobes or inwards towards the centre of the corolla throat. There are seven Tasmanian species in this group. In three the corolla tube is short and distinctly campanulate in shape. The other four species have a longer, more cylindrical tube.

Epacris gunnii. An erect, sparsely branched shrub rarely above 1m high. Typically the leaves are ovate-cordate, the blade incurved and recurved towards the tip. The apex is acuminate and pungent. The white flowers, borne in spring, extend down the branches in long "spikes". The tiny anthers are projected inwards to the throat of the tube. *E. gunnii* is abundant in Tasmania, ranging from sea level to alpine heathlands, usually in damp situations and in Victoria and NSW where it is sometimes included with *E. microphylla*.



Epacris navicularis. A much branched shrub to 0.5m, found at high elevations on quartzite mountains of southwest Tasmania, frequently in company with *Leucopogon milliganii*. Most notable is the ranking of the leaves in 5 seres, small, 2.5–3.5mm long, thick, keeled and with an incurved apex. The white flowers, borne in mid-summer, are clustered in terminal heads.

Epacris petrophila. An alpine species, common on the Central Plateau, particularly near watercourses and tarns. It occurs also at high altitudes in the Australian Alps. The tiny leaves, rarely more than 2mm long, are appressed to the stems (more open in mainland forms) and are keeled on the lower surface. Flowers are few at the branch tips in summer.

Key to *Epacris* in Tasmania.

1. Style short, stigma close to ovary or below anthers 2
 Style long, stigma reaching or exerted beyond anthers 14
2. Anthers on long filaments, part or wholly exerted above plane of
 corolla lobes, or projected towards centre of corolla throat 3
 Anthers almost sessile, enclosed within corolla tube or tips barely showing 9
3. Corolla tube campanulate, width of
 throat equal to or wider than the length of the tube 4
 Corolla tube cylindrical or slightly tapering, but throat narrower than length of tube 6
4. Leaf base cordate, stem clasping *E. gunnii*
 Leaf base obtuse, or attenuate, appressed to stem but not stem clasping 5
5. Leaves ranked in 5 distinct rows *E. navicularis*
 Leaves alternate, not ranked *E. petrophila*
6. Leaf with distinct hyaline margin *E. marginata*
 Leaf margin not hyaline 7
7. Sepals hirsute *E. grandis*
 Sepals glabrous 8
8. Leaf base cordate, stem clasping *E. limbata*
 Leaf base obtuse *E. myrtifolia*
9. Leaf apex acute or obtuse, blunt 10
 Leaf apex acute with short pungent mucro or acuminate 12
10. Prominent raised leaf scars on old stems. Corolla caduceous *E. curtisii*
 Leaf scars on old stems small, not conspicuous
 Corolla persistent and browns after anthesis 1
11. Leaves ovate / orbicular. Margin thickened or part hyaline *E. serpyllifolia*
 Leaves lanceolate or narrow elliptical. Margin minutely serrulate *E. mucronulata*
12. Leaf margin scabrous, midrib keeled and conspicuous,
 other veins indistinct *E. apseyensis*
 Leaf margin narrowly hyaline, midrib not keeled, 3–5 conspicuous veins 13
13. Sepals glabrous *E. heteronema*
 Sepals hirsute *E. aff. heteronema*
14. Anthers sessile or on short filaments, enclosed within corolla tube 15
 Anthers part or wholly exerted beyond throat of corolla tube 18
15. Corolla with 5 distinct indentations at base of tube *E. impressa*
 Corolla tube smooth at base 16
16. Sepals brown and hard *E. corymbiflora*
 Sepals herbaceous 17
17. Leaves oblong–elliptical, apex obtuse, blunt *E. obtusifolia*
 Leaves narrow, linear lanceolate, apex acuminate, pungent *E. lanuginosa*
18. Leaf base cordate, stem clasping *E. acuminata*
 Leaf base obtuse, not stem clasping 19
19. Flowers extending down stems in long spike-like inflorescences 20
 Flowers mostly in short “spikes” near tips of stems or on short side branches 22
20. Young stems, leaves glabrous or with sparse hairs *E. glabella*
 Young stems, petioles and leaves hirsute to some degree 21
21. Leaves narrow, lanceolate or elliptical, flat, apex blunt *E. exserta*
 Leaves ovate–lanceolate or ovate, flat often with incurved tip,
 apex acute with small mucro, barely prickly *E. virgata* and forms
22. Sepals hirsute *E. barbata*
 Sepals glabrous 23
23. Corolla persists after anthesis and turns brown plant *E. ‘Strzelecki’*
 Corolla shed soon after anthesis (few may remain) 24
24. Leaves narrow elliptic or obovate, apex blunt,
 petiole slender, semi-appressed *E. ‘Union Bridge’*
 Leaves elliptic–ovate or ovate–lanceolate, apex pungent, petiole broad, appressed 25
25. Leaves elliptic–ovate to ovate, blade flat, thick, shiny,
 apex shortly acuminate or mucronulate, pungent *E. stuartii*
 Leaves ovate–lanceolate to lanceolate, recurved in upper part,
 apex tapering to a pungent point *E. tasmanica* and forms



Epacris gunnii

See page 106 & page 118

B. Fuhrer



Epacris navicularis

See page 118

R. Crowden



Epacris grandis

See opposite & page 106

R. Crowden



Epacris limicola

See page opposite

R. Crowden

***Epacris grandis*.** A rare plant of the Apsley River region of the east coast, where it occurs patchily on very shallow soils in scrubby dry sclerophyll, often in company with *Leptospermum grandiflorum*. A tall plant (may exceed 2m), with few branches which are weighed down by long "spikes" of large flowers in late spring. The ovate sharply pointed leaves clearly display 3–5 major veins. The hirsute sepals are a diagnostic feature. Cultivation on page 106.



***Epacris limbata*.** Restricted in occurrence to localised damp heaths on the east coast near the Apsley River. Vegetative plants are indistinguishable from *E. gunnii*, however the flower is distinctive. The corolla tube is more cylindrical than *E. gunnii* and the anthers are exserted above the plane of the lobes, rather than projected into the corolla throat. Flowers in late spring.



***Epacris marginata*.** Occurs in a few localised populations on the Tasman Peninsula, The Thumbs Ranges, and on Maria Island. A rigid, erect plant with numerous branches, rarely exceeding 1m. The slightly concave, ovate-cordate leaves are densely crowded towards the ends of the branches, where they partially mask the flowers. The leaves have a distinct hyaline margin and the apex is extended into a pungent point. Old stems show characteristic raised leaf scars. Flowers in late summer to autumn. Photo on page 109.

***Epacris myrtifolia*.** A robust shrub, 0.3–1.8m high, found on sea-facing cliffs and dune slopes of much of the southern Tasmanian coastline, including Bruny Island and the Tasman Peninsula. The flowers, borne in spring, form spike-like clusters down the stem. Photo on page 116.

Group 2

Style short, stigma below anthers, anthers sessile or nearly so, enclosed within the corolla tube or the tips protruding. There are 5 species and 3 unresolved taxa in this group. Typical flower detail on page 119.

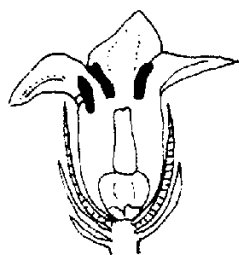
Epacris apseyensis is restricted to a small area of the east coast inland from Bicheno, near the Apsley River. It is a small wiry plant (usually less than 1m), with few branches. The lanceolate leaves are recurved in the upper half. Vegetative plants are difficult to resolve from *E. tasmanica* (see below). The corolla tube is cylindrical with a narrow throat and is shorter than both the sepals and the lobes. Flowers in mid autumn.

Epacris curtisli shows affinities with *E. serpyllifolia* but differs in floral characters. It has a shorter style, anthers more hidden in corolla tube and obtuse sepal apices (acute in *E. serpyllifolia*). Also it has a different flowering time (late winter–early spring). It is known only from northwestern Tasmania at altitudes below 100m, growing in peaty soils (buttongrass). Photo on page 109.

***Epacris heteronema*.** An erect, branching shrub up to 1m in exposed habitats, but can become a small tree up to 6m in wet sclerophyll scrub. The leaves vary from narrow ovate-cordate to broadly ovate-cordate, the apex acuminate and pungent and 3–5 prominent veins on the abaxial surface. The margin is narrowly hyaline. The corolla tube is as long as or slightly shorter than the sepals and as long as the lobes. Flowers at the ends of branches appear in late spring. *E. heteronema* is common in heath and wet scrub in southern and southwestern Tasmania, from lowland to at least middle altitudes. With increasing altitude, the leaves tend to become smaller, thicker and more rounded and the apex appears more mucronate. It becomes difficult to resolve these plants from *E. serpyllifolia* although a chemical test will separate them. *E. serpyllifolia* contains flavone bisulphites which are absent from *E. heteronema*. Photo on page 117.

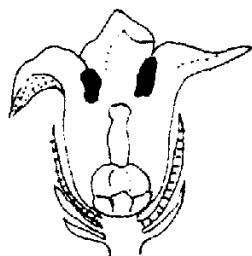
***Epacris* aff. *heteronema*.** Plants collected from the west coast (west of Zeehan) and from mountains in the southwest (Western Arthurs Ranges) have a hirsute calyx (glabrous in *E. heteronema*). Photo on page 117.

***Epacris mucronulata*.** A riverine species found on the banks of the Huon, Picton and probably other southern rivers. The leaves are spreading, narrow / elliptical to narrow / lanceolate, the apex acute, blunt with a short mucro. Corolla tube is cylindrical, slightly longer than the sepals and lobes. Flowers are clustered at the branch tips and appear in late winter. Photo on page 116.



Riverine plants on the major west flowing rivers, Gordon River and Pieman River are generally included in *E. mucronulata*, but these have some differences in floral morphology. In particular the tube is slightly tapering, although hardly campanulate, and the style is long, projecting the stigma at least to the top of the anthers. This is shown in drawings of *E. franklinii* of the earlier literature which taxon was later incorporated into *E. mucronulata*. Additionally some recent collections from several north flowing rivers (Meander River, Mersey River (*E. 'Union Bridge'*, photo on page 117), and Leven River initially referred to as *E. exserta* may well be better placed with this riverine group.

***Epacris serpyllifolia*.** Widespread in alpine and subalpine areas, it is a woody shrub of variable habit ranging from erect and arborescent in scrub, to prostrate and scrambling over boulders in exposed alpine communities. The leaves are variable in shape and size, mostly rounded, flat or slightly concave, with a blunt or mucronate apex, but sometimes ovate to broadly lanceolate, with a more acute apex. In scrub habitats and at lower altitudes the leaves become more elongate and recurved in the upper part and the apex more acute, margin minutely serrulate or scarious. The corolla tube is cylindrical, as long as or longer than the sepals and longer than the lobes. Flowers are clustered at the ends of branches in summer. Photo on page 117.

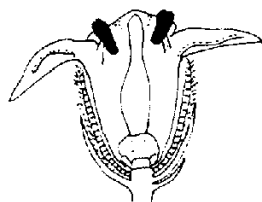


Group 3

Style long, anthers exserted. The corolla tube is cylindrical or slightly tapering and shorter than or equal to the sepals. Filaments long, the anthers exserted in part (more than half) or entirely above the plane of the lobes. Style long, usually with a basal swelling, the stigma level with or exserted beyond the anthers. There are seven species and several unresolved taxa. Species within the group are decidedly plastic in respect of their morphologies, particularly leaves, and show quantitative overlap of shape and size characters. A numerical taxonomic analysis using nine variables on leaves and flowers was carried out by Menadue and Crowden (1990) in an attempt to clarify relationships within the group. This study endorsed and quantified the field observations that while there are forms that are consistent with the formal descriptions, the same populations contain forms which digress in respect of one or more characters.

***Epacris acuminata*.** Once widely distributed and abundant in the south and southern midlands from low to middle altitudes its natural habitat has been substantially diminished by land clearing and grazing. Very few large populations can be found today. Readily distinguished from other members of this group by the cordate, stem clasping leaf base. Photo on page 116.

Epacris barbata occurs on the coastal granite of the Freycinet Peninsula. While vegetative plants may be confused with *E. tasmanica* (see below) it is generally a more robust and larger plant than *E. tasmanica*, perhaps reflecting a better substrate. Moreover, leaves of plants near the coastal cliffs tend to show a moderate succulence. Separation of the two species is based on the habitat and on the consistent presence of a hairy vestiture of the sepals and bracts in *E. barbata*. In this last regard, it should be noted that in several populations of *E. tasmanica*, eg near the Prosser R. weir, south of Orford and near Blackmans Plains, east of Dunally, there is a small percentage of plants with hirsute sepals throughout the populations. Photo on page 109.



***Epacris exserta*.** Many stream bank *Epacris* collections (particularly riverine *E. tasmanica*), have been incorrectly identified as *E. exserta*. Riverine *E. exserta* is found on stream banks in the fast flowing upper reaches of some rivers in northern Tasmania eg Nile, North Esk and Mersey, and in the east, e.g. St. Pauls River. It is replaced by other species in the lower reaches of the same rivers. For cultivation see page 106.

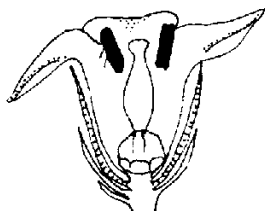
Typically *E. exserta* has soft lanceolate to narrow ovate leaves, usually less than 1cm long with a blunt apex. It is very floriferous, with flowers extending well down the stems. *E. exserta* is found also in some habitats away from rivers, e.g. Gog Ranges and near the upper St. Pauls River, where the leaves are somewhat "harder" and more rounded.

***Epacris glabella*.** This plant is known from two isolated west coast locations (Serpentine Hill near Zeehan and near the upper reaches of the Heazlewood River, west of Waratah). It can be distinguished from other

members of the group by its leaves, which are obovate to broadly elliptic, flat, thick and shiny, and by its glabrous branchlets.

Epacris stuartii is known from a single location, Southport Bluff, on D'Entrecasteaux Channel. The habitat is in cracks in rocks and on sea facing cliffs where it receives periodic sea spray. Whereas aspects of its morphology may lead to its regard as an extreme morph either of *E. tasmanica* or *E. virgata*, its location is well removed from any known current population of either species. The leaves are shiny green, slightly succulent and ovate. The flowers appear in spring. Photo on page 116.

Epacris tasmanica is an abundant and widespread species over much of the lowland east, south of St. Marys to Copping, inland down the St. Pauls valley to Avoca and continuing down the South Esk river system to the Trevallyn Gorge. Thus it links the two major habitat areas of the closely related and partially overlapping species *E. virgata*, and indeed co-occurs with this species at Hospital Creek and near Rheban in southeast Tasmania. A lowland taxon on Flinders Island (NE and central) is probably covered by the wide variation range within *E. tasmanica*. Its usual habitat is very dry, stony places in dry sclerophyll forest and woodland on shallow dolerite derived soils, frequently in seepage zones. It is an erect, rigid, sparsely branched shrub, rarely exceeding 1m in height, with hard recurved leaves, very prickly to the touch. The flowers generally are borne towards the ends of branches in late winter. An extensive population centred around Rheban-Thumbs Ranges (south of Orford), consistently flowers in autumn. *E. tasmanica* shows a degree of morphological variation between populations, particularly in respect to leaf shape and size, flower size and also the location of corolla lobe geniculation, which sometimes obscures the anther projection. A riverine form with softer, flatter leaves, has incorrectly been dubbed *E. exserta*, apparently for no reason other than that it occurs on riverbanks. Photo on page 108.



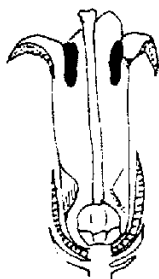
Epacris virgata. There are two major and disjunct centres of occurrence of this species. In the north, an extensive population occurs on the Dazzler Ranges near Beaconsfield, with several small isolated populations elsewhere, eg. east of the Tamar River near Lalla. In the southeast, it is found over a wide area south of Hobart, Kingston, Margate, Kettering, south of Orford and on the Tasman and Forestier Peninsulas. It may well have had a wider distribution prior to European settlement. Its habitat typically is on shallow, poorly drained soils (e.g. dolerite or ironstone bedrock), most frequently in association with *Eucalyptus ovata*. The southern populations tend to have longer, more pointed leaves (and often slightly recurved), than plants from the Dazzler Ranges, and are apt to be confused with *E. tasmanica*, especially if vegetative. *E. virgata* is characterised by flower size and morphology, especially the more marked exsertion of the anthers, and also by the long "spikes" of flowers which may extend 30cm or more down the branches. Photo on page 108.

Group 4

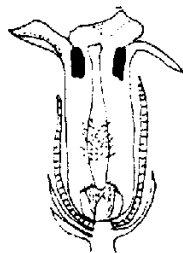
Style long, anthers enclosed within the corolla tube. This group contains two species in which the corolla tube is distinctly longer than the sepals and the corolla lobes, and two species and one unresolved taxon in which the corolla is barely longer than the sepals. In all five, the anthers are sessile or on very short filaments (less than half the length of the anthers) and enclosed within the corolla tube. The style is long, the stigma being positioned at the level of the anthers or exerted from the tube.

***Epacris corymbiflora*.** The characteristic *Epacris* of the lower altitude, buttongrass areas of southern and southwestern Tasmania. The broad elliptical leaves are erect and appressed to the stem, apex blunt with a hard mucro and the margin narrowly hyaline. *E. corymbiflora* is easily recognised by the hard, shiny brown sepals. Flowers in mid spring. Photo on page 108.

Epacris impressa is an erect or straggling plant of heathlands, woodlands and open forests, ranging from sea level to mid altitudes. It shows quantitative variation in respect of size of leaves and corolla and flower colour varies from red through shades of pink to white. An orange-pink morph occurs in heathlands on Flinders Is. and is rare on the northeast tip of Tasmania (it occurs also in Victoria, e.g. Wilsons Promontory). A pink form (see page 89) is also known. Although the main flowering seasons are spring and autumn, individual populations can be found in flower at all times of the year. Leaves in general are semi-erect, linear-lanceolate to ovate, slightly concave and recurved in the upper part. Apex is acute and drawn out into a pungent tip. Photos on pages 89 & 109.



***Epacris lanuginosa*.** An erect shrub of wet heaths, usually less than 1m, but as high as the general vegetation canopy. The narrow-lanceolate leaves are erect to half-spreading and crowded in the upper parts of the stem. The acute apex tapers to a sharp point. The white flowers that appear in spring, are crowded into "drumheads". The corolla tube is longer than both the sepals and the lobes, the throat slightly constricted. A key diagnostic is the central swelling of the style bearing a cluster of woolly hairs. *E. lanuginosa* is similar in most respects to the mainland species *E. paludosa*, which reportedly occurs on Strzelecki Peaks, Flinders Island. In *E. paludosa* the leaves range from narrow-lanceolate in the more northerly populations (Blue Mountains, NSW), becoming broader in more southerly populations (Baw Baw plateau, Victoria), the central swelling of the style is glabrous. Photo on page 108.



Epacris obtusifolia grows in wet or marshy places, commonly in coastal heaths. An erect, sparsely branched plant up to 80–120cm high, the cream flowers appear mid spring to early summer. Leaves are thick, erect and at least partially imbricate, elliptical-oblongate with blunt apex. Photo, pg133.

Epacris 'Strzelecki' differs from *E. paludosa*. On Strzelecki Peaks the plant grows amongst boulders away from seepage or water channels. Anthers are exerted, style is swollen at the base and leaf shape is more ovate. Photo on page 133.

Tree profiles*

Subtropical Farm Forestry Association **

The four trees examined here have fast to very fast growth rates with a greater hardiness and tolerance of drier and colder sites than many rainforest species. They all produce high quality cabinet timbers.

Melia azedarach, White Cedar

Melia from the Greek name for Manna Ash with similar leaves and *azedarach* from the Persian 'Azad-darakht' for the Indian Neem tree which it resembles.

White Cedar grows to a height of 45 metres and a diameter of 120cm. It is deciduous, foliage turning a bright yellow in autumn and is widely planted as an ornamental shade tree. The bark is brown with greyish ridges and a striped effect with vertical fissures. The underbark is pinkish brown. The live bark is mottled green and yellow-brown. The **leaves** are compound (fern-like) bi-pinnate, with opposite prominently toothed leaflets, mostly ovate but sometimes lanceolate, 2–7cm long often protracted into a long narrow tip. Surfaces are green, paler beneath. The **flowers** are chocolate scented, lilac and appear in loose panicles 10–15cm long in the leaf axils. They are about 18mm in diameter and appear in October. The **fruit** ripens from March to June and is a succulent yellow drupe 10–14mm long surrounding a hard stone that contains five seeds. These fruits are poisonous to man and stock but are eaten and dispersed by a broad range of birds and flying foxes.

A common tree of riverine, dry and littoral rainforests from the Shoalhaven River (NSW) to Cape York and W.A., it is a very hardy tree, tolerant of frost and dry conditions once established but prefers better quality soils. It is attacked by a web building caterpillar that defoliates the tree, causing multiple branching with serious effects on timber potential. A collar of sticky tape [sticky side out] or metal around the trunk stops them climbing up. The light brown timber is highly and broadly figured, light, soft and easily worked and dressed. Weight, 400–500 kg/m³.

***Tree profiles** is a publication by the Subtropical Farm Forestry Association, available on request for \$21.95 per copy including postage, from their office, Comdale Rd., Comdale, 2480, phone (02) 66895286, email sff@turboweb.net.au. It comprises 17 sections, each of 4 pages in a spirally bound folder. Above is portion of the section on Rainforest Cabinet Timbers. Other sections are on useful timbers in demand, all basic sound information. Not reproduced are the sketches of the leaves, fruit and flowers included to aid identification, or a whole page headed 'Miller's Comments' where for each log there are comments by a commercial miller on log size, wood density, milling attributes, drying, shrinkage percentage, royalty payment, uses and market demand.

****Subtropical Farm Forestry Association** is a co-operative group of private property farm forestry growers in north eastern NSW that meets regularly on various farm plantation visits to discuss mutual problems and to assist each other. On occasion there a field officer of Greening Australia has been present who gave a detailed report on the establishment of the growing timber forest being inspected and how it could be replicated on other properties. One had to be impressed with the vigorous growth of the trees of a wide range of species. In our last issue the proven methods of Jack Mitchell in establishing many farm forestry projects mainly of the Forest Farmers Association of Queensland centred in south east Queensland, were detailed. There are similar groups in many areas of Australia. Interested, enquire from Greening Australia. Editor.

***Pentaceras australis*, Black Teak**

Pentaceras from the Greek meaning five-horned refers to the five horn shaped carpels of the flowers and fruit and *australis*, Latin for southern.

Black Teak, or Bastard Crows Ash, is a medium sized tree to 18 metres height and 45cm diameter. The bark is brown, smooth, often with short vertical rows of very small pustules. The brown and green outer surface of the live bark is rough and pitted. The **leaves** are compound, alternate and pinnate consisting of seven to fifteen leaflets on a common petiole. The leaf margin is entire, with ovate or lance shaped leaflets that are very unequal sided at the base, 5–13cm long, tapering to a blunt or fairly fine point at the tip. They are glabrous and green on both surfaces but paler beneath. The white honey scented **flowers** appear in much branched panicles at the end of branches from June to October. The **fruits** are wind dispersed, dry carpels in bunches of up to five, but mostly single, light brown, surrounded by a broad flat, irregularly egg-shaped wing up to 4cm long. Ripe fruit may be found from November to January or as late as May. It is found from the Richmond River, NSW, to Gympie, Qld. in dry, littoral and riverine rainforests. Frosts are known over this range and it is reasonably frost, drought and wind tolerant. A hardy, fast growing and adaptable tree, it has proven very difficult to raise from seed but can be grown from root cuttings. The yellow close-grained timber is hard, dense and durable with fine figure and finishes well. Black Teak is similar to *Flindersia australis*, Teak and used for the same purposes. Weight, 900kg/m³.

***Euroschinus falcata*, Ribbonwood**

Euroschinus from the Greek 'euros' the south-eastern wind and 'schinus' the mastic tree, referring to it as a south-eastern mastic tree, *falcata* means sickle-shaped and refers to the curved leaves.

Ribbonwood is only one of many common names including; Chinamen's Cedar, Port Macquarie Beech, Maiden's Blush, Blush Cudgerie and Pink Poplar. It grows to 45 metres and a diameter of 90cm with a trunk that is often flanged or buttressed in larger trees. The outer bark is brown, usually wrinkled and finely scaly. Live bark is pink with creamy pink blotches. The compound **leaves** are alternate, pinnate with four to ten alternate leaflets, not toothed, elliptical or egg-shaped, 5–10cm long, drawn out into a long point at the tip and asymmetrical at the base and green both sides, paler beneath. **Flowers** are pink in long terminal panicles or spring from the fork of the upper leaves and appear from November to January. The **fruit** is a scented black drupe, shaped like a small mango, which ripens from December to January and is eaten by a broad range of birds. The timber is pinkish, soft, light and tough and resembles Red Cedar but is 'woolly', less durable and harder to work. Weight, 400–575kg/m³. It is found in all types of rainforest and as a pioneer of the rainforest-sclerophyll forest ecotone, from Jervis Bay to Cooktown. Frost, wind exposure and soil moisture deficits occur on much of its range but it is intolerant of poor drainage.

***Rhodospaera rhodanthema*, Deep Yellowwood**

From the Greek 'rhodon' a rose and 'sphaera' a ball, *rhodanthema* for red flowers.

Also known as Yellow Cedar or Tulip Satinwood, it is a medium sized tree to 30m with a straight, cylindrical to slightly buttressed trunk up to 75cm diam.

The bark of *Rhodosphaera rhodanthema* is dark brown and scaly, shedding in irregular patches, patterned between the scales with brownish pustules. The outer surface of the live bark is light pink. The compound **leaves** are alternate, pinnate, 6–12 leaflets, mostly opposite occasionally irregularly toothed and are elliptic to lanceolate in shape, 4–7cm long and 1–2cm wide, tapering to a blunt point, often asymmetrical at the base and green on both sides, glossy above, dull beneath. Bright red **flowers** appear in large panicles on the end of the branchlets in September and October. The **fruit** ripens from February to June and is a dry glossy brown globular drupe, 1cm in diameter, in conspicuous dense branches. It is found in subtropical and dry rainforests from the Macleay River, NSW to Maryborough, Qld. Frosts are common in its range and this, together with its tolerance of wind and drought, make it a very hardy and adaptable tree. A web-building caterpillar destroys growing tips, slowing growth and causing multiple branching and poor structure. The deep yellow bronze timber has a fine lustre. Weight, 500–875kg/m³.

Terrestrial orchids

Their cultivation _____ by Alec Blombery*

The greatest numbers of terrestrial orchids grow in temperate areas with consistent rainfall throughout the year. Those that grow in very low rainfall areas, occur only in protected positions, where there is adequate moisture. Generally those terrestrial species which grow in coastal areas where there is higher rainfall are much easier to cultivate. The tuberoids of inland species rot easily if subject to much water.

Terrestrial orchids grow with roots completely below the ground surface. Whilst some genera have evergreen leaves and fleshy roots, the majority have deciduous leaves with underground small potato-like tuberoids or fleshy rhizomes or stems. The majority of the terrestrial genera are in this group. The leaves are deciduous and die down each year. A number of genera make only a single underground tuberoid that is replaced each year. Other species, even in the same genus, produce several tuberoids each year and under favourable conditions of adequate moisture results in colonies of plants. These are more readily cultivated. Each tuberoid has a bud from which a new shoot develops each year.

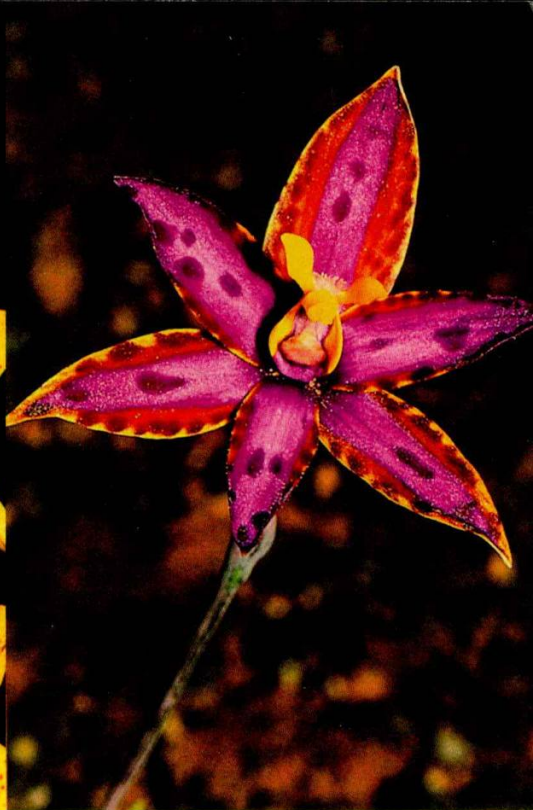
As the tuberoids rot readily it is important that the growing medium should be well drained. A covered area is necessary in the shade house so that watering can be controlled at all times. While some species are tolerant of free watering others require very careful watering for success.

***Growing Australian Orchids** by Alec M Blombery & Betty Maloney is the source of the above article. As with all books by Alec Blombery this is a very practical step-by-step guide on growing plants, in this case, orchids. The major part of the book contains detailed instructions on culture in a shade house either in pots or suspended from the roof on wood slabs or in receptacles such as a propagation tray. He has divided the orchids into groups based on the preferred method of culture for all areas of Australia. It is available from your bookseller for \$21.95 - Editor.



Freckled Sun Orchid

Thelymitra sargentii, of the Kalbarri to Hyden area of WA, is extremely tolerant of heat and dryness. The 5–25 flowers are to 4cm across on a sturdy scarp to 50cm tall.



Queen of Sheba

Thelymitra variegata of the Dingara area of WA. The metallic looking flowers are to 5cm across on a tiny scarp to 35cm tall, the pattern varying with an iridescent sheen.

Reprinted from ***Native Orchids of Southern Australia, A field guide*** by David and Barbara Jones, (Bloomings Books) available widely for \$29.95. There are 268 species described all with beautiful colour photographs as reproduced above. I have chosen two species from WA but all the common species south of a line passing through Brisbane and Kalbarri are illustrated in the book. Interested in native orchids? Then you need this book to identify them easily.

Growing *Thelymitra*? In our recent issues I have featured many of the Sun Orchids, mostly those in shades of blue. Will those who have successfully grown Sun Orchids contact me - Editor.

Cultivation of deciduous terrestrial orchids

This group of orchids is deciduous with the leaves dying down each year. They have one or several small underground tuberoids. In some species the shoot develops first into a flowering stem with leaves at ground level. With most species when the leaves are fully developed a flowering stem is produced. One of several tuberoids then develops underground. When flowering is complete the leaves begin to turn yellow and finally die. The process is repeated each year. The tuberoids may become dehydrated and the plant die during drought periods.

Tropical species from the monsoonal regions of northern Australia are not suitable for general cultivation as their growth cycle is governed by the monsoonal rains. They grow, flower and die rapidly as the wet period only usually lasts for about three to four months followed by a dry period. It is very difficult to repeat these conditions in temperate areas.

Amongst the many different temperate species, there are a number which are easy to cultivate and which may multiply freely. Even in the same genus, however, there are a number of species that are difficult to keep growing for extended periods. Examples of these are the large and beautiful *Caladenia* spider orchids and some *Pterostylis*.

Soil mixes used for potting these orchids must allow water to pass through freely otherwise the tuberoids will rot. To assist in free drainage a shallow pot should be used. The following mix has proved successful:

- two parts yellow bush loam
- two parts coarse sand free of any fine silt
- one part leaf mould
- one part finely chopped up dried tree fern stalks
- a small amount of blood and bone

Coarse river sand is satisfactory but should be first washed to remove fine silt. This is simply carried out by placing sand in a bucket and pushing a hose into the bottom of the sand and allowing water to bubble up through the sand and when the overflow water is finally clean the hose is removed. Fine sand that accumulates on the top should be removed. Beach sand should not be used, for as well as containing salts, its particles are rounded and pack tightly, reducing drainage.

Editor's Note:

Australian Native Orchid Societies usually have what is known as a tuberoid bank to which members who grow these orchids contribute their surplus tuberoids, available for a small charge. A commercial grower of terrestrial orchids who produces a list of the species available for sale, is Nesbitts Orchids, PO Box 72, Walker SA 5081. Plants are forwarded on a mail order basis. Please advise the editor of any others who provide this service.

The Orchid Study Group is under the leadership of Don & Pauline Lawie, P.O. Box 230, Babinda, Qld., 4124. They would be keen to learn of your experiences in growing orchids and of potting mixes or cultivation practices which have given you good results. Just how can we grow the hard ones?

Potting the tuberoid

Select a 125mm (5 inch) or 150mm (6 inch) shallow plastic pot. Check and clean out drainage holes from any obstruction. Place about 12mm (½ inch) of coarse clinker ash in the bottom of the pot. Add moist potting mix in the pot to approximately 35mm, slightly more than an inch. Bump the pot on a bench to consolidate the mix then level the surface. Next place six tuberoids on the surface of the mix with the eye pointing upwards, then cover with potting mix to approximately 12mm (½ inch) from the top. Add a layer of cut-up *Casuarina* or pine needles on the surface to prevent soil disturbance when watering and to prevent the surface drying out. Water well and place in a protected shaded position.

Correct watering is essential for success in cultivation and to prevent rotting of the tuberoids. The soil can be checked for moisture by placing a finger in the soil to a depth of about 12mm (½ inch). Generally plants from moist coastal areas need more frequent watering than species from inland areas. Watering twice weekly should be adequate for coastal species during the growing period. When plants die down, watering should be withheld to prevent tuberoid rotting. With coastal species, soil can be kept slightly moist and with inland species soil can be allowed to dry out during the dormant period. Watering weekly or fortnightly for inland species should be adequate during the growing period, depending upon the atmospheric conditions. Use rainwater if local water is unsatisfactory.

Protection of plants

Generally 50 to 70% shade is satisfactory for most genera. To achieve flowering with small plants such as *Corybas* as well as providing shade and keeping the plants moist (but not wet) place a covering such as a glass jar or the bottom of a plastic soft drink bottle over the plant to prevent it drying out. Coastal terrestrial orchids can be grown in a shade-house with epiphytic orchids with a cover of 50% shade-cloth. For a variety of terrestrials, a covered area should be provided in a shade-house or a cool glasshouse to prevent plants receiving too much water during rain. Ensure there is free air movement amongst the plants to prevent fungal attack such as damping off.

The more readily grown species

Acianthus – 12 species in all states except Western Australia and the Northern Territory. Requires well-drained mix; it is prone to rot if wet.

Species: *Acianthus exsertus*, *A. fornicatus*.

Caladenia – 104 species in all states except the Northern Territory. Most species are difficult. Add extra sand to the mix to provide drier conditions.

Species: *Caladenia carnea*, *C. catenata*, *C. latifolia*.

Diuris – 39 species in all states except the Northern Territory. Best grown in a well-lighted covered area, keep leaves dry particularly in winter to avoid rot. Species: *Diuris corymbosa*, *D. lanceolata*, *D. maculata*, & *D. punctata*.

Pterostylis – 100 species in all states except the N. T. During early growth they may be lightly fertilised. Repot annually. Species: *Pterostylis acuminata*, *P. curta*, *P. baptistii*, *P. nana*, *P. nutans*, & *P. pedunculata*.

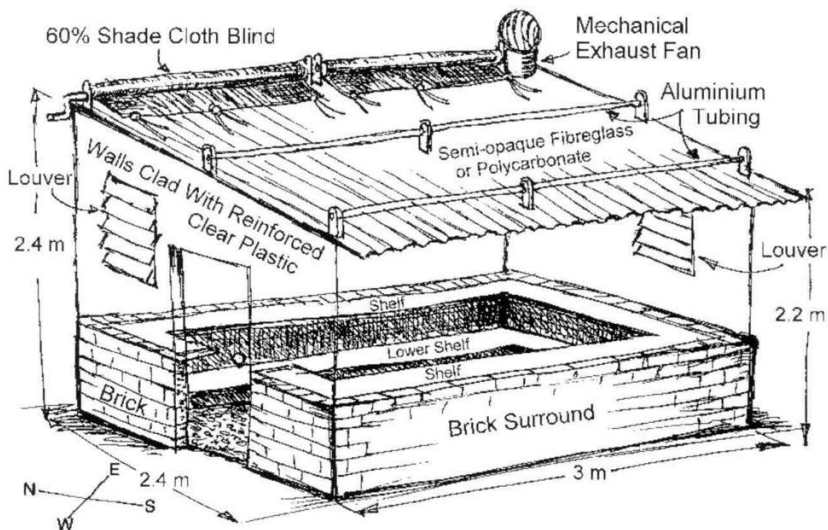
Thelymitra – about 37 species in all states except the Northern Territory. Tuberoids rot readily so avoid hot wet conditions. Do not repot each year. Species tried: *Thelymitra antennifera*, *T. carnea*, *T. ixioides*, & *T. rubra*.

A propagation shade-house

by Ross Doig

From my article on page 100 it is evident that I have had success in the propagation of wildflowers that others have had some difficulty with. For what it is worth the shade-house I used may be of interest to others.

The sketch does not show the structural details of studs, noggins and braces that hold everything together, hopefully showing the relevant details more clearly.



The shade-house receives morning sun for 2–3 hours through the eastern wall, a tree shades it from 12 & 2pm, and the western wall is shaded by another tree some of the afternoon.

The 60% shade cloth blind is rolled down on hot days ($28^{\circ}\text{C}+$) and permanently in the hottest period of summer.

The interior is kept dry except for hosing the floor (compacted shale and clay) mid-morning on very hot days when the door and vents are thrown open. Humidity is thus confined and problems with fungus, mildew etc. avoided.



Epacris obtusifolia

B. Fuhrer



Epacris 'Strzelecki'

R. Crowden

Epacris microphylla - an *Epacris* of Kosciuszko
See page 134. Reprinted from *Kosciuszko Alpine Flora*.

Colin Tottenham



Kosciuszko Alpine Flora

by Costin, Gray, Totterdell and Winbush

This superb book is a must for any visitor to the Kosciuszko area. It lacks only the defined walking trails but these are available from the National Parks and Wildlife Service office when you get there. It is crucial that you keep to the well-maintained tracks, as the alpine flora is a delicate finite resource. Previous CSIRO publications have been more technical and less useful to the casual visitor to the area, but this second edition is a superb presentation. Thanks to the magnificent photography of Colin Totterdell, the hundreds of large colour photographs will enable visitors to recognise all of the 212 flowering plants from the pictures alone. Two of these have been reproduced here, *Epacris microphylla* on page 133 which has close affinities with *E. gunnii* shown on page 120, and the Billy Buttons in the scene on the rear cover. Once a plant has a name the more enquiring mind will refer to the descriptions in the rear section of the book easily translating the simple botanical language to recognisable values. The scenery presented in the large beautiful colour plates must surely urge visitors to venture out and experience the magnificent grandeur for themselves. At \$59.95, this exceptional book is indeed value for money. There is also a soft cover field guide version for \$29.95.

Wildflower Nurseries in Queensland

Fairhill Plants and Botanic Gardens — Huge range; rainforest plants, grafted grevilleas, rare plants, wildflowers, ferns, orchids, revegetation trees. Extensive display gardens. Open every day 8.30 a.m. to 5.00 p.m. Fairhill Native Plants, Fairhill Rd, Yandina, Qld 4561. Tel. (07) 5446 7088.

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Annangrove Grevilleas — 98 Annangrove Rd, Kenthurst 2156. Tel. (02) 9654 1380. Wide range of natives including hundreds of different species in tubes — many hard to get. Ten percent discount to SGAP members.

Bryants Native Plant Nursery — Cosy Camp Rd, Bexhill, NSW 2480. Tel. (02) 6628 4323. 15 kms north of Lismore. Open 7 days (from 11 a.m. on Sundays). Extensive range. Excellent quality and service.

Dealbata (cold climate) Aust. Plant Nursery — off Bloomfield St, Dalgety 2630. Tel. (02) 6456 5043. Specialising in alpine and dry Monaro plants — Sorry no overseas orders. Phone to arrange a visit.

Illawamba Native Growers — PO Box 89, Cobargo, NSW 2550. Tel. (02) 6493 7398, mail order specialist. Send 2 x 45c stamps for a catalogue of our large range including rare species.

Newcastle Wildflower Nursery — 260 Lake Rd, Glendale 2285. Tel. (02) 4954 5584. Extensive range of native plants including rare and endangered species.

Stocks Native Nursery — Lot 3, Simmonds Rd, Harden, 2587. Tel. (02) 6386 2682. Plants for frost and dry weather suited to Canberra, Wagga Wagga, Orange type conditions.

Sydney Wildflower Nurseries — South at Heathcote (02) 9548 2818; West at Marsden Park (02) 9628 4448; North at Terrey Hills (02) 9450 1555. Excellent range of native plants. Open 7 days.

Wirrimbirra Native Nursery — Hume Hwy, between Bargo and Tahmoor E. side 2574 (3 km from Freeway entry). Wide range including unusual plants. Tel. (02) 4684 1112.

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Brenton Tucker Native Plants and Carawatha Garden — Placid Estates Rd, Wellington East via Tailern Bend. Tel. (08) 8572 7104. Wide range of tubestock and advanced plants. Extensive display gardens and picnic areas. Open weekends and public holidays March to November and by appointment, 10 a.m. to 4 p.m.

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Plants of Tasmania Nursery — 65 Hall St, Ridgeway 7054. SAE catalogue. Tel. (03) 6239 1583. Open 7 days.

Wildflower Nurseries in Victoria

Kuranga Native Nursery — 393 Maroonah Highway, Ringwood 3134. Tel. (03) 9879 4076. www.kuranga.com.au
For Australia's largest range of Australian flora including rare and unusual forms. Delivery to most states. Free stock list on request.

Australian Wildflower Seed Suppliers

R. Horner — 1 Grundy St, Alice Springs, NT 0870. Seed of trees and shrubs of Central Australia. Please sent 45c stamp for a list.

Wildflower Society of Western Australia (Inc.) — PO Box 64, Nedlands 6009. A range of seeds available, labelled and packed, at \$1.50 (plus postage) per packet. Send for a 2000/01 Descriptive Seed List (\$2.50 posted) to: The Seed Sales Officer, Eastern Hills Branch, 65 Swan View Road, Swan View, WA 6056. Also available a book *Hints on Growing Native Plants*, \$4.00 posted.

The Grevillea Book, volumes 1, 2 and 3 by Peter Olde and Neil Marriott, is a complete reference to all species of *Grevillea*. The Australian Plants Society NSW ensured that they were published to a very high standard with at least one large colour photograph of each of the 340+ species, an easily read description of each species and details of its occurrence and cultivation. They are available from the Australian Plants Society NSW, PO Box 744, Blacktown, NSW, 2148, at \$44 per volume plus postage and handling of \$7.50 for 1 or 2 volumes and \$15.00 for 3 volumes within Australia.

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Alpine wildflowers of the Kosciuszko National Park
See page 134. Reprinted from *Kosciuszko Alpine Flora*.

Colin Totterdell