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Australian Plants — Publishing Policy

1. To produce articles on the cultivation and propagation of Australian flora.
2. To promote the conservation of the unique Australian flora generally through study and practice as to the best methods to manage the flora in the wild as well as created areas. It is no longer sufficient to abandon plants in reserves and hope for the best. Methods of sustaining healthy growth in competition with the various contrary forces involves a study of cultivation and nutritional practices.
3. To provide a link between professional publications and academic life and the general public. As research papers are published, readers are advised of their content in simple terms. The scientist has found this an exceptionally valuable service to more widely publicise their work and to indicate to the general public how their tax dollar is being spent.
4. To publish colour photographs of plants not produced elsewhere. Most general publications continue to reproduce photographs of the same plants that are more widely known. It is rare that books such as *The Grevillea Books*, are reproduced with a complete set of photographs of all species and this has only been possible because of the financial support of the SGAP Publishing Section.
5. To provide a continuing service to update the most valuable books. As new research dictates changes, new species etc., the only publication suited and active in this work is *Australian Plants*. Already recent books such as the creditable *Grevillea Book* need updating with recently published scientific work. Using the *Grevillea Book*, or *Brachyscomes* as examples, photographs of other forms of species published can be produced maintaining them fully up to date.

Note. This is a summary of some of the policies adopted on the publication of *Australian Plants*, policies that have been published often as those who read it will readily know. Unfortunately this can only be done by using scientific names and this has brought criticism from some. I do the very best I can to make it simple. If this is not good enough how about you prepare an article for publication in the manner you prefer, then criticise if not published.- Editor

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COVER PLATE *Darwinia leiostyla* grafted onto a hardy vigorous *Darwinia* species. The research and development work and the photography by Doug McKenzie

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Growing *Darwinia*

Grafted for Reliability

Our Garden No. 25

by Doug McKenzie

We live on a fairly flat block 1.3 acres in area, 1 km inland from the south coast of Victoria at Ocean Grove. The soil is acid and consists of a shallow layer of medium heavy loam overlying sticky orange clay at about 0.25–0.33 metres (10"–12") depth. Sometimes a layer of stony nodules lies at the junction of the two layers. Drainage is fair, but some areas that have been planted lie in a hollow and remain wet for a long time after heavy rain. The natural vegetation, which has been left around most of the perimeter, consists of an open *Eucalyptus* woodland type vegetation, the main tree species being the swamp gum, *E. ovata*, and the yellow gum, *E. leucoxylon*. Annual rainfall would be about 60 cm distributed through the year with a winter maximum. Frosts occur rarely.

The garden, the oldest parts of which are about 18 years old, has been planted mainly on the north side of the house in a fairly large area initially cleared of taller trees to allow plenty of sun. This garden area is protected from wind by the house and surrounding natural vegetation, a mixed blessing when growing plants that are prone to fungal troubles. Quite a few beds have been built up in height mostly using straight ungraded scoria, which was cheaper than sandy loam.

The first grafting experiments were with *Banksia*, a few of these plants still surviving, just hanging on as dwarfed or stunted specimens. Considering the time spent and the number of plants grafted, the results were disappointing but the grafting bug really bit. Trial grafting of other genera, *Hakea*, *Swainsona*, *Grevillea* and *Eucalyptus* followed. The small plants in the Myrtaceae had always interested us, and I remember hopefully trying some early grafts of those notoriously difficult genera *Verticordia*, *Hypocalymma* and *Darwinia* onto a whole range of easy to grow plants from other genera in the Myrtle group such as *Melaleuca*, *Thryptomene* and *Astartea*. Needless to say most of these failed as the combinations were hopelessly incompatible. In the end the rootstock that showed the most promise was *Darwinia citriodora*. Many of my oldest grafts using this rootstock are still alive after 17 years. It is a great rootstock for our conditions being very tolerant of both wet and very dry conditions. It has been successful as a rootstock for *Darwinia*, *Chamelaucium* and *Actinodium*.

Grafted *Darwinia* have proved to be a great success. The resulting plants are much more vigorous, even more robust than those in their natural habitat. Many times I have grown plants from seed or cuttings on their own roots and planted them next to a grafted plant. The ungrafted plant if it survives is always outstripped in vigour many times by the grafted plant.

It is a mistake to regard grafted plants as cast-iron super plants that can not die. Solving root problems is very important but is not the only limiting factor that dictates the survival of our plants when introduced to horticulture. It now has a hardy root system, but the foliage can still suffer from foliar diseases if grown in a humid, poorly ventilated spot. Probably the most reliable results can be expected from plants growing in full sun in the open ground.



- △ **The McKenzie Garden** — Front centre, two small plants of *Darwinia hypericifolia* with a compact form of *Darwinia macrostegia* on the right. On the extreme left is the bright pink *Chamelaucium* species that is grafted onto *Darwinia citriodora*. In the rear are numerous species of *Darwinia*.
- ▽ ***Darwinia hypericifolia***. A shrub to 70 cm high × 1 m wide having oblong leaves with recurved margins, to 1.5 cm long. The scarlet bell-like flowers, to 3 cm long, are in heads of 3–6 flowers. It favours well-drained, gravelly soils that receive adequate moisture. It requires plenty of sun but benefits from periods of shade. Indications are that the harder the treatment the better the flower (bract) colour. Also available as grafted plant.





△ **The McKenzie Garden** — Front, *Darwinia macrostegia* × *D. meeboldii* left with *Darwinia macrostegia* and *D. hypericifolia*. Midgarden, *Kunzea pauciflora* (Grafted to *K. ambigua*), *Darwinia collina* (yellow flowered) with several *Darwinia oxylepis* not yet in flower.

▽ ***Darwinia macrostegia*, Mondurup Bell**, the compact form described on page 243 and available as grafted plants. The usual form, described on page 249, may grow a little higher and the leaves are to 2 cm long.



Planting Grafted *Darwinia*

Because these plants have been grafted using a micro-grafting technique when the plants are very small and young, the graft union is quite close to the ground. When planting out, make sure that the plant is planted at the original level so that the graft union is clear of the soil; in fact it is best to mound the soil surface slightly so that there is no danger of the graft being covered as the plant matures. Some of the topmost roots may be slightly exposed. This is deliberate, and should not cause concern as these small roots will soon wither as the stem increases in diameter. Try to avoid staking when planting out.

If the plant can be planted in an open, sunny, moderately well drained position, few problems should occur. I think that one aspect of growing *Darwinia* whether grafted or ungrafted that is often overlooked is their need for air movement. The mountain environment from which most of the 'bell' species come is windy, not just the freezing cold southerlies that may bring snow in winter or a sudden cold southerly change in summer, but also the effect of the sea-breezes which usually moderate the hottest of summer days. If growing in a garden, it is tempting to position them in a hot dry position, perhaps facing north, protected from wind by a fence or wall or perhaps growing them in a pot in a protected courtyard or on an open verandah. Plants planted in this situation in our garden, we have noticed, are the first to show signs of fungal trouble, powdery mildew, or partial leaf drop. Plants free of these diseases are those fully exposed to our prevailing cool winds, even plants growing in filtered sunlight rather than full sun.

Avoid pushing the plant with too much water or overdoses of fertilizer, particularly when the plant is young. Do not pamper the plant it is hardy.

They may also be grown in a container. Use a good quality potting mix that is suitable for native plants. If the plant has been growing in the container for a long time, or is not in active vegetative growth do not over water but allow the soil to dry a little between waterings and make sure the container is sited where the plant gets plenty of sun and air circulation.

Pests and diseases

Some species may be disfigured by powdery mildew after warm moist spells, particularly if the plant is growing in a sheltered position. A white powdery deposit is seen on the upper leaf surface. Leaves may go black and drop off. Solutions are to grow the plant in a more open situation, or to spray with one of the proprietary Rose sprays — these usually contain Triforine which is most effective against powdery mildew.

Other fungal problems sometimes cause leaf drop of older leaves, or spotting of the foliage — particularly after lengthy damp periods. The best solution to these problems is to place the plant in a better ventilated area. If leaf drop occurs, keep the plant dryish if possible, until new leaf growth begins.

Coming from the colder peaks of southern Western Australia most species are frost and cold hardy — indeed some species seem to need cold weather to set buds. Very severe frosts may however cause burning of developing flowers on some species.

Keep an eye out for the usual plant pests. The highly aromatic foliage does seem to discourage most pests, but watch for insect damage to buds.

SPECIES AVAILABLE as grafted plants*

Darwinia macrostegia (Mondurup Bell)

Photograph on page 241

The form being grown as a grafted plant is incredibly floriferous. One garden plant that is about 10 years old has over 2,000 bells on it. It forms a flat-topped, dense, dark green mound that is about half a metre high and up to 2 metres across, with every little branchlet terminating in a bright waxy red and white tulip shaped bell. It can flower for many months. Unfortunately this form is the one most prone to powdery mildew so be ready. This usually shows up as irregular dark blotches on the leaves. Flowers may be disfigured also.

The bells, first noticed in autumn, colour deepest crimson red on the side that gets most of the autumn and winter sun so choose a position where the north-facing side of the plant will be normally viewed. The bells last well in the water, even retaining their tulip shape and bright red and white colour when they dry.

Darwinia meeboldii (Cranbrook Bell)

Photograph on page 261

One of the tallest in the genus, grafted plants of this species are bushy, growing to over two metres in height and over one metre in width, carrying thousands of bells! The bells are flared and tri-coloured green, white and red, hanging at the end of each little branch giving the whole plant the appearance of a decorated Christmas tree. Beautiful cut flower with a vase life of at least two weeks.

Darwinia collina (Yellow Mountain Bell)

Photograph on page 244

This is a very rare species that occurs only near the summit of several of the highest peaks in the Stirling Range. It has bright yellow hanging bells that can appear sometimes in autumn as well as in spring. The bells dry well. It needs good air circulation and sun for best development.

Darwinia Hybrid (*D. macrostegia* × *D. meeboldii*)

This hybrid, which is an F1 cross between the two above species, is a beautiful plant with a combination of characteristics of both of its parent species. It is dome-shaped with light green foliage that is dense to ground level. Bells are large and basically tulip shaped, bright white in colour with a smudge of bright pink bordering the end of the bell. The pink tonings in the flower develop best in bright sun, so a north facing position is best.

Darwinia carnea (Mogumber Bell)

Photograph on page 261

This species which has the largest bells of all has almost been wiped out in its natural Western Australia habitat. Because of the density of the foliage of this prostrate plant, make sure that it has a good open position with plenty of sun. It is ideal as a basket plant.

Darwinia oxylepis

Photograph on pages 260 and 277

Many regard this tallish shrub as the most beautiful of all the Mountain Bells. The brightest of scarlet red flared bells cover the bright green pine-like foliage. This is an excellent cut flower.

Continued on page 278 together with their use as dried flowers.

*This promotion may appear strange but this is a special case. Doug McKenzie has spent many years pioneering the grafting of a very wide range of Australian plants. We are indebted to him for his unselfish research, check out the report of grafting of *Verticordia* in our last issue.



△ **McKenzie Garden** — A range of grafted *Darwinia* including hybrids on trial in a low damp garden bed. Front left, *Darwinia leiostyla* hybrid known as Coolamon Pink (this is also the large plant in the centre rear), see photograph on page 280, with *D. leiostyla* on the right. The bright pink flowered plant in the centre behind them is *Hypocalymnia robusta* grafted onto *Hypocalymnia coridifolium* with *Darwinia macrostegia* on the left and *D. collina* (yellow/green bells) on the right various forms and hybrids of *Darwinia macrostegia*.

▽ ***Darwinia collina*, Yellow Mountain Bell**, as described on page 243 and page 249.



Darwinia

by Trevor Blake*

Darwinia is a purely Australian genus comprising 45 named species. As illustrated in this issue they are plants with excellent horticultural potential. The group varies in habit from prostrate and cascading to upright bushy species of 3 m in height. Doug McKenzie has selected from the smaller species with large colourful striking heads prominently displayed on branch ends.

Darwinia can be useful as rockery plants, as low shrubs with prostrate, decumbent or upright habit; they are naturally undershrubs in open or semi-shaded positions. Most like some moisture and are found in situations where this is provided. To plant these species in vastly different situations will usually result in poor specimens or total failure after a season or so, although some are proving tolerant and those with grafted rootstock especially so.

Darwinia respond well to light pruning which will thicken the habit of the plants and usually encourage a greater quantity of flower buds. A number of the species have greyish-green to silver-grey foliage, *D. citriodora*, *D. luehmannii*, *D. purpurea*, and a *D. carnea* hybrid, a worthwhile element in horticulture. Most respond well to light applications of blood and bone just prior to, and after flowering. The most common means of propagation is to grow from cuttings, which has proved quite successful with most species.

The small flowered, small bracted *Darwinia* flowers are always upturned as in Figure 1c. The species with larger floral parts always have pendent flowers which give the 'Bell-like' appearance as in Figure 1d. These include *D. carnea*, *D. collina*, *D. helichrysoides*, *D. hypericifolia*, *D. leiostyla*, *D. macrostegia*, *D. meeboldii*, *D. oxylepis*, *D. pimelioides*, *D. squarrosa*, *D. speciosa* and *D. wittwerorum*. The rest have similar, smaller flower heads which do not have large bracts that extend beyond the floral parts. The foliage shape is generally fine and heath-like, but in some species it is broader and oval. The western group occur in habitats ranging from sandy, coastal heaths to moist peaty acid sandy clays of mountain areas of Western Australia and the eastern species are east of the dividing range except for *D. porteri* of Cape York. All are undershrubs in these situations.

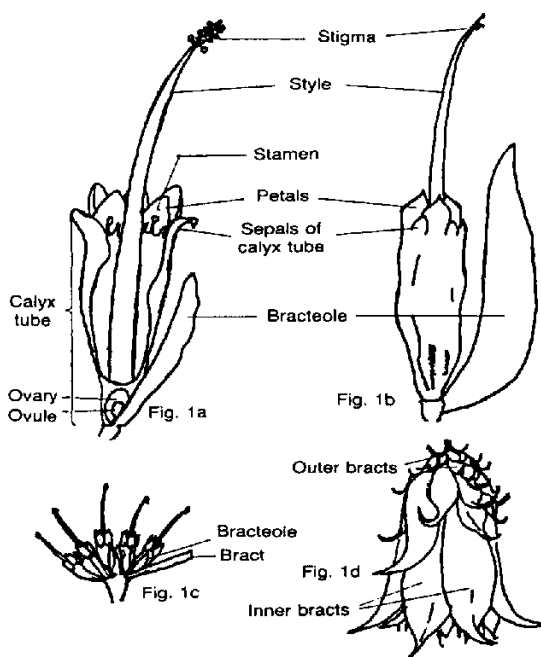
Many of the 'Bell' flowered species are restricted to the National Park area of the Stirling Ranges in a range of habitats from moist valleys to the mountain tops, *D. collina*, *D. leiostyla*, *D. macrostegia*, *D. meeboldii*, *D. oxylepis*, *D. squarrosa* and *D. wittwerorum* all pollinated by birds. Those that are found at the western end of the range usually encounter drier conditions, while the eastern Stirling Ranges species thrive under the cool, moist and often misty climate of 1,000 m+. They prefer the peaty acidic sands which retain moisture, provide coolness to roots and whose rocky terrain provides anchorage in gales and storms, rather than the lower dry sandplain country.

*A Guide to *Darwinia* and *Homoranthus* by Trevor L. Blake is a unique small 88 page book that describes all 45 species of *Darwinia* and seven species of the closely related *Homoranthus*. Part of the introduction is reproduced above. The description and recommendations for cultivation for each species are as given with additional notes of interest. For most species there are also detailed sketches showing a flowering branchlet with individual flower details enlarged. It is a book for the grower of *Darwinia* presented so that they can identify a flowering plant just by looking at the sketches. Available from Trevor Blake, 22 Vista Ave., E. Ringwood, for \$10 inc. postage.

Darwinia and birds. The flowers are nectar producers and either insects or honey eating birds frequent this food source. Those hardier species that can be planted to attract honeyeaters include *D. citriodora*, *D. fascicularis*, *D. grandiflora*, *D. leiostyla*, *D. pinifolia* syn. *D. rhadinophylla*, *D. taxifolia*.

Botany:

This genus can be identified from the huge order of *Myrtaceae* by having a single celled ovary, ten stamens that alternate with a similar number of staminodia (infertile stamens) and five broad calyx lobes. The style is usually long and the anthers open in pores or short slits. The single celled ovary contains two to three ovules with exceptions of four and are attached to the placenta at the base of the ovary. The groups of flowers are surrounded by fringed bracts.



Flowerheads comprise a number of individual flowers held upright as in Figure 1c or pendent inside a bell of **bracts** appealingly coloured in many cases as in Figure 1d.

Individual flowers as in 1b, some of the outer petals removed as in 1a to show the following:

Female components, the central column with the **stigma** on top ready to receive pollen, the **style** which transmits the fertilising pollen down the hollow centre to the **ovary** at the base which is single celled with 2-3 (rarely 4) **ovules** which, on fertilising form **seed**.

Male components, the 10 **stamens** (alternating with 10 staminodes, infertile stamens) ring the style, in this case attached to the inside of the petals.

Floral envelope, the five **petals** and five similar **sepals** are bonded to form a tube.

Cultivation in Containers

Many *Darwinia* species have proved to be excellent subjects for tub or container growing. Decorative characteristics are the long flowering period and massed displays. Outstanding species for this purpose include *D. collina*, *D. hypericifolia*, *D. leiostyla*, *D. macrostegia*, *D. meeboldii*, *D. nieliana*, *D. oederoides*, *D. oxylepis*, *D. speciosa* and *D. squarrosa*. All of these have large pendent heads of hanging flowers.

Plants that have this low growing habit and could be grown effectively in containers are *D. glaucophylla*, *D. grandiflora*, *D. homoranthoides*, *D. pinifolia* syn. *D. rhadinophylla* and the low growing form of *D. fascicularis*. Two other unusual species are *D. sanguinea* and *D. virescens*. The attractiveness of these two is that their habit of growth is low and spreading with large upturned discs of flowers at the ends of the branchlets. The latter species has attractive pale grey bark which offsets the blue/grey leaves.

Quite often a contrast of foliage is required to offset nearby plants. Several have blue/grey foliage, *D. citriodora*, *D. fascicularis*, *D. glaucophylla*, *D. luehmannii*, *D. micropetala*, *D. purpurea*, *D. pinifolia*, *D. thomasi* and *D. virescens*.

Compact growth with a good display of flowers is also a feature of *D. acerosa*, *D. diosmoides*, *D. fascicularis*, *D. luehmannii*, *D. oldfieldii*, *D. pauciflora*, *D. purpurea* and *D. vestita*. Containers should be big enough for healthy growth, which implies that they contain enough soil to overcome constant re-potting. The soil should be friable to allow water to drain through, and roots to grow readily. Such a potting mix will contain some water absorbing materials such as humus, peat moss, or pine bark. A good mixture is five parts coarse sand, five parts organic material and three parts friable loam. Heavy clay usually results in caking and restricts growth and too sandy a soil encourages drying out.

Watering should keep the soil constantly moist but not wet. This is best tested by checking the soil 2–3 cm below the surface as it can be moist below but appear dry on top or wet on the surface and dry below. Containers will have some bearing on the moisture content, glazed and plastic materials will retain much more than the porous unglazed materials and therefore will require less watering, the deeper the container the less evaporative surface to dry the soil. Drainage holes should be about the size of a ten cent piece covered with a layer of crock.

Light applications of blood and bone will benefit tub plants or even a few slow release fertiliser pellets placed deep in the soil will give results. Applications of liquid seaweed fertilizer could be sprayed on leaves at intervals as a substitute.

Plants grown inside should, at regular intervals be placed outdoors, (not in strong, hot sun or wind). Spraying of the foliage is important to remove dust and allow the leaves to 'breathe'. Most species are suitable for cut flowers and if completely immersed in water mixed with a few drops of hormone, prolonged good conditions should result. An advantage of this pruning is that it keeps plants compact and promotes flowering.

Darwinia carnea, 'Mogumber Bell', has two forms, one a tall, erect shrub to 2 m high, the other a low, open, spreading shrub to 45 cm with opposite, glossy, concave, keeled leaves from 5–15 mm long $\times$ 1–3 mm wide. The flower heads are 'Bell-shaped' and hang from the ends of the branchlets each with up to 10 individual flowers completely enclosed by the large, green to pink inner bracts, 3 cm long. The outer bracts are green and more leaf-like but coarser, to 5 mm at the base. The calyx tube is cylindrical but not ribbed, the calyx lobes oval and one third of the length of the 4 mm long calyx tube. The petals are 4 mm long and extend beyond the calyx lobes. The style extends beyond the calyx, but covered by the bracts. It requires a well-drained position receiving morning and winter sun, but will tolerate full shade. Frost hardy.

Darwinia citriodora, 'Lemon Scented Myrtle', is a dense shrub from prostrate to 1.5 m high by 1–2 m across. Aromatic, opposite, blue-green oval leaves develop reddish tints in autumn and winter. They are to 1.5 cm long with curved margins. The flowers are both pendulous and erect variable in size and colour. Those with four flowers are generally red whilst the six flowered heads are yellowish-green. Some forms have tiny flowers. All forms are surrounded by leaf-like bracts, the inner ones being almost colourless. The bracteoles which are shorter than the petals, allow the scarlet styles to protrude prominently. The lower part of the calyx tube has 5 angles and occasionally there is a ring of warty growths at the base. The calyx lobes are half as long as the petals. It grows in jarrah forest of the Darling Range on moister slopes of granite outcrops of south-west Western Australia where it is widespread. The soils although moist are well-drained and plants do well in open sun to semi-shade.

This species is successful under a range of conditions and soil types from sands to heavy clay, both shallow or deep and will tolerate some lime. For this reason it is used as the hardy rootstock to which is grafted more showy species. It will succeed in a sunny to shaded position and is moderately salt resistant, but appreciates moisture and makes rapid growth; a good tub plant. There has become available a more vigorous, larger-flowered form with greyer foliage which has much brighter orange flowers than the more common, denser, smaller form. It responds well to tip pruning after flowering and will become thicker, which makes it a good choice as a low screen plant. If given strong anchorage it will tolerate fairly high wind buffeting and makes a good windbreak. It is also suitable for coastal planting in a second line, which indicates some protection is necessary from the heavily salt laden winds. A 25 year life span can be expected.

Darwinia collina, 'Yellow Mountain Bell', is a bushy shrub to 1.8 m $\times$ 1.5 m with tightly packed elliptical leaves (5–9 mm long) with minutely toothed margins. The 'Bell-like' flower heads to 6 cm, hang on the ends of the branchlets giving a spectacular and massed display. Numerous flower heads are enclosed by large, yellow, entire bracts that resemble petals. The outer ones being short and green merge into the stem leaves. The narrow bracteoles have prominent oil glands. The calyx tube has 10 prominent ribs at its base and ends in small oval calyx lobes. The long style, 1.3 cm long, extends well beyond the flower, but not beyond the bracts and is partially flattened at the end. It grows above 1,000 m in moist, peaty sands over shale on four eastern summits of the Stirling Ranges, it is exposed to frost and occasional snow storms. It requires acid, well-drained, moist peaty soils in open or semi-shaded situations and should be protected from the west sun. In warmer areas this species should be grown in almost total shade.

Darwinia leiostyla is an erect, compact, dense shrub 20–100 cm × 60–100 cm. The small, crowded, aromatic, scattered, linear leaves under 1.5 cm long providing a striking contrast to the large, pink and white bracts, that enclose the 8–10 flowers of the pendulous 'Bell' (3–4 cm × 2–2.5 cm wide). The outer bracts are oval, short and have leaf-like points. Narrow bracteoles are often longer than the calyx which is about 6 mm long without ribs, but with a granular surface. The calyx lobes are oval and tiny. The style is variable. It is found in the Stirling Ranges and the Middle Mt. Barren Range and is closely related to *D. meeboldii*. It favours stony to peaty sands in semi-shaded, moist and cool situations in valleys between the peaks. There seems to be a form of this species with wide spreading 'Bells'. Another form from Mt. Trio has 'lolly pink Bells'.

It is proving adaptable to a wide range of soil types, from clays and gravels to sands and has done well in neutral to acid well-drained soils (pH 5.0). A moist situation ensures good flowering although the plant will tolerate conditions that are a little drier. It also seems to tolerate a range of sun and open position to deep shade. It responds well to regular pruning which promotes bushy growth. This is a striking species which is suitable for tub growing.

Darwinia macrostegia, 'Mondurup Bell', is a straggling shrub from 70 cm–2 m high by up to 1 m wide. The almost stalkless leaves are oblong to elliptical, up to 2 cm long and are scattered along the branches. This is the largest of all the 'Bells' to 6 cm long, and is white, but blotched and streaked with variable amounts of red. In some instances the 'Bells' or flower heads can be nearly all dark red. Each little branch is terminated with a pendulous bell flower. The large bracts or floral leaves completely enclose 8 or so small flowers but as they open, greater white areas are revealed. A pair of bracteoles enclose each flower and are as long as the calyx tube. The lower part of the tube has 10 prominent ribs which have horizontal wrinkles between them. The calyx lobes are minute. The style extends almost as far as the bracts and hidden inside.

This species favours well-drained, stony soils on several peaks and valleys in the drier western areas of the Stirling Ranges in fairly open situations. It is also found to the south in the Porongurup Range. Under cultivation, it appears to prefer well-drained soils during winter and moisture during summer in an open, sunny or semi-shaded position. It does succeed as a tub plant.

Darwinia meeboldii, 'Cranbrook Bell', is a slender shrub of erect habit reaching 2–3 m high which is the tallest of the genus. The leaves are linear to oblong, 5–9 mm × 1.5–2 mm wide with the margins smooth and recurved. The pendulous flower heads are large 'Bells' which comprise 7–8 flowers and are enclosed by 3 mm long, tri-coloured, inner bracts which are red, white and green with small serrations towards the apex. The outer bracts are green, much smaller and tapered and blend into the stem leaves. The bracteoles are slender and are the length of the calyx, 11 mm. The cylindrical calyx tube appears hard and shiny with the erect, rough and thickened calyx lobes violet-coloured towards the apex. An elongated style is 2–2.5 times the length of the calyx and almost black. Another form of this species displays predominantly red bracts with white tips.

Three populations grow naturally in shaded or semi-shaded positions in moist, peaty soil on northern slopes of the Stirling Ranges on the western boundary. In its natural habitat it is a sparse plant and appears to have wide tolerances as it is frequently subjected to cloudy, wet situations. This species needs similar growth requirements to *D. leiostyla*, well-drained, open or semi-shaded moist conditions.

Darwinia oxyiepis is an upright, dense, bush 1–1.5 × 1 m wide. The thickened leaves generally recurved and densely arranged on the stems. Similar flower heads to *D. meeboldii* — typically 'Bell-shaped' and magnificently displayed. Each head hangs from the curved terminal tip of branchlets and is 3 cm × 2.5–3 cm wide. 10–12 individual flowers are well enclosed by the bracts. The outer bracts are green becoming red towards the apex of the head and very recurved. The inner bracts are 1–1.2 cm long × 3–7 mm wide and the largest of these enclosing bracts is 2.5 × 1 cm wide. Once the upper bracts are lifted white is revealed below, but this can be variable on different shrubs and the white extends below the upper bracts. Each flower has a pair of bracteoles enclosing the calyx tube. The inner bracts, 14 mm long, white, extend 2–3 mm beyond the calyx which is 10–12 mm long, smooth with the lower half yellow and the upper half deep red. Calyx lobes are 3 mm long, the style extending 15 mm beyond them.

This bush grows in moister areas north-west of Mondurup Peak in the Stirling Ranges. It can be found on rough, rocky ground in full sun or partial shade and in dry gullies which indicates that it requires some moisture. In well-drained, grey, clay soils in 1,000 mm rainfall the species survives for up to two years and then suddenly dies. It appears to require constant moisture. As a tub plant some unexpected deaths have occurred in well-drained moist, sandy soils after three years of highly successful growing with plants producing scores of flowers.

Darwinia speciosa is a small sub-shrub erect and sprawling or prostrate to 30 cm. The leaves are oblong, opposite, crowded with entire margins and generally 4–6 mm long. The four drooping, oval-shaped, green flowers are almost completely enclosed by 3 cm long, dark reddish-brown, entire bracts giving a distinctive 'Bell-like' appearance. The outer ones are much shorter and the inner bracts are tapered towards the ends. Bracteoles are lance-shaped and shorter than the 4–6 mm long calyx tube which is distinctly five ribbed. The calyx lobes are similar shape to the bracteoles but only half the length of the petals (2 mm).

It grows naturally in the sand heaths between Hill River and Mingenew in open to under shrub situations. It has been successful in well-drained sand or clay loam soils in semi-shaded to open situations. It should make an excellent container plant and it may be advisable to keep away from the hot afternoon summer sun.

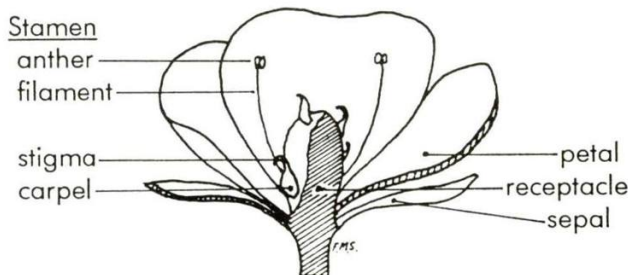
Darwinia squarrosa, 'Pink Mountain Bell', is a small branching straggling shrub to 1 × 1 m across. The fringed leaves are oblong to oval to 8 mm long, paired and set at right angles to each other. The large bright pink fringed bracts to 2 cm long completely enclose the 6–7 flowers giving a 'Bell-like' appearance. The 'Bells' are terminal and drooping and are attached directly onto the branchlets. The outer green bracts are small but longer than the leaves with the inner pink ones being quite large and fringed. The 6–8 totally enclosed tiny flowers each have a pair of small bracteoles. The small lobed calyx tube is faintly ribbed and the long style extends well beyond the white petals.

It grows naturally on the rocky upper slopes of the moist, eastern peaks of the Stirling Ranges. The soils are peaty sands in well-drained rocky situations. Good drainage is essential and it appears to like semi-shade and cool roots. This species grows as a compact container shrub and promises to be an excellent choice with highly ornamental foliage and flower. ■

Butter Cups – *Ranunculus*

by F. Shepherd
and W. H. Payne

Buttercups have world-wide distribution with 400–500 recorded species. There are 47 species found naturally in Australia. Their general appearance is uniquely consistent, the characteristic, bright 'enamel' yellow flowers standing primly, generally from 5–30 cm above a herbaceous plant, often a rosette of leaves close to the ground. See the colour photographs on page 253.



A typical flower is sketched in Fig. 1 the features shown being:

Receptacle — a woody extension of the flower stalk, holding the following:

Female organs comprising the **stigma** that receives pollen necessary for germination and the **carpel** below the stigma containing **ovules** that mature to seed after fertilisation.

Male organs, the **stamen**, comprising the **anthers** where fresh pollen is made available on top of the **filament**.

Floral envelope comprising the **petals** — in this case usually yellow, and five or more in number and the **sepals**, often so similar to the petals as to cause confusion but for *Ranunculus* they are generally green and 5 in number.

A characteristic of *Ranunculus* is the way the sepals, petals, stamens and carpels are separately attached to the woody receptacle that extends up into the flower with the numerous carpels arranged spirally on it. To simplify presentation and to attempt to eliminate those hated botanical terms the species are presented in groups as follows:

The Buttercup Species

Firstly, let us make it quite clear, we have not overlooked our emerald isle, Tasmania. All Australian species are mentioned below except those of Tasmania. The book, upon which this report is based, describes all Australian species. I have purposely left Tasmanian species out in the hope that this will stir southern members into preparing an article on their own plants for a future issue.

*This article relies heavily on a unique book by Frank Shepherd, *In Search of the Buttercup*, available only from him by mail for \$30 (includes packing and postage), sent to PO Box 484, Turrumurra, New South Wales, 2074. While all Australian species are described, each on a left hand page opposite a full page, full size sketch of the species on the opposite or right hand page, those interested in botanical history will enjoy what is really the major part of the book, the explorers, naturalists and publishers who played roles in finding the various Buttercup species. It is the culmination of 10 years of research, a personal quest, by Frank Shepherd.

Species with white flowers — there are only two, easily separated species

Ranunculus anemoneus opposite, is a floral gem of the Kosciusko plateau. It is a tall (15–30 cm) herb with divided, stem-clasping upper leaves. The large white to cream flowers are also unique with 15–30 petals so beautifully arranged.

Ranunculus millanii is the smallest of the alpine buttercups and forms mats of vegetation in wet situations in sod tussock grassland, bog and fern. It is widespread in mud and in still shallow water on the alpine area from Kosciusko to Mt. Buffalo in Victoria, and adjacent ranges to Mt. Wellington. There are usually five petals but sometimes up to 12.

The lonely species in Western Australia — the coastal plains of the south west

Ranunculus coloratum is one of the larger species, up to a metre high. It is a small plant, five petalled flowers 16–40 mm across.

The small flowered species with flowers less than 8 mm across.

Ranunculus hamatosetosus is found in shady humid places often between rocks in South Australia from Adelaide to the northern Flinders Ranges. With 1 or 2 petals the tiny flowers do not show.

Ranunculus pentandrus from the dry inland plains of Australia east to the Darling Downs and Narrabri has only 1–2 pale petals on flowers 2–3 mm across.

Ranunculus productus from the Kosciusko sub alpine regions has pale yellow 5 petalled flowers 3–4 mm across with hairy 3–7 segment leaves.

Ranunculus pumilio is found on damp-sites from Tasmania north to Queensland. The 2–4 small yellow flowers are 2–3 mm across, the hairy deeply divided leaves on stems to 300 mm long branching from the base.

Ranunculus sessiliflorus is found on low altitude plains country from Tasmania and South Australia, north to Central Queensland. The 1–2 yellow petals are tiny on a flower 2–3 mm across.

Ranunculus amphitricha River Buttercup is found along swamps and waterways on coastal plains and tablelands south from Brisbane to Tasmania and South Australia, arising from underground stolons. The pale yellow 5–9 petal flowers are larger, 7–10 mm across.

Very small perennial herbs

Ranunculus acrophilus, Felted Buttercup, tiny plants to 4 cm tall from the windswept feldmark of the Kosciusko peaks has hairy, felt-like almost stalkless wide leaves with three small lobes on the ends. The 4–5 petal flowers are 15–35 mm across.

Ranunculus muelleri is similar but the tufted plants to 15 cm tall are found at lower elevations.

Ranunculus niphophilus, Snow Buttercup, grows in dense clumps which create a carpet of gold when in flower, in alpine regions of Mt. Kosciusko. The shining bright green leaves are crowded sometimes forming a mat.

Ranunculus clivicola is similar, golden flowers in clusters of 2–4, 12–30 mm dia.

Ranunculus collinus of the subalpine wet areas from Gippsland to Tasmania has rosettes of leaves cupping a flower with 6–11 petals, 10–15 mm across.



△ *Ranunculus anemoneus*

▽ *Ranunculus lappaceus*

Photographed by John Story in his garden.



Ranunculus diminutus is found at Lake Bathurst and Lake George, the tiny three segmented leaves arising from underground stolons, 5–8 petals 12–18 mm across.

The remaining buttercups, upright and usually more than 10 cm high

Ranunculus dissectifolius is a tufted herb 5–20 cm tall of the wet localities of Kosciusko alpine areas, flowers with 6–10 petals are 15–30 mm across.

Ranunculus eichleranus is found in subalpine areas of Mt. Hotham, the 5 petal flowers being 16–20 mm across.

Ranunculus graniticola, Granite Buttercup, grows in clumps 5–30 cm tall and to 20 mm across, in alpine areas of Kosciusko to Mt. Buller. The 5–8 petal flowers are 10–36 mm across.

Ranunculus gunnianus from alpine areas of Kosciusko to Tasmania, the 5–13 petal flowers are 25–45 mm across.

Ranunculus inundatus may be partly submerged in elevated areas south from Queensland. The 5–7 petal flowers 10–15 mm across arise with leaves from underground stolons.

Ranunculus lappaceus, Common Buttercup, is small tufted herb to 70 cm tall. The 5 petal flowers are 15–40 mm across. It is widespread in grasslands and forest from Queensland to Tasmania. The photograph on page 253 was taken by John Story in his garden, treasured as a plant native to the Toowoomba area.

Ranunculus ligulatus from the Mt. Buffalo Plateau has 5–8 petal flowers 15–20 mm across.

Ranunculus pachycarpus is found in low altitude grasslands from Albury and Wagga Wagga to Port Augusta. The 5 petal flowers are 13–28 mm across.

Ranunculus papulentus is found in the ACT, Lake George, Yass has 5–9 petal flowers 15–20 mm across.

Ranunculus pimpinellifolius is found in wet grasslands, sometimes underwater, on high country from Kosciusko to Tasmania. The 5–8 petal flowers are 5–15 mm across.

Ranunculus plebeius is found in damp places in coastal and tableland forests of New South Wales from Port Macquarie and Gloucester to Narooma. The 5–8 petal flowers are 7–16 mm across.

Ranunculus robertsoni is found in coastal and tableland grassland and forest in western Victoria. The 5 petal flower is 13–26 mm across.

Ranunculus scapigera is found in subalpine grasslands from Kosciusko to Tasmania. The five petal flowers, often tinged with purple on the back are in clusters of 2–4 on stalks to 25 cm long, and are 8–16 mm across.

Ranunculus undosus is found in damp areas on low altitude plains of New South Wales, Balranald to McIntyre River. The 5–11 petal flowers are 20–25 mm across.

Ranunculus victoriensis is found in subalpine grassland of Mt. Hotham and Bogong High Plains. The five petal flowers are 16–30 mm across. ■

Blandfordia in History

by Tony Cavanagh
Deakin University, Geelong

In common with so many of our native plants, *Blandfordia* was extensively grown in Great Britain in the nineteenth century as a greenhouse and conservatory plant. All four species were grown, most being introduced under different names. Some of these introductions were undoubtedly hybrids as the genus is known to produce hybrids. A hybrid between *B. cunninghamii* and "*B. flammea*" (*B. grandiflora*) was deliberately produced in 1874.

The name *Blandfordia* was chosen by the English botanist Sir James Edward Smith in 1804, based on specimens supplied by the Colonial Surgeon John White from Port Jackson. Apparently, Smith was so impressed by the specimens (which were of the least attractive member of the genus) that he decided to commemorate a worthy patron of horticulture, George Spencer Churchill, the Marquis of Blandford who owned an extensive estate near Reading, England. The name Smith gave was *Blandfordia nobilis*, a species found on the heaths south of Sydney almost to the Victorian border.

The next to be named was *B. punicea*, but it carried the name *Aletris punicea* given by its discoverer Jacques de Labillardiere in 1805. The English horticulturalist Robert Sweet in a listing of plants then being cultivated in England and published in 1830, correctly identified it as a *Blandfordia*. It was subsequently known for many years, especially in the nursery trade, as "*Blandfordia marginata*". *Blandfordia punicea* is endemic to Tasmania where apparently it is widespread, usually growing in moist, acid soils.

The remaining two species are confined to Eastern Australia and both are noted for their large, showy flowers and the large number of flowers per plant, as many as 20. *Blandfordia grandiflora* was named by Robert Brown in 1810 from specimens he had collected near the Hunter River. Possibly because he had not seen Labillardiere's *Aletris punicea*, Brown cited his species in synonymy with a query, a suggestion that caused considerable confusion among botanists and horticulturalists alike as to exactly what the "true" *B. grandiflora* was. For many years, it has also been called "*B. flammea*" while the golden form was given the name "*B. aurea*".

The last species to be described, *B. cunninghamii*, is confined to a restricted area of the Blue Mountains and is extremely showy. Cunningham collected the original specimens but due to the variability of plants in the field, he failed to recognize a new species and instead labelled it "a very luxuriant specimen of *B. nobilis*". John Lindley was to name the species after Cunningham in 1845.

Cultivation of *Blandfordia* in 19th Century Britain

At about the same time as White's dried specimens of *Blandfordia nobilis* were reaching Smith, seed reached English nurserymen. However, it wasn't until 1818 that the first *Blandfordia* was flowered in cultivation, at Whiteley and Brames' nursery in London, presumably from a plant imported from Botany Bay.



Printed by J. Paulsen 109 Piccadilly. Oct. 1. 1825

J. Walter del.

Blandfordia nobilis as illustrated in Edwards' Botanical Register in 1825.



Miss D. D. del.

Publ. by T. Rodgerway 169, Piccadilly April 1 1845

S. Barclay sc.

Blandfordia punicea as illustrated in Edwards' Botanical Register in 1845 (Vol. 31, t. 18).

Several other nurseries were to grow this species in subsequent years, Stockwells in the early 1820's and Colvilles in 1824 where "growing in the open border of a conservatory . . . it flowered in great beauty and profusion". It had been raised from seeds collected by a Mr. John Richardson but such was the confusion which existed with identification that it was described as "*B. grandiflora*". This confusion existed right through the century and most of the illustrations in horticultural magazines of the period referring to "*B. grandiflora*" are of *B. nobilis*, albeit with generally larger flowers than normal.

The first "true" *Blandfordia grandiflora* was illustrated in *Paxton's Magazine of Gardening and Botany* of 1849 under the name of "*B. flammea*". It was introduced through the nurserymen Messrs Low and Son of Clapton from seed collected on the banks of the Hunter River. Though new to cultivation, the writer tells us that "it has been known for some years in a dried state, Dr. Lindley having specimens four feet in length, received from Port Stephens."

In 1854, *Curtis' Botanical Magazine* was to sing the praises of what was "unquestionably the most beautiful and distinct of all", another specimen of "*B. flammea*". This had an interesting history — "The root (i.e., plant or division) was brought from the Sydney Botanical Garden (under the name of *B. grandiflora*) four years ago by Lord Walter Butler, to the Countess of Carrick, who presented it to Sydney from Hunter's River . . ." The account goes on to say "Dr. Mackay's finest specimen had the flower stalk three feet and a half high and in all had fifteen flowers upon it . . ." Truly, this must have been a spectacular sight.

Finally, in 1869 the golden form of *Blandfordia grandiflora* made an appearance under the name "*Blandfordia aurea*", imported by the nurserymen Veitch and Sons from New South Wales.

Although *Blandfordia punicea* was first named in 1805 and recognized as a *Blandfordia* in 1830, it wasn't until 1842 that a plant was flowered in England, at the Fulham nursery of Messrs. Osborne and Co. It came from Tasmania but the collector is unknown. Three years later, it was again illustrated in *Edwards Botanical Register* where the flowers were described as being of a "deep copper colour instead of half red and half yellow" and as forming "a nearly regular cone". One specimen examined by Lindley at the time had 23 flowers (which) "must have made a splendid appearance when alive". The plants described in the article were given two names, "*B. marginata*" (on account of the roughness on the edge of the leaves) and "*B. Backhouseii*" (after the botanical collector James Backhouse) and were collected in Tasmania by the well known amateur botanist, Ronald Gunn. The cultivation notes advise growers that because it came from damp places, the plant required a good supply of water over summer.

When introduced in 1868 by Messrs. E. G. Henderson and Sons, *Blandfordia cunninghamii* was described as "by far the most handsome and profuse flowerer". Certainly the plant illustrated had very large showy flowers but little is known of the origin of the seed except that it came from the Blue Mountains.

Editor's Note: Have we progressed with knowledge of cultivation of *Blandfordia* since 1868? For a start we need to find exceptional forms for development for horticulture. Will readers keep a look out for exceptional flowers and those flowering in June and July as well as March/April and advise Editor?

Cultivation of *Blandfordia*

In the 1880's, *Blandfordia* were still popular and a very detailed article by W. Bull in *The Garden* of October 27, 1883, described the species then being grown and illustrated a form of *B. cunninghamii*. His opening sentence is worth repeating — "This beautiful genus of Lilaceous plants must take a foremost position amongst the many garden treasures we owe to Australia. It is by far the finest representative of the order to which it belongs . . ." *Blandfordias* were not regarded as "difficult" to cultivate although Bull tells us "They require a little extra attention, and in return for it will yield freely their spikes of brilliantly coloured flowers, which remain in good condition on the plants for several weeks". They were treated as cool greenhouse plants, potted in a mixture of sandy loam and peat or coarse sand and peat, and kept out of direct sunlight in the summer. All growers emphasized careful and regular watering, with regular "syringing" (foliage watering) in warm weather. Liquid manure was recommended when the plants were beginning to bloom.

Propagation was by seed or divisions although *Blandfordia* rarely set seed in England. Division was recommended in early spring although "care should be taken not to cut the rootstock too severely or disaster will result"; waiting until some good offsets were produced was suggested. Bull indicated that plants actually grew better in a peat bed in a conservatory providing it was not too shaded but conceded that most plants would still be grown in pots. As late as 1895, *Blandfordias* were still in cultivation in England.

Finally, it is interesting to note that at least one hybrid was raised in England, "*Blandfordia flammea-elegans*", a hybrid between *B. grandiflora* and *B. cunninghamii*. It was grown by the nursery firm of E. G. Henderson and Son in 1874 but little more is known about it. In the field, *B. nobilis* and *B. grandiflora* hybridize readily, and specimens which could represent hybrids of *B. grandiflora* and *B. cunninghamii* have been found in the Blue Mountains. It is thus highly likely that several of the "named" species of the last century may represent hybrids, e.g., "*B. marginata*" may represent one of the intermediate forms between *B. grandiflora* and *B. nobilis* while Bentham's *B. grandiflora* var. *elongata* probably represents a hybrid between *B. grandiflora* and *B. cunninghamii*. ■

Organic Gardening

by Peter Bennett

The very essence of good gardening is detailed here. Of course it is aimed to produce vegetables but the prepared gardening practice is equally suitable for the cultivation of the Australian flora to perfection. This is to eliminate or reduce chemical fertilizers and pesticides, build a healthy soil biomass in which roots, worms, fungi, moulds, bacteria and viruses abound, look after the trees and animal life and build a sustainable fertility system capable of producing vegetation of the highest nutritional quality.

All the creatures found in a healthy garden are illustrated and described in simple terms and their role in the balance of nature's natural cycle is given together with suggestions for natural control of those that compete with our efforts. There are 60 pages devoted to this including birds and how to create a haven for lizards. Another 76 pages are devoted to care of the soil, composting and mulching. Of course if you are into vegetables the last 70 pages are a must. The book is widely available for \$24.95 or by mail as indicated inside our rear cover.



△ **The McKenzie Garden** — *Darwinia* as cut flowers (pot on left) as picked include *Darwinia collina* (yellow) with some *Darwinia macrostegia*. *Darwinia* are ideal cut flowers for display. Dried flowers, assorted species, have been wired and dried for some time and stored in the pot on the right as described on page 278.

▽ *Darwinia macrostegia* and *Darwinia oxylepsis* as described on page 243 and 250. These plants are both grafted onto the one rootstock.





Grow Grafted *Darwinia* in Pots. These plants are on our verandah facing north. In front centre are grafted Sturt's Desert Pea of various forms, with *Darwinia cornea* on the right. At the back, the taller plant is *Darwinia meeboldii*, behind various forms of *Darwinia macrostegia* with *Darwinia collina* (yellow) on the left. Recommended practices for cultivation in containers is given on page 247. They may also be grown very effectively in hanging baskets, the bells of flowers drooping down all sides. Page 237 shows a potted *Darwinia* in colourful flower.

Darwinia carnea are reliable as grafted plants as described on page 243 and 248.



Brachysema

(brack-ee-see-ma)

Hardy pea flowered plants

by W. H. Payne

I have been growing red flowered species of *Brachysema* in the garden for 30 years and I have found them extremely hardy and reliable. Some plants must be 10 years old. They are valued in the garden as not only do they appear almost indestructible, but they are small scrambling shrubs that do not take over preferring to be present as small filler plants with their interesting leaf forms and bright red pea flowers in spring to summer. They take very hard pruning if required, so you can always have fresh leaf growth. My natural soil is light sandstone derived but *Brachysema* appear to grow in all soil types.

There are ten species of which I have grown only three but all should be equally hardy. I wish I could get the plants? I am able to describe all species for you based upon a scientific publication in Australian Systematic Botany by Dr. M. D. Crisp. These descriptions need not be in difficult botanical language as you can differentiate between the species by looking at the accompanying sketches by Anne O'Dowd. (That of *B. melanopetalum* is by Don Fortescue).

The first three species described here are shown in the sketches opposite. All of these have the characteristic flower parts as shown in Figure 1 as follows:

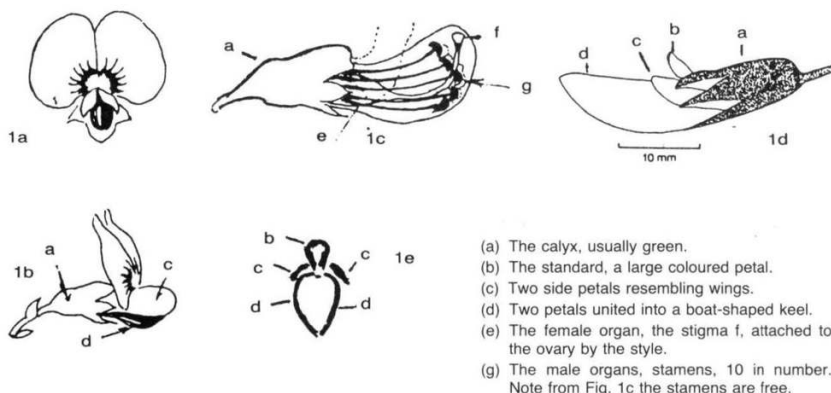


Figure 1. A typical pea flower is shown on the left, 1a from the front and 1b, a view from the side. It comprises five petals, the single upright petal known as the standard, the two wing petals, and a keel formed by two keel petals. The *Brachysema* flower as in Figure 1d above or Figure 2b or 3b on other pages, does not have a prominent standard, you can see it peeping out from the calyx, and the wing petals do not unfold to form wings but remain clasping the two keel petals below them. The floral pointed tube formed by the four petals is the prominent feature of the usually red flowers. As you will see from Figures 1–9 the densely hairy calyx that cups the flowers remains (persists) to cup the seed pod. This calyx for the first four species described here has the three lower lobes longer than the top two, in fact longer than the calyx tube.

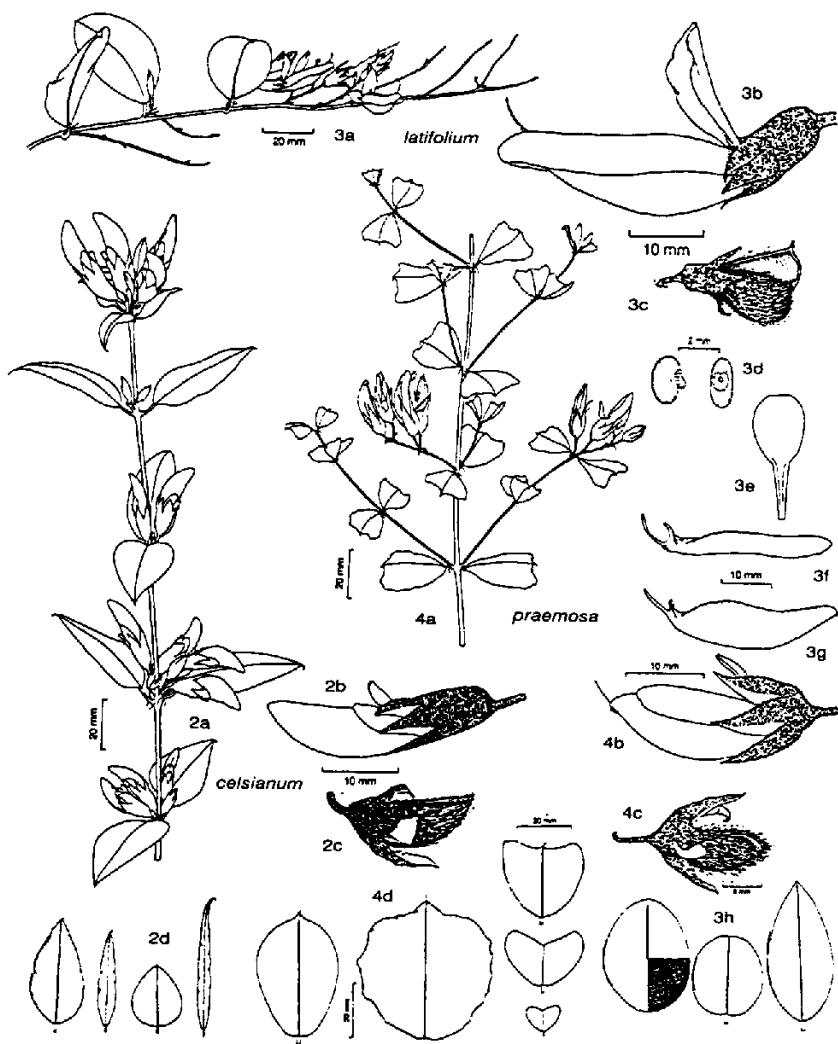
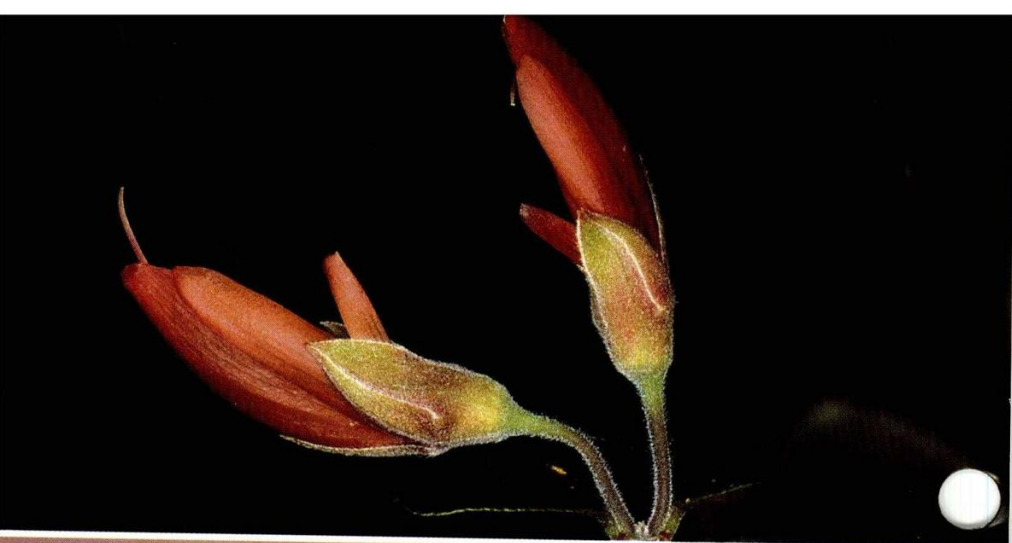


Fig. 2. *Brachysema celisianum* — 2a, an upright plant stem — 2b, a flower cupped by the five pointed calyx covered in short silver hairs — 2c, an open seed pod inside the persistent calyx — 2d, the leaf variation in shape.

Fig. 3. *Brachysema latifolium* — 3a, a prostrate flowering stem — 3b, a flower comprising the prominent standard petal pointing up (Fig. 3e shows its shape removed from the flower), the two wing petals facing down (detail in 3f of one of these) and two keel petals underneath like the keel of a boat (detail in Fig. 3g). Note the prominent horn, an appendage the botanists call an auricle. The end of the petal is elongated, narrow and conspicuous, a character common to all species on this page. The seed is shown in Fig. 3d and you will note that the aril is horseshoe shaped (a food body to reward seed-dispersing ants), another feature common to this group. The variation in leaf shape is in Fig. 3h.

Fig. 4. *Brachysema praemosum* — 4a, a flowering stem — 4b, the flower — 4c, the open seed pod and 4d the leaf variation.





- △ *Brachysema celsianum*, previously known as *Brachysema lanceolatum*. Photo, M. B. Crisp.
- ◁ *Brachysema praemorsum*, opposite top, see pages 263 and 266. Photo, M. B. Crisp.
- ◁ *Brachysema melanopetalum*, opposite centre, described on page 266. Photo, M. B. Crisp.
- ◁ *Brachysema subcordatum*, lower left, as described on page 266. Photo, M. B. Crisp.
- ▽ *Brachysema latifolium*, described on page 266. Photo, Colin Woolcock.



Brachysema celsianum, Fig. 2, has been known to me as The Red Swan River Pea, *B. lanceolatum*. It is the hardiest of plants requiring little attention and space. Reaching one metre in height, in the garden situation it is easy to keep quite compact. The central stems seem to prefer to grow upright to half a metre making a showy small shrub even when not in flower. The leaves are shown in Fig. 2(a). The leaves are variable as in Fig. 2e, dark green above and an attractive silvery grey beneath. You can always have fresh showy leaves by pruning the bush almost to the ground every year after flowering. Other stems prefer to lie on the ground unless supported by other shrubs but the space taken is less than a metre square. The deep red flowers, Fig. 2b, contrasted by the pleasing foliage peep out demanding appreciation. Photograph on page 265.

Brachysema latifolium, Fig. 3, has similar leaves but these are on long trailing stems making it an ideal prostrate ground cover plant. It has been widely used as a ground cover or on embankments and pruning can produce a dense mat to about one metre across. The flowers are a bright red but the small upright standard can be yellow-orange. The first three species described are shown in the sketches on page 263. All have the characteristic flower petals and seed axils as shown in Fig. 1d–g and described in the caption, page 262. Photograph on page 265.

Brachysema praemorsum, Fig. 4, is also a prostrate creeper with some upright stems to form a small shrub to half a metre. The characteristic leaves shown in Fig. 4c–f are glabrous (smooth without hairs), grey-green (often purplish) above, paler beneath. The leaves usually have a distinctive paler band around the margins. The flowers are initially a cream, greenish or a dull red becoming darker and then a purer red with age. Photograph on page 264.

Brachysema papilio are shrubs with wiry stems, which in the wild form tangled clumps to 1.5 m high, after climbing through other shrubs. The small pendulous cream to red flowers to 22 mm long, are in pairs on a long stalk. While being close to *B. praemorsum* botanically, it is a very distinctive species because of its crescent or butterfly shaped leaves. It is restricted to one site near Busselton, Western Australia and is not known in cultivation. No doubt the branch length could be restricted by pruning and would I feel be an ideal basket plant.

Brachysema bracteolosum, Fig. 5, is a prostrate shrub sometimes weakly erect to almost a metre high. The narrow silvery leaves, enlarged bracts and the long claw on its standard separate it from other species. Pruning may display the large pendulous orange-red to deep red-brown flowers with purple markings.

Brachysema melanopetalum, Fig. 6, is an erect shrub to three metres tall with silvery young growth. The feature is the deep burgundy flowers, seemingly almost black, that tend to nod. This is a striking plant now well established in the nursery trade and sold as *Brachysema sericeum*. Photograph on page 264.

Brachysema subcordatum, Fig. 7, are bushy erect or spreading shrubs to 1.5 m tall. The distinctive feature is the crenulate and wavy leaves. It also has dark flowers, a deep burgundy red (that do not nod) and for this reason has been confused with *B. melanopetalum*. However the leaves are quite different as in figures 7d. Photograph on page 264.

Continued on page 273

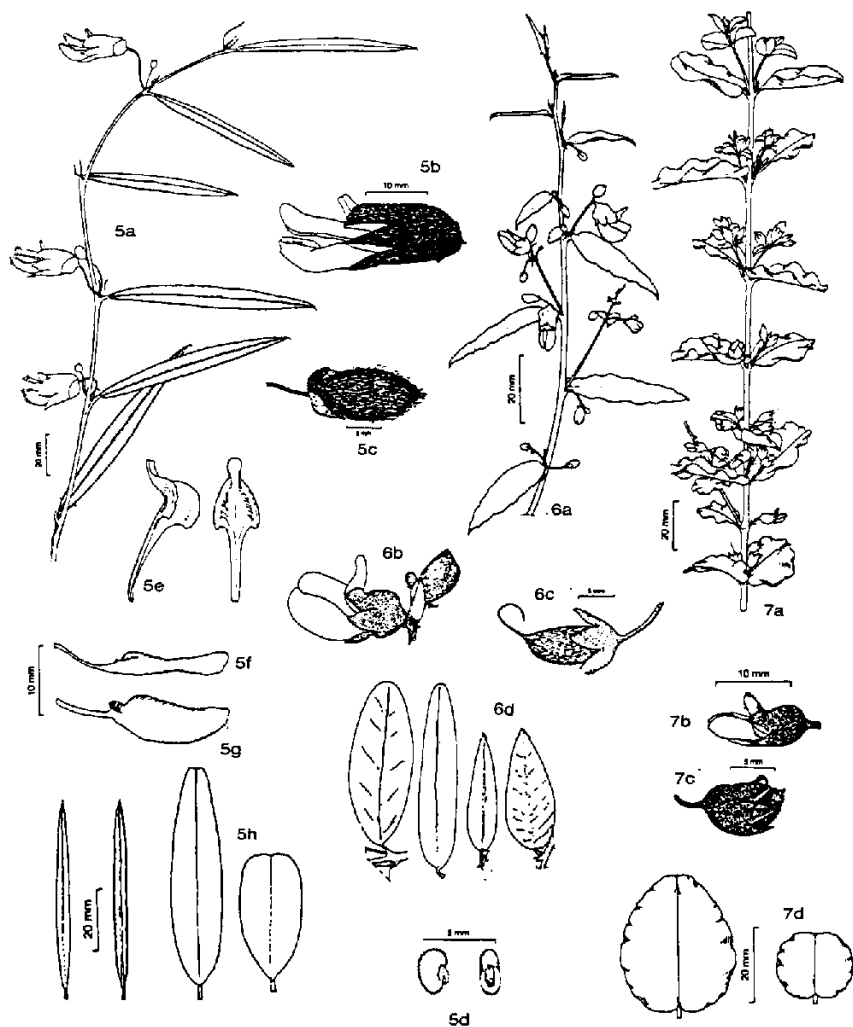


Fig. 5. *Brachysema bracteolosum* — 5a, a weak sprawling plant stem with flower in the leaf axil tending to nod on the lax flower stalk; 5b, the flower with the standard petal only just peeping out of the hairy calyx cup; 5c, the seed pod; and 5d, the seed. The standard petal removed from the flower is shown in two views in 5e, one of the wing petals in 5f, and one keel petal in 5g. The variation in leaf shape is in 5h.

Fig. 6. *Brachysema melanopetalum* — 6a, an erect flowering stem with deep burgundy, almost black flowers, often in pairs on an upright stalk; 6b, the flower, shorter and flatter than most other species; 6c, the seed pod; and 6d, the variation in leaf shape.

Fig. 7. *Brachysema subcordatum* — 7a, an erect flowering stem with characteristic wavy leaves; 7b, the deep red flowers are small; 7c, the seed pod almost hidden in the silver hairy calyx; and 7d, the leaf variation.



Acacia glaucoptera developed for the Flowering Pot Market.

Acacias as potted plants

by M. Parletta and M. Sedgley, Department of Horticulture, Viticulture and Oenology
Waite Agricultural Research Institute, University of Adelaide, Glen Osmond, South Australia

The genus *Acacia* contains more than 700 Australian tree and shrub species. Many are winter flowering, with bright or pale yellow inflorescences in globular heads or cylindrical spikes. Many are widely used as ornamentals as garden plants, cultivated particularly for their attractive yellow flowers. Overseas, the potential of *Acacia* for a wider range of uses has been recognized and exploited for some time. Cultivation of Australian species of *Acacia* has been popular in Europe for many years, and attractive interspecific hybrids were recorded in the 1920's. Commercial exploitation soon followed, and Australian acacias are now an established cut flower crop, marketed under the name of *Mimosa*.

The *Acacia* cut flower industry in Europe is based on selections of the species *A. dealbata*, *A. retinodes*, *A. baileyana*, *A. podalyriifolia*, and their natural hybrids, and forms with gold flowers and pendulous habit are popular. Plants are grafted, and tolerance of the calcareous soils of southern France and Italy is achieved by the use of *A. retinodes* as a rootstock. The plants flower in winter in this Mediterranean climate, as they do in Australia, and so are a popular source of cut flowers for the lucrative Christmas market. They are managed to promote maximum flowering by heavy pruning, which stimulates numerous lateral shoots for initiation of flowers. Stems are harvested at the yellow bud stage, just prior to opening, and are placed in forcing rooms set at a temperature of 22–25°C and 85–90% relative humidity for between 48 and 72 hours. This forces simultaneous opening of the buds producing a strong showy floral display. Vase life is extended by a post harvest storage solution containing up to 10% sugar, 200 ppm 8-hydroxyquinoline sulphate, 50 ppm silver nitrate and 50 ppm aluminium sulphate. This treatment is essential, as untreated *Acacia* stems have a short vase life due to occlusion of the vessels by pectins or gums. Stems are marketed throughout Europe, Britain and the USA.

The European industry is based on relatively few species, whereas many others have attractive flowers and could be developed for this market. In addition to their importance as a cut flower crop, Australian acacias have potential for two markets which are expanding internationally. The attractive foliage of many species gives them appeal as filler crops, and some of the smaller species could be developed as flowering pot plants.

The ideal pot plant has compact size, is in a 15 cm pot, and flowers with a shelf life of two weeks or more, in temperatures of 20°C and under the low light conditions of the home or office. For the following study of *Acacia* suitable for potted plants species were selected with non-spiny, blue or bright green, dense foliage and bright coloured flowers, naturally low growing and time of flowering.

Editors Note: If Australian scientists do not develop our spectacular flowering plants from the unique Australian flora, it will be done overseas. There is already one instance where an Australian company has purchased the rights from a continental country to produce an Australian origin plant for sale here. We are indebted to Margaret Sedgley and her team for pioneering work on our flora for practical use by the Australian industry. This society has contributed to such work through The Australian Flora Foundation.

Production of potted plants for study

Species survey: Seed was obtained from commercial sources, and was sown in June in a sand/peat/perlite mix following scarification of the seed for two minutes in boiling water. Ten seedlings of each species were transplanted to the same soil mix in 15 cm pots, when they had reached a height of between five and ten centimetres. They were placed in a glasshouse with temperature control to approximately 23°C day and 13°C night. The plants were watered regularly, but received no fertilizer and no further treatment during the experiment. They were observed regularly. Observations continued for a further 14 months until August, when the plants were observed for flower formation.

Pot plant experiments: Seedlings were transplanted into 15 cm pots containing a sterile mixture of peat, sand and vermiculite, and were raised under glasshouse conditions (day/night: 25/15°C) until the commencement of treatment. Ten replicates per treatment were placed in a completely randomised design. All plants were placed in day/night: 27.5/7.7°C after 12 months. Measurements recorded were plant height (cm), width (cm), number of shoots at 12 and 18 months, and number of inflorescences at flowering. Results are as follows:

Table 1. Effect of temperature, pruning and paclobutrazol treatments on growth and flowering of *Acacia polybotrya*.

Treatment	Height (cm)	Width (cm)	Number shoots	Number inflorescences
0 months (at start)	6.2	9.6	1.2	
After 12 months				
Control A (27.5/ 7.7°C)	32.0 a*	31.7 a	8.4 a	0.0
Control B (25/15°C)	83.9 c	73.8 cd	28.8 bc	147.7
Pruned to 10 cm	87.7 c	76.4 d	27.6 b	95.0
PAC (growth control)	53.0 ab	54.0 b	28.8 bc	97.9
Prune + PAC	62.7 b	56.0 b	37.5 c	80.8
	p < 0.001	p < 0.001	p < 0.001	NSD

Control A day/night temperatures controlled to 27.5/7.7°C

Control B day/night temperatures controlled to 25/15°C

Reduction of plant height by pruning to 10 cm, at 25/15°C

(PAC) Growth control paclobutrazol as a soil drench of 2 mg a.i. per pot

Prune + PAC, both used, all treatments at 25/15°C

(BAP), benzylaminopurine foliar spray at 50 ppm until runoff, at 25/15°C.

*Values with different letters within columns are significantly different.

Table 2. Effect of paclobutrazol and benzylaminopurine treatments on growth and flowering of *Acacia imbricata*. Similar results were obtained for a number of *Acacia* species, including *A. acinacea*, *A. baileyana* and *A. glaucoptera*.

Treatment	Height (cm)	Width (cm)	Number shoots	Number inflorescences
0 months (at start)	13.3	8.2	11.4	
After 18 months				
BAP + PAC	30.2	28.0	115.9	149.1

Discussion on pot plant experiment results

Day/night temperatures of 27.5/7.7°C reduced vegetative and floral growth. Paclobutrazol reduced height and width of plants, whereas benzylaminopurine stimulated branching, although the effect was slow, and appeared to be suppressed to some extent by paclobutrazol. Pruned plants grew as vigorously as untreated plants, and this treatment was not suitable for most species. The combination of pruning and paclobutrazol produced a reduction in height and width, which resulted in attractive form for *A. glaucoptera*, *A. imbricata*, and *A. polybotrya*. *A. imbricata* had flowered by 18 months, thus providing a cost-effective nursery proposition. There is no doubt that acacias have potential as flowering pot plants, with a commercial production system.

Dwarfing of plants for pot culture

Dwarfing of flowering pot plants is generally achieved using chemical growth retardants, such as paclobutrazol, cycocel and daminozide. The chemicals can be applied to plants at the seedling stage, and variables include the size of the seedling to which the retardant is applied, the method of application, the concentration of the chemical, and the number of applications. The aim is to produce dwarfing with a single application of retardant.

Paclobutrazol, either alone or in combination with pruning dwarfed all species, and produced flowering pot plants within two years. Benzylaminopurine stimulated branching, but the effect was slow.

There is increasing resistance to using chemicals in the industry and in the general community for both safety and environment reasons. Recent research overseas has shown that plants can be dwarfed by growing them under certain controlled environment conditions, generally with the night temperature exceeding the day temperature. This has not so far been applied to acacias.

Species selection

Species with potential included those with divided ferny foliage (*A. dealbata*), strap-shaped phyllodes (*A. decora*), oval phyllodes (*A. podalyriifolia*), crowded needles (*A. cometes*), and unusual zigzag foliage of (*A. acinacea*), grey foliage (*A. baileyana*), grey and purple foliage (*A. baileyana* var. *purpurea*), and both upright (*A. notabilis*) and pendulous (*A. vestita*) plant habits. Inflorescences varied from yellow spheres (*A. meisneri*), through cream spheres (*A. silvestris*) to yellow cylinders (*A. drummondii*).

All species observed were considered to be suitable for cut flower and foliage production, with the exception of *A. verniciflua*, which produced an unpleasant sticky secretion from the leaves. All grew vigorously under the conditions of the experiment, but some had a relatively compact habit, and on this basis have potential for pot plant production. Some plants of most of the species had flowered by two years. The species which were considered to have most potential as pot plants were *A. cometes*, *A. glaucoptera*, *A. drummondii*, *A. elegans*, *A. semilunata*, *A. vestita* and *A. imbricata*. The species *A. acinacea* syn. *craspedocarpa*, *A. crassuloides*, *A. acinacea* syn. *rotundifolia* and *A. spinescens* may also have potential, but the first two were rather slow growing.

Editor's Note: Will readers keep a look out for dwarf and attractive forms of *Acacia*. There is much we can do to help the scientist. A major problem for them is to find suitable plants to work on.

Acacia for horticulture

Many species of *Acacia*, in addition to those currently cultivated, are suitable for the production of cut flower and foliage stems. Of major importance is the development of improved cultivars and vegetative propagation techniques. Acacias are largely outcrossing, and between plant variability is high. This leads to variability in yield and quality, and so detracts from the overall product. Research is also needed into management of the plants for optimum production of quality stems, including pruning, pest control, nutrition, irrigation, soil management and post harvest handling. Relatively few species have been tested in this experiment, and although the species were selected for their ornamental attributes there may be many others which could also merit attention.

Precocious flowering is desirable for cut flower production, but is particularly important for flowering pot plant production, where rapid throughput in the nursery is an economic consideration. Many of the growth retarding chemicals, including paclobutrazol, cycocel and daminozide, also have the effect of enhancing flowering. Previous research has shown that *Acacia pycnantha* flowers only following low temperatures. Subjecting plants of each of the promising species to controlled environment experiments involving low temperature treatment could minimising the use of chemicals

An essential aspect of commercial production of flowering pot plants is the development of a production package defining the growing and cultivation conditions required to produce a marketable commodity. This may be possible for acacias from seed grown material. Ultimately, however, it will probably be more cost effective to select superior cultivars and vegetative propagation methods. This will allow selection of compact, floriferous individuals which require the minimum of manipulation. Moreover, vegetative propagation from mature tissue results in earlier flowering than in seed-grown plants. Both of these factors have the potential to lower production costs, and in the long run cover the costs of research and development.

Acacias have a bright future, with a range of products for both domestic and export markets. They can be promoted as Australian, and so aid in developing a national marketing identity. The large number of species native to Australia, and the variability within species also provide the opportunity for continual development of new lines to maintain the interest of the market. We are now in a position to achieve this goal, and the Australian ornamental industry is well placed to foster and exploit the research effort required. ■

George Caley — 19th Century Naturalist

by Joan Webb

This is not a book about plants but a dedicated plant collector. In 1770, while Cook was sailing around New Holland, George Caley was born. This chronicle of the exploits of George Caley is dramatically coloured by the reports of his association with Joseph Banks, Robert Brown, George Sutton and Ferdinand Bauer and the explorers of the time, especially Mathew Flinders. His numerous reports to Joseph Banks included informed views of the political stresses in the colony from the capable Governor Philip through the trials of successive governors to Governor Macquarie when he returned to England with ex-Governor Bligh. Because this book is so well researched it is an independent history of New South Wales. Students of Australian flora will value this report to relive the trials of a dedicated and competent botanical collector. Available for \$37.95 from Surrey Beatty & Sons, 43 Rickard Rd., Chipping Norton, New South Wales 2170.

Brachysema sericeum, Fig. 9, is a prostrate or weakly ascending shrub to one metre high with silvery new growth but with hairless stems, leaves glabrous above and silky white beneath. An attractive feature is the massed foliage that suits a rockery, the pale green pendulous, flowers being a disappointment.

Brachysema minor, Fig. 8, is an attractive prostrate shrub, the trailing stems with their round leaves adding interest to a rockery. The small, not vigorous plant with its chain of round leaves usually sitting flat on the ground. In flower, the bright red flowers form singly in the leaf axils pointing upward, small but a vivid spot of colour in the chain of round green leaves.

Brachysema modestum is a little known species very similar to *B. minor*. It is unique in that the prostrate stems form stolons usually hidden below leaf litter. The flowers on short stalks poking up from the leaf litter do not appear to be attached to a plant. The flowers are, however, a pale creamy pink.

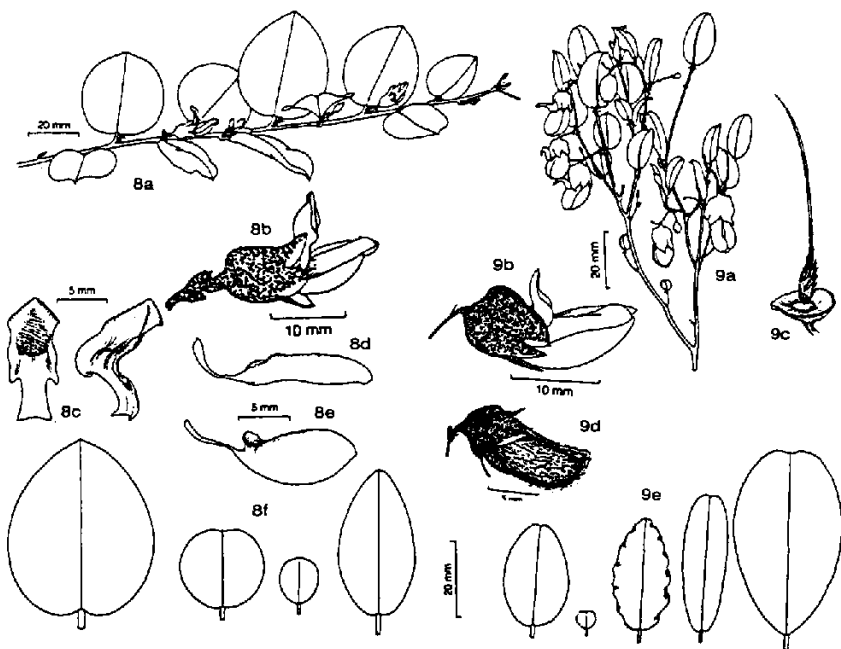


Fig. 8. ***Brachysema minor*** — 8a, a prostrate flowering stem. The leaves appear to sit on the ground, a chain of green discs; 8b, the red flower; 8c, two views of the standard petal that can have yellow spots; 8d, one of the two wing petals; 8e, one of the two keel petals; and 8f, the leaf variation.

Fig. 9. ***Brachysema sericeum*** — 9a, a weakly upright flowering stem showing the characteristic most sought after in this species for rockeries, the cluster of oval leaves; 9b, the pendulous flower is an inconspicuous pale green; 9c, the central female part of the flower, the petals and bracts removed, revealing the long pointed style, the hairy ovary which on fertilization swells to become the seed pod, sitting on the disc (nectary) on top of the flower stalk; 9d, the seed pod; 9e, the leaf variation.

Conserving Biodiversity*

by W. H. Payne *et al.*

"Any scientific review of threats, no matter how comprehensive, is ultimately of little use unless these can be practically addressed — ultimately we must face the reality that conservation of biodiversity is not going to be achieved solely by reservation of land in national parks or other kinds of conservation reserves — conservation in the future is only possible when a partnership is accepted among all individuals, communities, institutions and governments of our society."

The above quotations and those similarly noted below are quotations from a book of the above title, prepared by a panel of scientists, arising I feel, from frustration, the conviction that all their dedication and study will be ignored. The official reason is money, the lack of resources to implement even just a few of their recommendations. I am convinced it is the national leadership. The scientists know the way and there is a desperate urgency in the community to arrest the present slide of our environment towards oblivion. Responsible leadership could foster the enormous community resource with a long term management plan for the future prosperity of Australia. The opportunity is god-given, the year 2001 when we commemorate 100 years of federal government. This allows us to overcome the shackles of the three-year election system where the winning of votes by any means is crucial and to evolve a plan for 10, then 100, then 1,000 years that we can all work towards.

Our plan for the **Year 2001 Centenary of Federal Government** is not a "green" plan, that would save everything — do nothing in case you spoil it, but it is a plan to improve productivity from the environment, to produce future wealth by the use of science and practical skills, to make Australia a healthier place for all creatures to live together. I introduced this plan in our March 1994 issue and the response from readers was so overwhelming I do not need to apologise for taking up so much space in this issue. It incorporates the features from the various papers published in the book "Conserving Biodiversity".

*A book with this title, subtitled "Threats and Solutions", is the latest book from Surrey Beatty (cost \$93), see page 279. It is the record of a conference of scientists at the University of Sydney in June 1993. There has just been another conference on the same subject in Melbourne. This report quotes various paragraphs from the book that highlights our concerns. I take all responsibility for the quotations taken and their interpretation. It is not to promote sales of the book though if you are rich and keen it is highly recommended.

No doubt the recent conference in Melbourne was attended by the same people as usual, those who could afford to attend or were there by courtesy of some government department. Similar statements on different themes were preached to the attending converted as have been made at previous similar conferences. The major product of the conference apart from those who attend for a good time, would no doubt be frustration. All the papers were well presented by very competent scientists who have given years of study to research their subject. Reading them one must be impressed by the obvious dedication and occasionally, original revelations that go to produce papers of such a high standard. Frustration!

Scientists know the answers, the way to necessary solutions, but they know it is almost certain they will be ignored, patted on the head, told what a good job they have done and then receive instructions on what paper they should prepare after years of research to entertain a future conference circus.

We know the way to forestall doomsday on this planet or at least for the continent given in trust to us but we are being prevented from doing it by political ignorance. Surrounded by an impenetrable bureaucratic shield defending territory, our politicians are not ignorant by nature. I am convinced that they are mostly dedicated people seeking to serve the electorate, but ignorant because of what they are prevented from hearing or do not want to hear. Hopefully we will get some far sighted responsible politician in authority to at least hear our simple solutions.

Why Conserve Biodiversity?

"Beauty — a quality that is present in a thing or person giving intense aesthetic pleasure or deep satisfaction to the senses or the mind." Our planet Earth.

"Function — human beings are interacting parts of the ecosystem comprising the whole galaxy of life forms and right now we have little knowledge of which species will be essential resources for sustaining future generations."

"Utility — species should be conserved as a potential resource, not just to maintain a viable evolving ecosystem as in "Function" but for commercial exploitation in the future, for medicine or sustenance."

Survival — why pussyfoot about! Without retention of biodiversity we perish.

Practical methods for conserving biodiversity

"Conservation biologists and managers could be excused for concluding that the rhetoric about biodiversity outstrips their capacity to actually conserve and manage it and far outstrips the political commitments to allocate the necessary resources."

"If we do not look after our environment, then we will eventually suffer a dramatic decline in living standards and an associated decline in health."

The usual often presented measures are defined but I feel without real conviction that anyone will act on them. This paper then goes on to emphasise that everyone should be involved — from those who have the knowledge to impart it, to the public encouraging individual and group action. The generation of commitment based on fervour, ethical responsibility and selfish self interest is stressed. For political reasons the scientist did not point out that a responsible committed political leader could create these human reactions by producing a national plan for survival, a crusade.

Habitat Loss — its nature and effects

"Even nature reserves and isolated remnants are being degraded. It is only a matter of a decade or so before native vegetation in some reserves is destroyed. We may be able to stop clearing with legislation but, if land is not managed sympathetically its long-term future is just as bleak as if there was no clearing control."

"On one hand we can continue as we are now and face extinctions with who knows what ultimate consequences, or make a huge effort to bring about social change. This requires the active support and co-operation of all sections of the community." Visionary leadership is required.

"Achievements by society local groups and individuals in areas throughout Australia in encouraging landowners to conserve forest remnants, to create wildlife corridors, to restore natural areas, to plant trees for commercial exploitation as well as restoration of the local ecology are trial cases, testimony that there is an awareness for change and a way to go."

The community is now at the point where a major change is possible. Land holders and the whole range of people are realising something needs to be done but they are suspicious of the "greenies" and feel deserted by their leaders, the politicians who are more intent on the party game. Now is the time for far sighted leadership. We need a management plan, not imposed upon us but a guide for community action.

Farmers as conservators of a sustainable production base

"Bushland on farms: do you have a choice? (a booklet available from AGPS Press) shows how Australian farmers can do what no other country has succeeded in doing, namely regenerating natural ecosystems on land cleared for agriculture — retaining and rejuvenating on farms a web of woodland, mallee and heathland comprising about one-tenth of the area of freehold and leasehold land. The tide has turned. Sufficient land holders have already achieved natural ecosystems on commercial farms in every State and Territory to prove that it is possible everywhere, no matter how bleak the countryside was before. If each one of them persuaded only one other farmer to follow their lead each year, in six years all of the 125,000 families Australia-wide would have begun to revegetate 50 million hectares of farmland to make agriculture sustainable."

"A teacher with a big stick is just a bully." We need leadership, a sense of participation to generate enthusiasm to save our lands. Who is our leader?

Can governments solve the problems?

The book proceeds to advise how various government bodies are taking environmental action. While some seek to justify their own departments and it is clear that it is not politic to criticize policy decisions, it is obvious that they are doing the best they can within the constraints of their finances. We applaud their work and dedication. Government departments must operate within their budget. The federal Department of Conservation and Environment has its share of the national income. As with all other departments this share suffers budget cuts to follow government fiscal policy and the department head Dr. Peter Bridgewater and the minister are doing an incredibly good job within the limits of the resources available.

To commemorate 100 years of federal government a special allocation will be made and spent. We suggest that the future prosperity of Australia be the main theme for the celebrations and that involves the environment in a critical way. One answer I have received from the Prime Minister's Department is "there is no money". We know that is the position at the moment but there will be some, hopefully not for more public buildings or monuments. Unfortunately the bureaucrat who answered the mail did not understand. We do not necessarily need huge amounts of money but we need leadership, a national business plan (not a green plan) for 2000 and beyond. It is also clear that our letters are relegated to the huge pile of begging letters they receive or to the even larger pile of letters from crackpot "greenies." How does one get through to the Prime Minister?

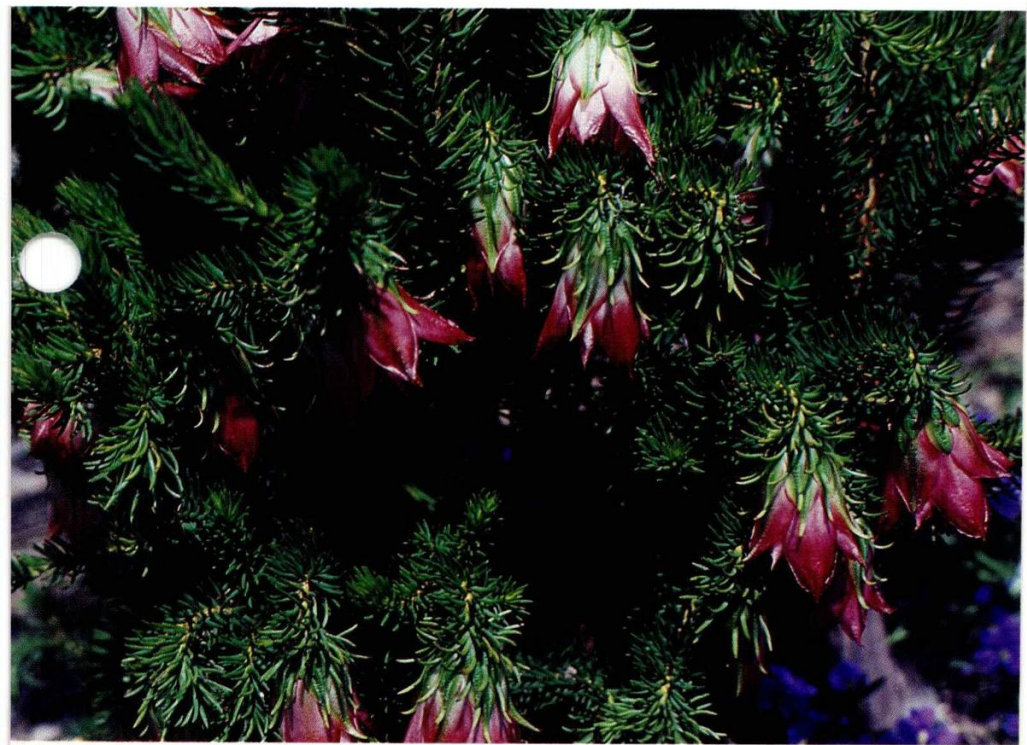
The role of activists

The society has a leading role in practical work on ecology. The local groups are full of "activists" working, usually under the magnificent LandCare Scheme. What of the general community, the millions of citizens who restlessly feel something needs to be done but does not know what. The bulk of the societies members are in this category. Most voters are in this category. They are suspicious of the "greenies" and their actions in the past and especially suspicious of action groups led by a loud mouth or a fervent radical.

What we all need is national leadership, a well prepared management plan for us all to work and strive for, not just hastily put together to last to the next election but for the ten years beyond 2000, then 100 years, etc., of assured prosperity for the nation. ■



- △ **The McKenzie Garden** — Foreground, from left, *Darwinia collina*, *D. macrostegia* and *D. carnea*. The pink flowered plant is a *Chamelaucium* species grafted onto *Darwinia citriodora*. Against the fence is *Banksia caleyi* grafted onto *Banksia integrifolia*,
- ▽ *Darwinia oxylepis* grafted onto *Darwinia citriodora*.



Dryandra leiostyla Photographs on pages 237 and 280

This is one of the bells that can at times be grown successfully without grafting but to have even moderate success the ungrafted plant requires shelter, moisture and cool roots, a situation that invites fungal problems. Grafted plants can however, be grown in full sun promoting much better bell colour, general vigour and freedom from fungal problems on the foliage.

Drying Darwinia flowers for beautiful dried arrangements

The robust, waxy, textured bells respond well to conventional drying techniques. In fact, after the bunches of flowers have served their purpose as fresh flowers in a vase of water, they may be hung until dry and used in dried arrangements. See colour photograph on page 260. To keep the bell colours remaining bright and to retain the shape of the bell, some alternative techniques are used.

One good method that ensures a good harvest of flowers from each bush is to wire each bell individually. The wire is inserted in the base of the bell (as is done for 'strawflowers') and the result should be hung in a warm dark cupboard. We use the large cupboard that adjoins our hot water system. Likewise, small branchlets with stems and with several flowers can be dried in a similar way. To prepare pot-pouri style flowers, place buds or fully opened flowers on a tray or plate and set this in a similar warm dark situation for a few days.

To preserve the exact shape of the bell and all its internal structure, with the above methods, lightly pack the centre of the bell with a small loose wad of cotton wool. This is removed and reused when the flowers are dry.

The best species for the above methods are *Darwinia macrostegia* (and all of its hybrids), *D. carnea* and *D. collina* (although the green colour in these flowers fades after a few months in bright light to a mustard colour), *D. oxylepis* and *D. meeboldii* (with their dark stamens). *D. leiostyla* and especially *D. squarrosa* unfortunately lose their pastel colours quickly.

Growing Verticordia in South Australia

by Gordon Curtis

Our garden is at Happy Valley in the lower Mt. Lofty Ranges. The front garden has a northerly aspect with a moderate slope to the roadway. The original shaley clay has been covered with 300 mm of acid soil and coarse sand. *Verticordia* have always been a challenge to us. While the commonly available species *Verticordia chrysantha*, *V. monadelpha*, *V. mitchelliana* and *V. plumosa* flower profusely they have yet to produce viable seed.

As other species are difficult to obtain those I could get were planted in large pots as stock plants for propagation by cuttings. The potting mix is mainly acid sand from the Penola area. It has a reputation for growing western plants. Cuttings are taken from new growth after flowering, dipped in red Clonex, and planted in a 50/50 mixture of coarse sand and peat. I cover cuttings with 2 litre clear plastic bottle with the bottom removed.

Plants in the garden provide the real challenge. A *Verticordia grandis*, seven years old, is 300 mm high and struggling, while another is one metre high and thriving. The main problem is root rot. I am experimenting with growing pea flowers in close association with my plants to overcome this. One plot that looks promising has *Bossiaea aquifolium* and *B. webbii* (also for its attractive foliage) growing with *Verticordia halophilla*, *V. staminosa* and *V. plumosa*. Another area has *Kennedia prostrata* growing among *Verticordia chryostachys*, *V. densiflora*, *V. drummondii*, *V. grandis*, *V. halophilla*, *V. linleyii*, *V. mitchelliana*, *V. minutiflora*, *V. pholidophylla*, *V. plumosa* and *V. monadelpha*.

Soil conservation — vital for survival of the Australian Continent

An important component of our Management Plan For The Year 2001 was the restoration of our soils by scientific management. This is also managing our soils for maximum cash returns by reducing salt toxicity and restoring biodiversity, a vital component of which is our native fungi, mycorrhiza, and read the following:

Mycorrhiza — Structure, Function, Molecular Biology and Biotechnology

Edited by A. V. Hock

Yes, this is a technical book, a very technical book. It is produced by Springer, Postfach 31 13 40, D-10643 Berlin, Germany as one of a series of books on the very latest scientific research in the world about the biology of plants. It no doubt costs a lot, write and ask them yourself. Why promote its sale here? Because it is the very best on a subject we all need to know a lot more about. Scientists are producing VAM to assist in the re-establishment of plants in other countries, why cannot we get our own unique VAM. What is VAM or VA mycorrhiza? See *Australian Plants* Volume 15, page 62.

Not only is the correct use of VAM recommended for the overall nutrition for a wide range of plants it could be crucial to any efforts to restore vegetation on degraded land and our arid interior. We are not dealing here with a plant-fungi relationship but a plant-fungi-soil relationship that is beneficial not only to the plant but to the whole ecological system below ground. The addition of mycorrhizas could result in increased vegetation in arid areas and relief of stressed habitats. An ignorant layman on the subject, how can I make such statements with conviction and scientific support. May I retract part of what I implied above. While this is a scientific book it is one of the most readable, clearly and simply expressed treatments of a scientific subject at the very cutting edge of new discovery. If you want to learn about this subject and are prepared to study it in small doses, you can follow the book quite comfortably.

I will not retract my challenge to Australian scientists, where is our VAM or is it AM?

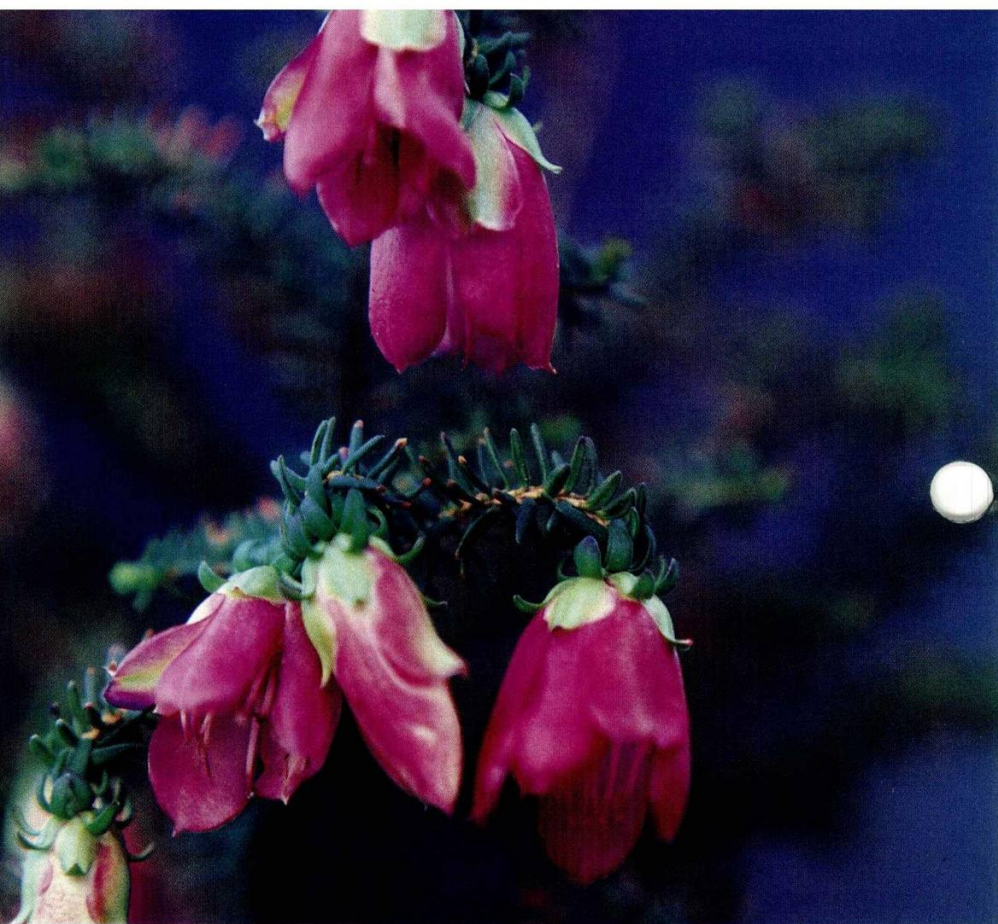
The Remarkable Publishing Achievements of Ivor Beatty

Ivor Beatty has published *Australian Plants* since 1960. We are indebted to him because of his basic skills, diligence and vision, factors that have helped keep down the cost of our world acclaimed publication. He deserves exceptional accolades because of his publication in other areas of Australian culture. The book 'George Caley', reviewed on page 272, is typical of his contribution to Australian culture on a general level, but he is to be highly commended for his books on our ecology such as "Conserving Biodiversity" reviewed on page 274. Others in this series include "Pacific Conservation Biology", "Nature Conservation 1 — The Role of Remnants of Native Vegetation", "Nature Conservation 2 — The Role of Wildlife Corridors", "Nature Conservation 3 — Reconstruction of Fragmented Ecosystems", "Nature Conservation 4 — The Role of Networks", "Australian Rainforests", Vol. 1 and Vol. 2, "Forest Management in Australia", "Kimberley Rainforests", "Biodiversity in Mediterranean Ecosystems of Australia", "Conservation of Australian Wetlands", "Communication Skills and the Debate on Conserving Biodiversity", "Repairing a Damaged World", "Guideline for Bush Corridors", "Conservation Biology in Australia and Oceania", "Conservation of Australia's Forest Fauna", "Healing the Planet", "A Coral Reef Handbook", "The Ecology of Australia's Wet Tropics", "Australian Ecosystems", "Arid Australia", "People and Nature Conservation".

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For these books write to Surrey Beatty, 43 Rickard Rd., Chipping Norton, New South Wales 2170.



△ *Darwinia leiostyla* hybrid 'Coolamon Pink'.

▽ *Darwinia oxylepis* crossed with *Darwinia leiostyla*.





Blandfordia cunninghamii as first published in 1868 in Curtis Botanical Magazine. See article on page 255.

Horticultural Flora of South-eastern Australia — Volume 1

Created by Roger Spencer, Horticultural Botanist at Royal Botanic Gardens, Melbourne, this is the first in a four volume series, an exceptional source of knowledge. It is "Flora of Australia" (see opposite) reduced to a specific area, presented in much simpler terms, confined to descriptions of species more commonly used or recommended for horticulture but incorporating non-Australian species so that there can be no confusion as to what is really native. The first volume is confined to ferns, conifers and their allies. You will need to be keen on these groups of plants for it to be of value but if you are really interested in them, this is the book for you. The way the text is presented in such an easily followed manner and the associated line drawings of distinguishing features of each species described, will allow the reader to identify a species. As the author is a horticultural authority the book presents a reliable guide to cultivation. It is an exceptional reference to the cultivars based on each species. The Monterey Cypress, *Cupressus macrocarpa*, of California, has 10 cultivars well described over two pages. For Lawson's Cypress, *Chamaecyparis lawsoniana*, 59 cultivars are described. Ferns? There are hundreds of them. This book is available from your bookseller or as mentioned opposite, for \$79.95.

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"Australian Plants", The Australian Flora Periodical

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Blandfordia grandiflora as first published in 1854 in Curtis Botanical Magazine (t 4819). See the article on page 255 including notes on cultivation.