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Australian Plants

What do these words mean? Obviously the entire Australian Flora but as this issue may be the first many people have seen perhaps it is timely to convey what the periodical *Australian Plants*, is all about.

It is certainly not a political magazine or even a conservationists' magazine. It is a periodical for people from all spectrums of the Australian way of life, that provides pleasure, information, reports on research and horticultural guidance on the Australian flora.

Over the 22 years of its existence the outburst opposite is the closest we have ever come to political activity and will probably be the first and last time. Perhaps there is some justification for a release of pent-up feelings as The Australian Flora Foundation is so important, almost a now-or-never in relation to the survival of our unique flora.

What *Australian Plants* is really all about is illustrated by the following articles: reports on recent research by scientists — a vital bridge between scientific endeavour and the general public; the use of the Australian flora in the every day life of the Australian community; the horticultural development of unique Australian flora to beautify our homes, parks and landscapes; the encouragement of the general community to cultivate our flora in their home gardens; the recording of results and experiences of the above activities towards the future survival of our flora; the encouragement of awareness and pride in the amazing diversity and beauty of the huge Australian flora that could be lost to mankind if no action is taken now.

Australian Plants has been nurtured by the Society For Growing Australian Plants, comprising people from all parts of Australia, for all areas of activity with a membership in excess of 10,000. Membership can be obtained from the officers listed inside the rear cover or you take a subscription.

The Australian *Eucalyptus*

Eucalyptus species dominate the Australian bush scene. These picturesque trees have found a warm welcome in many parts of the world because of their rugged form, beautiful trunks and fine timber. In flower many species are spectacular and previous issues have featured the red flowering forms. This issue gives prominence to those with bright yellow flowers. The development of horticultural forms is one objective to be encouraged.

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COVER PLATE: *Eucalyptus roycei*

Photography by G. J. Keighery

A small yellow flowered mallee to 2.5m. This photograph is of a plant in cultivation in South Perth. *E. roycei* Carr, Carr et al. is one of many newly described species. A special feature of this issue is of other bright yellow flowered *Eucalyptus* species.

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The Australian Flora Foundation

The objective of this foundation is "to foster research into the biology and cultivation of the Australian Flora."

Our efforts to establish this foundation will be successful on Friday, 14th August, 1981, at the University of Sydney. It will be attended by the leading scientists of Australia, politicians, conservation groups and concerned people. It will be a curtain raiser to the International Botanical Conference.

What does this mean to us and the unique Australian Flora?

As the pressures of population and development of this spectacular continent of ours build up, there is little doubt that survival of our unique flora is threatened. The setting aside of areas, many of which exist only because nobody can work out a way to make a quick dollar out of them, and leaving these areas in the hope that the locked-in isolated remnants of the flora will continue to survive, is far from adequate. Properly co-ordinated research is essential to ensure survival of our floral heritage.

Governments are indifferent, commercial developers are wantonly destructive, and people do not care for the future or survival of life forms. None of these statements are accurate but could become stark reality.

Governments are guided by people despite cynical responses to the contrary. They feel that their management of the peoples' purse is in the best collective interests of the nation. They will be more receptive if well planned research can define action necessary, costs and reasonably assured objectives. This research is an objective of the foundation. What support can the foundation expect from your Government?

Developers, some might say exploiters of our natural resources, are not indifferent to the chaos they cause to the environment. They think dollars and cents. Not just the dollars that go into their pockets but dollars that can be allocated to various activities related to their business. If research can show what dollars are needed for specific objectives some of which involve the restoration of your land, they will gratefully accept guidance. I believe that this is not just conscience money or a tax lurk, but because they are not completely indifferent to the long term future of mankind. The foundation will provide this research. What support can the foundation expect from the commercial sector of our community?

People do not care. At last there is one way people can show that they do care. It is in a response to this appeal. Nothing is more telling than cash from the pockets of people already taxed for living, in so many ways. Membership of the foundation is limited to the 100 or so leading scientists and others who represent institutions who have the resources to contribute to the work of the foundation. But there is a class of "membership", a sponsor.

You can become a sponsor of the foundation by sending a donation of \$25.00 towards the research fund. Some may be only able to afford less and others, especially business interests, will be able to afford more. We have submitted a formal application for taxation concessions for donations to the foundation and nothing will impress Malcolm Fraser more than donations of \$25.00 from a large number of people from all parts of this land. People can rant and rave and write letters on such things as "Solar not Nuclear", "Save our Flora", etc., but nothing will impress our political masters more than evidence that they have "put their money where their mouth is".

There is only one way to make a peaceful successful demonstration in this case. Send your cheques for \$25.00 payable to the Australian Flora Foundation, 860 Henry Lawson Drive, Picnic Point, N.S.W. 2213. I am not running the foundation. I have led the fight to create it and expect to hand over the created body to the very capable group of people who have offered to serve, with a big bag of cheques. Over to you! ■





Wildflower Gardens are for People

By Byron Lamont

The Front Garden (above)

A natural setting for the plants is provided by the mulch of ironstone gravel. The log slabs are of *Eucalyptus gomphocephala*. They provide a route through the garden, and their informal layout invites discovery of "what's around the corner". Heather Lamont stands beside *Eucalyptus formanii* (on her right). This slow-growing mallet is notable for its soft, needle-shaped leaves but does not flower well. The plant here is about six years old. With time, the tree has spread over the paths and the foliage has been carried above head height and thinned out. Overhanging twigs are pruned back. *Stylidium repens* has recently appeared in the leaf litter accumulating beneath the tree. Matthew (striped jumper) stands near *Casuarina glauca*, behind which is *Grevillea leucoptervis*, a vigorous dense shrub (not unlike *Grevillea banksii*) but with imposing naked limbs projecting above the canopy and bearing masses of creamy flowers. The species tends to be top-heavy (difficult to stake) and short-lived. This one died after eight years, but not before it had produced many seedlings which arose spontaneously in the garden.

The Back Garden (top left)

Matthew in his 'adventure playground' with washed sand flanked by native shrubs. To dispense with upkeep of lawn altogether, the *Dichondra* groundcover in the lower right has now been replaced by logs of *Melaleuca raphiophylla*, railway sleepers, rocks and a 'Flintstone' car set in more washed sand. An extensive patio of loose bricks stops sand entering the house. In the foreground is *Banksia hookerana* whose straggly habit is compensated for by prolific flowering in April-June, a great attraction with honeyeaters. The *Banksia* in flower is *B. ashbyi*, with the dense and hardy mallee, *Eucalyptus platypus* behind, and the fast-growing *Grevillea leucoptervis* to the left. The most rewarding plant in the back garden is the little-known *Eucalyptus orbifolia* — a beautiful silvery form, pale yellow flowers in Autumn-Winter and maintenance-free. The *Hakea francisiana* (extreme left), now eight years old, produced its beautiful pink spikes for the first time in June this year.

A Corner of the Garden (bottom left)

The weeping branches of *Acacia lasiocalyx* contrast with the sculptured appearance of *Hakea baxteri* on the right (since died in the summer drought) and *Hakea petiolaris* on the left. The herb under the *Acacia* is the brilliant, blue-flowered *Styphandra imbricata* which does better in full sunlight and dies down over summer. I have found *Hakea petiolaris* to be vigorous, maintenance-free and attractive in both leaf, flower and fruit, but it needs plenty of room. It can be shaped by pruning, but since flowers are produced on the old wood as well as the new, potential flowers are lost.

The Wildflower Garden of Byron Lamont, Burrendah, Perth, W.A.

A three-year-old garden with beds of exotics among broad expanses of buffalo lawn was removed late in 1975. Sand was taken from the bank in the backyard to the front to give a platform almost out to the boundary. A sunken area was created at the north-west side of the house and later fenced to give an extended, private area to the rather small backyard. Steep slopes were then supported with loose surface lateritic rock packed with fine road gravel. A pergola supported by wooden sleepers was created to give privacy and shade to the front windows.

The present garden was planted in sections — the front in December 1975, the back in August 1976, the sunken area in October 1976 (planting is best done in early winter). Paths of Tuart stepping logs were laid down between groups of plants so that all parts of the garden were accessible for viewing. Brightly-coloured varieties of *Arctotis* daisies (South African) were planted on the verge and south side of the house. These were most impressive during winter-spring, but gaunt in summer and gradually deteriorated. They were removed and replaced with native shrubs and creepers in May 1979. Sawdust was spread 2-3 cm deep over the surface, then covered with a 1-2 cm layer of road (lateritic) gravel. Laterite rocks were pushed into the gravel to give a more natural effect. The native ground cover *Dichondra* was planted in the back and sunken areas. This was attacked by cutworms on one occasion and required frequent watering during summer. It was replaced by loose, half-brick patios, more gravel and a large pit of washed sand and natural playground items for our young children. Photograph on page 144.

A choice selection of Australian ferns was planted in the front pit bearing 15 cm of sawdust, W.A. peat and litter. This was successfully watered with a soaker sprinkled over two summers. Water restrictions prevented adequate watering in 1977/78. The few ferns surviving have now been interplanted with hardier native sedges and Kingias. Most plants were 50-150 cm high at the time of planting, but many smaller ones have since been planted among the larger plants. Individual plants were watered once a week over the first two summers, but have not been watered artificially since.

Most plants are given a very light dressing of resincoated (slow release) fertilizer or blood and bone at the start of winter. Vigorous plants producing abundant litter and Banksias, Dryandras, Grevilleas and Hakeas are not fertilized at all. On clearing, numerous plants arose spontaneously in the garden, the most conspicuous being the Woolly Bushes, Prickly Moses, Pea bushes, Hibbertias, Hemiantras and Kangaroo Paws and an annual sedge.

One of the joys of the garden is to see seedlings appearing unexpectedly from hidden seed dispersed by plants which flowered the previous year — Red Runner Pea, the Everlastings, *Opercularia*, Wild Wisteria, Plume Grevillea and several Hakeas. Another source of excitement is the large collection of native insects and birds now attracted to the garden — the children join us in hunting for preying mantids on the Grevilleas, jewel beetles on the wattles, honeyeaters in the one-sided bottlebrush. We have fewer pests and diseases than most gardens (we have no leaf miners on our Eucalypts for example, though this grub devastated Eucalypts in Perth, including those near).

The present maintenance activities include light pruning of overhanging branches, staking of wind-blown plants and spot-watering of plants not yet established. Weeds continue to be a problem — though we have far fewer than the average lawn (especially chickweed) and they are easier to pull out. It is clear that most weeds are blown onto the garden as the only troublesome area is the front verge.

Our water consumption was 841 kl for 1975; 695 kl for 1976; 327 kl for 1977 and 259 kl for 1978. This is despite the fact that we gained two children during this time. It is evident that our plants have grown more strongly and attractively than many other plants in the street that have been raised on frequent applications of bore water, and this can probably be attributed to the absence of competition from lawn and allowing the plants to experience

nature's cycles. This has not been without its sacrifices however — 12 otherwise healthy shrubs died during the 1977/8 drought because of inadequate water but at least those remaining are drought-tolerant.

Highlights:

The following directions are provided for people visiting the garden in spring. Those who know the plants will be able to visualise the garden. Others may use it as encouragement to relandscape their own garden.

- Follow the chalk arrows on the stepping logs, noting the following along your way.
- As you enter the garden, observe the One-sided Bottlebrush (*Calothamnus homalophyllus*) with its flowers on the old stems. A great favourite with honeyeaters.
- The everlasting at your feet are self-sown; their flowers close whenever it is wet or dark. In some ways they are not like the other plants in the garden — they are soft and very prone to snail attack, they attract aphids and require fertilizing.
- Push aside the branches of the next *Calothamnus* (*villosus*) to show its flowers hidden on the old wood — the honeyeaters hop on the ground to get at this one.
- Further along on the right is a spider orchid (*Caladenia dilatata*) with 5 flowers — this is the third year it has flowered.
- Despite its beautiful flowers, the *Melaleuca radula* hybrid never sets seeds — a mark against buying hybrids. As with other honeymyrtles and paperbarks, this species should not be pruned either, as the previous season's wood is the source of flowering branchlets the next year.
- The (in)famous Prickly Moses on your left is colourful, but thorny. It is short-lived but regenerates. Folds up its leaves at night or during drought.
- Towering above is the Plume Grevillea with its grey-fern foliage and long, naked branches bearing huge clusters of cream flowers at present hidden by pink bracts. I have recorded over 70 insect species visiting the flowers of this plant, especially moths and beetles at night. Some people do not like its sickly sweet perfume (though we have had no complaints from neighbours — there is a bigger specimen in the back yard) so I suggest you go to Kings Park's Botanic Garden in the evening, October-January, to see if it bothers you, before you buy one!
- Flowering profusely in winter, *Hakea petiolaris* can be strongly recommended.
- Note the ground covers here — the extremely hardy and Red Runner Peas, with the pink-flowered Snakebush (*Hemiandra pungens*) behind the State's floral emblem (red and green Kangaroo Paw) *Anigozanthos manglesii*.
- Grevillea thelemanniana* is a ground-cover shrub and extremely hardy from coast to hills.
- The perfume pervading the garden at present mainly is from *Acacia lasiocalyx* on the left — it flowers and seeds well, has an attractive form and bark, and is very hardy — but give it plenty of room. Yellowing of the tips suggests potash deficiency, but this could be an indirect effect of root-knot nematodes in the soil — a major problem in Perth's moist sands.
- Kunzea pulchella* next door gives foliage variety to the garden, but is slow to grow and flower — has anyone seen it flower in gardens?
- Behind *Hakea sulcata* are two soft-leaved Woolly Bushes, *Adenanthos cygnora*, natural colonizers that could serve in the place of some exotic cypresses.
- Melaleuca lateritia* further along the left has struggled to survive in our garden — because it occurs naturally in swamps — but if you have more water than average, then its brilliant bottlebrush flowers (appearing on the old wood) are a delight.
- Next door is the very hardy, South Australian wattle *Acacia iteaphylla*. It has a dense, rounded form, flowers in winter, attractive pods, pink branch tips and green stems, and is extremely hardy. On the right is the ground cover-shrub *Grevillea obtusifolia*, and another further along — both showing remarkable growth and colour in a very dry part of the garden. The true mulga is a summer flowerer, and gives foliage contrast to the garden — it is a small tree.
- Around the loop now, noting *Melaleuca diosmifolia* grown for its foliage — I have never seen it flower in Perth. *Eucalyptus spathulata* is a handsome small tree, but limbs arising from the ground tend to split off. The blue-flowered lily *Stypandra* dies down completely each summer. Sheoaks are sturdy, open trees suitable for the garden — we have had to be content with Eastern species, as the horticultural potential of our many small sheoaks has not been explored yet. Their ornamental nuts (female plant) and orange catkins (male plant) make up for their lack of showy flowers.
- Peeping over the fence around the sunken area on your right is the delicate-looking Weeping Gum, *Eucalyptus sepulcralis*, native to the Fitzgerald River region. Pass the coastal wattle, *Acacia cyclops*, which has been the fastest grower in the garden, and has a role as a windbreak, shade against a wall and rapid cover, but we do not expect it to survive more than 10-15 years.
- Note the large swelling of the rootstock (lignotuber) of *Eucalyptus macrandra* which indicates it is a true mallee — a small, summer-flowering, bird attracting tree which can be strongly recommended.
- The delicate *Hibbertia stellaris* is notable for its red stems and orange display flowers — note its preference for partial shade, mainly provided by the remarkable *Eucalyptus formanii*, a slow-growing mallet with soft needle leaves.
- The eastern melaleucas at the right have been disappointingly slow and the western melaleucas in the backyard have more to commend them. (e.g. *M. huegelii*).
- The Wild Wisteria (two plants altogether) over the pergola is at its best at present — note the smell of essential oils from the bunches of flowers — this creeper is fast growing but needs support initially and gives dense shade.
- Walk over the sleeper bridge, past the fern pit, inspect plants near the garage, walk through the garage and view the plants and features of the backyard. Now wander into the sunken area (watch the steps), and observe the privacy and discrete placing of the shed, as well as the plants. The gravel has stabilised the slopes, but cannot be walked on. Watering is difficult — it is best to have ground covers rooted on the flat and let them cascade down the slope. ■





Wildflower Gardens are for Birds

Photography and notes by George Adams

Noisy Miner— Above

Myzantha melanocephala

Possibly the best known honeyeater in Eastern Australia from the far north to Tasmania, the Noisy Miner is a common garden bird and conspicuous by its constant noise as indicated by its name. Although a member of the group of Australian honeyeaters, the Noisy Miner is more stockily built and has a shorter beak than most. It mainly feeds on insects and berries as well as nectar from flowering plants. It is often called "Soldier Bird" because it is forever alert and ready to give the alarm. If encouraged into the garden by the provision of water and/or bread soaked in diluted honey they become very tame. A garden with birds has pest control.

The patch of yellow skin behind the eye is used for displays of aggression. By sleeking the feathers back from its edge its effective size can be changed to look like two large threatening eyes in a frontal stare. To act submissively the feathers are fluffed out to reduce the area of yellow skin displayed.

Noisy miners are gregarious birds and form organised colonies with their own territories. Groups may number 12 to 18 birds or more. These groups forage for food together and join forces to mob predators driving off all comers including cats, hawks or goannas. At nesting time the colony communally feeds the nestlings with the feeding rate reaching up to seventy visits an hour. Up to 25 birds have been recorded attending the one nest, more frequent than any other species recorded. Young birds help feed their younger siblings. Bathing is also a popular communal activity and they can provide entertaining observation if a bird bath is available in the garden. Of an evening the group roosts together and just before sunrise the group performs a communal song noted for its musical qualities. Only heard between May and January and consists of pure whistles and other notes in chorus in contrast to their usual raucous sounds.

This has been taken from a larger description in the book "Foliage Birds — Australian birds and their favoured plants" by G. M. Adams, available from the Editor, Australian Plants, in September, for \$35.00, post free.

Eucalyptus leucoxylon var. *rosea* and a Noisy Miner (above)

A hardy small tree to grace the garden and attract the birds. In the best of the Yellow-flowered Eucalyptus, Ivan Holliday recommends a form with bright yellow flowers.

Eucalyptus macrandra (opposite top)

Photography by G. Watton

A small tree for the garden with a long flower period. See page 151.

Eucalyptus dielsii (opposite bottom)

Photography by G. Watton

A neat bush tree with glossy leaves and attractive trunk. See page 150.

YELLOW FLOWERED *EUCALYPTUS*

Some cultivated Eucalypts
which feature bright
yellow flowers
by Ivan Holliday

Of the cultivated eucalypts with bright yellow flowers most are dry area species which are best suited to dry to moderately dry temperate conditions. The exceptions are *Eucalyptus cornuta* and *E. macrandra* which can tolerate wet conditions in well-drained soils and, to a lesser extent, *E. leucoxylon* and *E. preissiana*.

All of the other species which I have described below give of their best, both for production of showy flowers and for tree form, if grown in areas of under 500 mm rainfall and preferably less than this.

Omitted from my list are *E. brachyphylla*, *E. burdettiana*, *E. kruseana*, *E. lehmannii*, *E. megacornuta*, *E. platypus*, because I have judged their flowers as predominantly greenish-yellow and *E. forrestiana* and *E. stoatei* because the bright yellow stamens are dominated by their large reddish floral receptacle.

***Eucalyptus cornuta* (Yate)**

Apart from its showy yellow flowers which may be produced profusely during early summer, the Yate features a distinctive foliage with a metallic sheen. Under favourable conditions it grows to a large, densely-crowned tree to 20 m high with thick dark grey rough bark on the main trunk and lower parts of the larger branches. However, in many cultivated situations it grows only to a moderate manageable size which can be particularly ornamental in full flower.

The flowers occur in globular clusters, the bud caps, long, thin and horn-shaped. Fruits feature prominent dome-shaped exerted discs and long pointed valves.

From the higher rainfall coastal areas of southern Western Australia, Yate is a particularly useful tree for sandy soils near the coast. However, it adapts to most soils and conditions and grows well in sub-tropical areas. Some fine specimens may be seen in parks at Victor Harbor, South Australia.

***Eucalyptus dielsii* (Cap-fruited Mallee)**

Rarely cultivated, this is a neat, bushy-crowned small tree with narrow, glossy leaves and shiny brown bark, ageing to grey. Its regular form and small size suggests it could be tried as a street tree in moderately dry temperate conditions. A colour photograph is shown on page 148.

Its bright yellow flowers occur abundantly in early summer in pendulous umbels with long slender stalks. The caps are dome-shaped and the cup-shaped fruits easily distinguished by their flat, overlapping disc.

The tree occurs naturally in the Salmon Gums-Ravensthorpe-Lake King area of Western Australia.

***Eucalyptus eremophila* (Tall Sand Mallee)**

This widely distributed tree from the Western Australian wheatbelt and goldfields areas occurs in a number of different forms and with a variety of flower colours. The bright yellow form can be one of the showiest of all the yellow-flowered eucalypts, the flowers appearing in pendulous masses from winter to summer. The bud caps are long, narrow and horn-shaped and the fruits longish, shaped rather like a wine glass, with slightly exerted valves. A colour photograph is shown in Vol. 1, page 192.

Featuring smooth grey-brown bark and narrow, lanceolate leaves this is one of the best small eucalypts for cultivation in dry to moderately dry situations.

***Eucalyptus erythrocorys* (Illyarie, Red Cap Gum)**

There are few eucalypts which can compare with this species for spectacular flowers. These are produced in large, showy heads, usually towards the top of the tree during autumn and early winter. Opening to a

greenish-yellow, they quickly turn to a bright sulphur yellow which contrast brilliantly with their large, crinkly, red, bud caps. Fruits are large, woody and bell-shaped and the leaves long, curved and glossy. The bark is roughish at the base but smooth and creamy-white thereafter. Restricted to a narrow coastal strip of Western Australia from about the Murchison River south to Dandaragan, Illyarie favours limestone soils. With careful training a small, ornamental tree to about 6 metres high can be produced. A good colour photograph is in Vol. 6, page 92.

***Eucalyptus gardneri* (Blue Mallet)**

At close inspection the flowers of the Blue Mallet are pale lemon but I have included it because in flower, specimens can appear massed with apparently bright yellow blooms. These contrast well with the attractive blue-green narrow foliage. Bud caps are distinctively horn-like, being very narrow and thin with a sharp apex. Fruits are small and pear-shaped. Flowering occurs in early winter. See Vol. 8, page 9 for a colour photograph.

This is an ornamental, medium-sized tree 6-9 m high with pale brown smooth bark, ageing to grey and handsome foliage. It occurs naturally in the Narrogin-Katanning-Kondinin area of Western Australia.

***Eucalyptus leucoxylon* (Yellow Gum, S.A. Blue Gum)**

A particularly good tree to attract birds.

***Eucalyptus macrandra* (Long-flowered Marlock)**

Another of the yellow flowering eucalypts with long, horn-shaped bud caps. It is a small tree, seldom reaching 7 m high, with smooth brown bark and narrow leaves with a dull metallic sheen, similar to those of the Yate Gum. Flowering can be very profuse, usually in summer or autumn when the masses of bright yellow flowers are spectacular. Fruits are cup-shaped appearing in clusters on a slightly flattened peduncle.

This is a particularly useful small tree for gardens as it withstands extra watering very well (often best grown in a cluster of several together). It is one of the best eucalypts for coastal situations. Colour plate on page 148.

Long-flowered Marlock is found naturally from the Stirling and Porongorup Ranges to the Phillips R. in W.A., favouring moist depressions and streams.

***Eucalyptus preissiana* (Bell-fruited Mallee)**

This distinctive species features very large yellow flowers in profuse clusters, usually during spring, and blunt, rounded reddish-brown to green bud caps. The large grey fruits which follow are bell-shaped with slightly sunken, enclosed valves.

A mallee, it should be grown as a spreading shrub 2-3 m high. The leaves are large, thick and grey-green to grey-blue, these contrasting well with the flowers. An excellent photograph is in Vol. 8, page 8.

Bell-fruited Mallee occurs naturally along the southern coast of Western Australia from the Stirling Range to Stokes Inlet, often in low thickets.

***Eucalyptus socialis* (Red Mallee)**

A widespread mallee of variable form, usually with creamy-yellow flowers, but occasionally bright yellow. It is closely related to *E. flocktoniae*, *E. gillii*, *E. transcontinentalis* each of which feature very similar creamy-yellow flowers as shown in the colour photograph of Vol. 8, pages 5 and 12.

In flower, the bright yellow flowering form of this species is most ornamental. The flowers appear in dainty clusters throughout the tree, the caps cream, resembling an elf's cap. Fruits are rounded, or slightly urn-shaped, with long pointed protruding valves.

Usually a small tree, 5-8 m high, best grown as a mallee. It occurs throughout the mallee regions of Australia. It can be distinguished from the Merritt (*E. flocktoniae*) by the distinctly bulbous, urn-shaped fruits of that species, although transition forms between the two species occur. Also, the seedling leaves of *E. socialis* differ from those of *E. flocktoniae* and *E. transcontinentalis* which are both broader and decurrent (i.e. the base of the leaf is continuous along the stem to form a wing). *E. gillii* is a quite different, glaucous tree from the northern Flinders Ranges and near Broken Hill.



***Eucalyptus woodwardii* (Lemon-flowered Gum) (above)**

One of my favourite trees where it is successful, usually in the dry, limy soils of many inland towns. Here it forms an erect tree with pendulous branches 10-15 m high. See page 154 for a colour photograph.

This tree from the Kalgoorlie area of Western Australia features mealy, glaucous leaves on long flexuose branches, the smaller branchlets and flower buds covered with a white, waxy powder. In flower, the combination of frosted white buds, bluish-grey leaves and bright golden globular clusters of flowers in profusion cascading down the pendulous branches is most ornamental. The bud caps are hemispherical with a prominent beak and the mealy fruits, bell-shaped. The tree flowers over very long periods, usually throughout the warmer months.

***Eucalyptus stricklandii* (Strickland's Gum)**

Another Western Australian tree (from the goldfields area of Kalgoorlie to Norseman) which features spectacular yellow flowers. These are produced around and down the branches during summer in large, showy clusters. The dome-shaped buds and smaller branches are usually mealy, white. Fruits are bell-shaped. See Vol. 5, page 113 for a photograph.

A smallish, heavy-foliaged tree, the thick leaves at first broad but maturing to a long, lanceolate shape. It is a good honey tree for dry areas, of ornamental appearance and useful in mildly saline soils. A rare red flowering form is occasionally seen in cultivation.

Eucalyptus x 'Torwood' — which is a hybrid cultivar between *E. woodwardii* and *E. torquata* and appears in several colour forms, can be found with spectacular bright yellow or orange-yellow flowers. It is generally a stouter, less glaucous tree than *E. woodwardii*. See page 153 for colour photograph.

Streets Need Trees



Eucalyptus 'Torwood'

Photography by I. G. Holliday

This widely sought after tree is a cross between *Eucalyptus woodwardii*, shown opposite, and *E. torquata*. The leaves of the tree above are only slightly glaucous and the opercula are only shortly rostrate, favouring the parent *E. woodwardii*. Some specimens are red flowered and closer to *E. torquata* while others are an orange-yellow.

***Eucalyptus youngiana* (Ooldea Mallee)**

This straggly mallee of large shrub proportions, or sometimes a slender tree, usually produces bright red, pinkish-red, or creamy-yellow flowers. However, occasionally it is found with bright yellow flowers 10 cm or more across. The large fruits and conical bud caps with a prominent beak, are strongly ribbed. It comes from the red sandy soils of western S.A. and eastern W.A. A red flowered form is illustrated in colour in Vol. 8, page 1 and Vol. 10, page 57. It is a close relative to *E. pyriformis* (Pear-fruited Mallee) and *E. kingsmillii* (Kingsmill's Mallee). ■

What Is A *Eucalyptus*?

By C. A. Gardner

Western Australian Department of Agriculture Bulletin No. 1078.

Description

What constitutes a *Eucalyptus*?

They are all woody plants, i.e. trees or shrubs.

The leaves are simple entire of more or less leathery texture. It has a single midrib or central nerve, and typically what are termed lateral nerves which arise and diverge from this midrib usually to terminate in what is termed an intramarginal nerve which may be close to (so close as to not be obvious), or remote from the leaf-margin. In some tropical species there are two intramarginal nerves.

The leaf consists typically of a leaf blade or *lamina* attached to the branchlet by a special stalk or *petiole*, frequently twisted, so that the leaf assumes a vertical pendulous position; at other times the leaf is stalkless or *sessile*, and in a few species two opposite leaves may be joined at their bases (*connate*) to resemble a single leaf pierced by the branchlet. The position of the leaves is usually *alternate*, i.e., on opposite sides of the branchlet but placed one above the other; at other times they are strictly *opposite* to each other.

The presence of oil in the fresh leaves may be detected by holding them up to the light, when the oil cavities will appear as translucent dots. In the dried leaves this character is not usually evident but there may be some indication of oil as dark spots, or minute depressions on the leaf-surfaces. More detail on leaf structure is given in Vol. 10, page 62.

Flowers

The flowers are arranged at the top of a stalk which arises from the point of junction of the leaf and branchlet (the leaf *axil*). The stalk is termed the *peduncle*. The flowers may each possess their own special stalk (*pedicel*), or may be stalkless, when they are said to be *sessile*. The pedicels, or the sessile flowers in most cases are clustered at the top of the peduncle; when pedicellate, the group (*inflorescence*) is an *umbel*; when sessile, the flowers are in a head, and termed *capitate*.

The *Eucalyptus* flower is a simple structure, for there are no sepals and petals. The lower part of the bud, which becomes the cup of the flower, and enlarges or hardens to form the fruit is termed the *calyx-tube*, and is usually *truncate* or flat at the summit. Occasionally the sepals are represented by four small teeth close to or at the summit of the calyx-tube, and these are always four in number. The petals are quite absent, but their place is taken by a bud-cap, called the *operculum*, and this is probably derived from the hardened and concrete petals. It is indeed this *operculum* that is the most characteristic feature of *Eucalyptus*, and from which the genus derives its name—*eu* = well, and *kalyptos* = covered. Continued on page 159

PESTS OF EUCALYPTS

by F. D. Hockings

Eucalypts as a genus provide food for more animal life than any other genus of plants. This is partly due to the fact that eucalypts of one species or another are prominent if not dominant plants in nearly all the plant habitats on the Australian continent from the rainforest margins and wetter coastal districts to the arid interior, from sea level to mountain tops.

Because of the ubiquitous and hardy nature of eucalypts, they have provided a constant and dependable source of food, not only for the nectar-feeding bats, birds, numerous marsupials and countless insects but also for the numerous leaf chewing, wood chewing and root chewing grubs and beetles, the numerous leaf chewing, bark and wood chewing and root chewing caterpillars of moths and butterflies, the numerous leaf and stem sucking insects and leaf sucking mites. In addition there are countless bud, leaf and stem galling insects and numerous mining insects. Eucalypts also provide shelter for the countless other insects and mites that feed on these plant eating species. All have evolved together.

Any *Eucalyptus* species, within its natural range of occurrence, is more or less in equilibrium with the animals it feeds. When we grow species a long way from their natural range they are often very susceptible to the local range of pests.

Furthermore, if the natural habitat is greatly disturbed or permanently altered to an over simplified system of eucalypts and grass, sooner or later constant attack by leaf chewers and leaf suckers, with little check from their natural parasites and predators, will lead to debilitation and death of the trees. This happens because the perpetuity and maintenance of a large range of parasites and predators of the eucalypt-feeding pests, depends on the existence of the smaller trees, shrubs and herbs, etc. that normally occur below the eucalypt canopy.

Pest Control of Eucalypts

First know your pest or problem. The book "Friends and Foes Of Your Australian Garden" is ideal for this as it shows, in full colour, the various pests in their life cycles.

Plates 23, 24 and 25 show the cup moth and their beautiful caterpillars eating *Eucalyptus* leaves, and the cup-like pupae; plate 27 and 28, the case moth; 33, the sawfly larvae; 35 and 36, leaf eating beetle and ladybird; 41, a leaf eating weevil; 42, the christmas beetle; 56, the leaf blister sawfly; 59, the leaf bubble gall; 61, the pimply, leaf gall; 62, the nema gall; 67, the irregular psyllid; 68, 69 and 70, various lerps; 84, blister mite; 89, the tip bug; 98, tip gall; and 103, the tip roller; all of which attack the leaves.

Pests associated with the tree trunk and stems are: plate 153, the frog hopper; 159, gum tree or rice bubble scale; 162 and 163, galls; 166, the seedling borer; 172, the twig-hollowing caterpillar; 175, the scribbly gum moth; 177 and 178, borers; 180, the bark bug. Plate 238 shows a fungus disease known as Ramularia Blight that makes the young shoots and leaves appear as if they have been splashed with white paint.

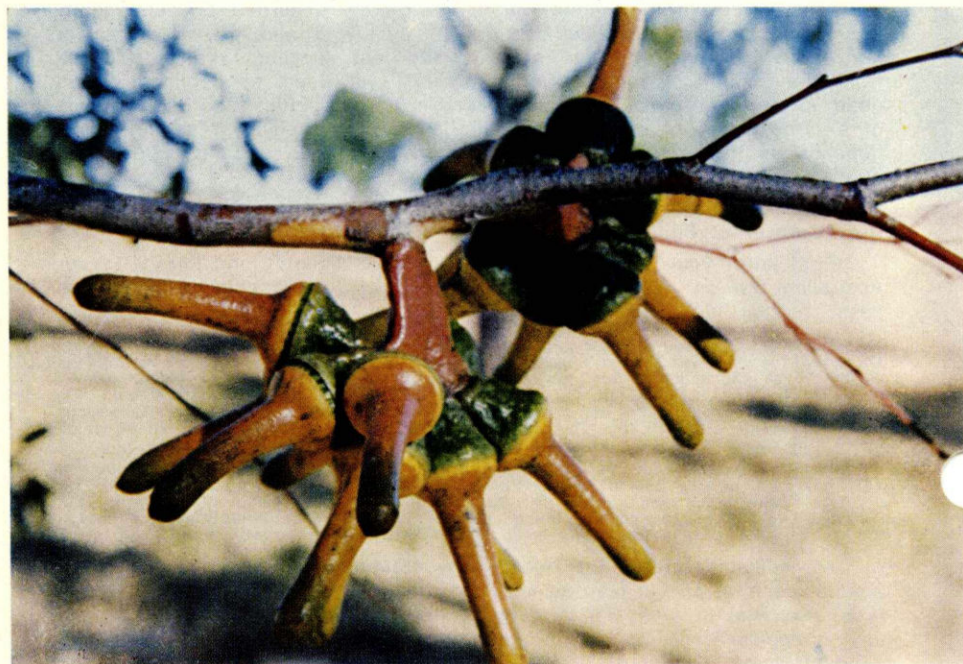
As indicated also in the book, many creatures you find on your plants are not pests at all but play an important part in the natural control of pests. It is also vital to realise that many of the pests play an important part in the ecological balance of the community living on eucalypt trees and although some may cause temporary damage, the phase will pass and the tree fully recover. Unless there is a real problem such as probable loss of the tree or the "fallout" cannot be tolerated any longer, leave pest control to nature especially the birds.

As a last resort the book has a chapter on chemical control agents:

Scale insects — half strength white oil plus diazinon or carbaryl.

Leaf eating beetles — carbaryl (references to trade names for chemicals are given).

Caterpillars — carbaryl, diazinon, endosulfan or trichlorfon. ■



Eucalyptus burdettiana

Photography by B. Ballingail

One of the small growing *Eucalyptus* species of considerable interest. It shows in a very exaggerated form the long operculum characteristic of the Western Australian species in the series *Cornutae*. In this respect it is perhaps more like *E. lehmannii* than any other. The stamens are rather coarse in this species too and the broad flattened peduncle is a prominent feature.

It is interesting that the specimen figured has produced flowers on old wood from a bud which has been dormant. This is infrequent in *Eucalypt* species and in many does not occur at all. The long operculum is associated always with a very long style and this can be seen on the flowers on the stem which have just finished flowering.

(Note by Prof. L. D. Pryor, Aust. Nat. Unit., Canberra, A.C.T.)

EUCALYPTUS LEHMANNII

and its allies

by D. J. and S. G. M. Carr, Department of Environmental Biology,
Australian National University, Canberra, A.C.T. 2601

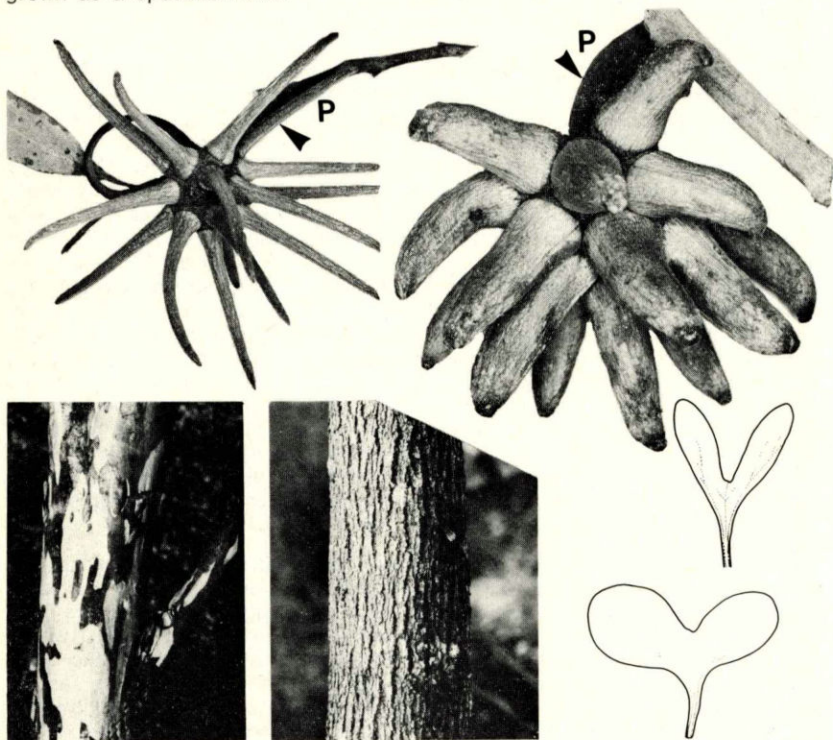
We have recently (Carr and Carr, 1980) described a group of seven very closely related species of eucalypts (the *Lehmannianae*), which are endemic to the south coast of Western Australia. They grow on well-drained soils in areas of high rainfall. All have flowers with horn-shaped opercula, straight stamens and a ribbed surface to the top of the ovary. The bases of the flowers, and hence the fruits, of *E. lehmannii* and *E. conferruminata* are fused together to form a single mass but the flowers are free from each other in the other species. In all species the flowers are borne at the end of a strap-shaped peduncle, which becomes turned downwards before the flowers open. The most familiar species is widely known as the Bushy Yate or Bald Island Marlock. It has hitherto gone under the name of *Eucalyptus lehmannii*. It was first collected in 1802 by Robert Brown at Lucky Bay and Goose Island Bay. His specimens are variously labelled "*E. aggregata*", "*E. conferruminata*" or "*E. glomerata*". It is unfortunate that none of these names was published because the species later became confused with *E. lehmannii* (Schau.) Benth. first collected by Ludwig Preiss in 1840 at Cape Riche. The confusion, which has continued since at least as far back as 1867, has now been removed by taking up Brown's manuscript name "*conferruminata*". The necessity of doing this is regretted because the species has been widely planted overseas as well as in Australia.

In nature *E. conferruminata* grows on the coast, not far from the sea (as at Middle Mount Barren and Two People Bay) or on off-shore islands. It forms a single-stemmed tree which under favourable circumstances may reach a height of 12 m. In coastal or island (e.g. Bald Island) gullies, where it grows in dense stands, the lower branches are shaded out and the trees are of pole form, branched only at the top. In more open stands (as on Middle Island) or when cultivated as a specimen tree or to form a windbreak, the lower branches persist and grow to a length comparable to the height of the tree. It is in this form that it is referred to as the "Bushy Yate" and makes a useful windbreak tree. It has been used in this way for at least 50 years on the Esperance Plains. *E. conferruminata* does not produce a lignotuber and, after destructive fire, regenerates exclusively from seed.

Eucalyptus lehmannii, on the other hand, is a small mallee with a relatively massive lignotuber from which it regenerates after fire. When raised from seed under nursery conditions, *E. lehmannii*, which has been sold as a "dwarf form", may retain a single main stem for some years and thus appear as a small tree. Under natural conditions, in which early damage to the seedling stem from fire or other agencies is to be expected, it assumes the mallee form, throwing up a number of stems from its lignotuber. The two species are quite distinct from one another in a number of other characters. In *E. lehmannii* the operculum of the flower is long and delicate (ratio of length to breadth at the base = 9-14); in *E. conferruminata* the operculum is thick-walled and its length less than 5 times its breadth at the base. Its head of flowers is borne on a short-strap-shaped peduncle. The peduncle in *E. lehmannii* is relatively long and slender. The fruits are persistent in both species. Peduncles of the compound fruits of *E. conferruminata* which are borne on the main trunk or on thick branches may become overgrown and immersed in the wood of the stem, so that the clusters of fruits may appear to be sessile. This never happens in *E. lehmannii*, the fruits of which hang down on their long, thin peduncles below the branches. The seedlings of the two species can be distinguished readily by the shape of

their cotyledons: they are Y-shaped in *E. lehmannii*, deeply bilobed in *E. conferruminata*.

Eucalyptus burdettiana, a small lignotuberous mallee which grows on the seaward slopes of Middle Mt. Barren, and *E. megacornuta*, a tree without a lignotuber, were described many years ago. The latter has been widely grown as a specimen tree.



Top: *Eucalyptus lehmannii* — Clusters of mature flowers
Bottom: Trunk of *E. talyuberlup* (left) and of *E. cornuta*

E. conferruminata
Cotyledons of *E. lehmannii*
and *E. conferruminata*

E. talyuberlup has been confused with *E. cornuta*. The two grow side by side as small trees at low altitudes in the Stirling Range, e.g. on Scenic Drive and at the picnic ground at the base of Mt. Talyuberlup. The two are readily distinguished. *E. cornuta* has a stocking of dark, persistent rough bark above which the deciduous bark of the upper trunk hangs in ribbons. The bark of *E. talyuberlup* is smooth throughout and is shed in flakes. *E. talyuberlup* has a strap-shaped peduncle which when cut across is seen to have a number of separate vascular strands. In *E. cornuta* the peduncle is usually more-or-less circular in cross-section (it is rarely flattened for part of its length) and, in the cross-section, the vascular tissue is in the form of a continuous ring. As a final check, if one is needed, the two species can be told apart by pulling off a side shoot from the current growth of the stem. This should split the stem through its pith, an examination of which with a lens (x 10) will show that *E. cornuta* has oil glands in the pith, but *E. talyuberlup* has none. Seedlings can be distinguished because the seedling leaves of *E. talyuberlup* have stellate hairs on the margins, midrib and petiole, but they are lacking on seedling leaves of *E. cornuta*. *E. talyuberlup* has a lignotuber and can thus grow as a mallee. However, on good sites it retains its seedling stem and grows as a small tree.

Eucalyptus newbeyi is a tree without a lignotuber, which grows on soils derived from spongolite, i.e. a mineral rich in sponge spicules. At present it is known from only two localities. One is on the break of slope in the Pallinup River valley above its estuary. The other is deep in the Fitzgerald River National Park on spongolite cliffs which form the banks of the Susetta River. It is distinct in both flower and fruit from *E. megacornuta* (it has been referred to as "smooth-budded *megacornuta*" — a reference to the characteristic warts of the *conferruminata*, are Y-shaped). There is an eighth species which we are in process of describing. Like *E. bennettiae*, it is from Mt. Desmond which is near Ravensthorpe. *E. lehmannii* and *E. megacornuta* also grow on Mt. Desmond which appears to be centre of distribution of these species, since no fewer than 6 of them occur within a radius of 70 km.

Reference:

Carr, D. J. & S. G. M. Carr. (1980) The *Lehmannianae*: a natural group of Western Australian eucalypts. Aust. J. Bot. 28, 523-550. ■

What Is A *Eucalyptus*?

Continued from page 155

When the bud cap falls off at *anthesis* (flowering time) the stamens expand. These consist of a stalk or *filament*, and at the top an *anther* which contains the pollen. The anther opens by two cells, or by circular or elliptical pores; most frequently these are longitudinally parallel to each other. Sometimes by upward confluence they appear as a single curved slit. The filament is attached to the anther at the base of the latter, when the anther is said to be *basifixed*, or it may be attached at the back, when it is *dorsifixed*, or *versatile*, and moves freely on its pivot. There is a large or small gland on the back of the anther.

Fruits or Seeds

After pollination and fertilisation the stamens wither or fall off, and the calyxtube undergoes some modification to form the fruit—popularly called the "gum-nut." This contains the capsule which in turn contains the seeds. The space at the top between the place occupied by the stamens and the edge of the capsule is termed the "disc," and this varies considerably in the different species.

The seeds vary considerably both in size and in shape; often they are minute, but sometimes as in the Red-Flowered Gum, for example, they are large, and sometimes winged. In addition to the fertile seeds, usually found in the lower part of the capsule, there are a number of sterile seeds, differing considerably from the fertile seeds and usually narrow. These form what is called the "packing" in the upper part of the capsule, and are the first to be shed when the capsule opens its valves.

The shape of the seed-leaves—those embryonic leaves which are the first to expand when the seed germinates—is of importance in respect to the relationships of species. There are two main types: the broad cotyledons of the Jarrah and Marri, for example, and the Y-shaped or forked cotyledons of the Mallets and a large number of the inland trees and mallees. ■

Eucalyptus Seed

by Boland, Brooker, Turnbull & Kleinig, CSIRO

Produced by the CSIRO of Australia this detailed and well illustrated 190 page book may be purchased from the CSIRO, 9 Queens Road, Melbourne for \$18.00 postage included. The chapters entitled Seed Development, Morphology, Production, Collection, Testing and Raising cover everything you would want to know of *Eucalyptus* seeds. Each Chapter is illustrated with numerous enlarged photographs that enable the interested beginner to easily follow the text. For instance 447 photographs of enlarged seed give a guide to identification of species just from the seed.

Eucalypts Of Western Australia — C. A. Gardner

Price \$9.00 post free

The work of Charles Austin Gardner, then Government Botanist of Western Australia, has been reprinted following popular demand. The 260 page book carries a full page line drawing for each of 117 species of *Eucalyptus*, opposite a full page comment and simple description of the species. Although a further 90 species have been described since his death, this book remains an invaluable reference.

Pelargoniums

Western Australian Species by G. J. Keighery,
Kings Park and Botanic Garden

Native Australian *Pelargonium*s may lack the variety of the Southern African species, but they have been underrated as garden subjects. In Western Australia four native species are found, and one of these *P. havlasae* is an outstanding subject for pot culture. All are found in the lower Southern regions of Western Australia.

Pelargonium havlasae Domin.

A small perennial herb, widespread in the Avon and Stirling Districts of southern Western Australia generally on heavy soil. The species has a basal rosette of geranium-like leaves from 8-15 mm across. An erect inflorescence up to 10 cm tall arises from the rosette in spring (August-November). Flowers are very faintly scented, white with prominent red veins and up to 2 cm across.

This species perennates via tubers, and dies back completely during summer, when the pots should be stored and kept relatively dry. Many offshoots are produced each year, and dense clumps are soon formed. A sunny position with a well drained loamy soil is essential. *Pelargonium havlasae* naturally occurs on sandy clays or loam soils.

Pelargonium australe Willd.

A herbaceous scarcely odouriferous perennial with tough, fleshy but not tuberous tap root, and short rhizomatous perennial stems. Flowering stems are decumbent then erect to 20 cm tall. Leaves are hairy, to 3-5 cm wide. Flowers are small, to 10 mm wide, pink with red markings. Flowering occurs in late spring and summer. Naturally occurs on granitic sandy soils. Propagate by rootstocks or cuttings.

Pelargonium drummondii Turcz.

A small perennial herb, with a fleshy rootstock, stem to 30cm, flowers pink veined red. Flowering in winter and spring, largely on granitic soils.

Pelargonium littorale Hugel.

Erect or prostrate perennial odouriferous herb, with a fleshy tap root but not tuberous. Flowering stems erect to 35 cm, flowers small (petals to 5 mm long) pink. Flowering occurs in spring (August to December) and early summer. Occurs on a wide variety of soils, but generally well watered sites. Easily grown from seeds or cuttings, it is a useful ground cover in shady areas.

PLANT STUDY GROUPS

A study group comprises a group of people who usually maintain contact by mail, exchanging advice, seed, plants and generally help each other. Some have special skills or knowledge but most only have the love of our wildflowers and the desire to help develop or preserve our magnificent flora. The leader receives the comments on progress and summarises activities in reports circulated to the members. The important thing is that these are "doing" groups and therefore if you do not intend to help by growing numbers of plants and recording results to instructions, then do not join. If you can help the groups with seed then please do.

The *Brachyscome-Helipeterum* study group is the latest group to get started. Interested people can contact the leader as listed below.

- ACACIA — Mrs. Marion Simmons, P.O. Box 1148, Legana, Tasmania, 7251.
BANKSIA — Mr. Trevor Blake, 12 Little John Court, Vermont, Victoria, 3133.
BEAUFORTIA — Mr. Brian Walters, Lot 32, Wilchard Road, Castlereagh, N.S.W., 2750.
BRACHYSCOME-HELIPTERUM — Mrs M. Schaumann, 88 Albany Drive, Mulgrave, 3170.
CALCIUM NUTRITION — Mr. Jim Webb, 22 Araba Place, Aranda, A.C.T., 2614.
CALLISTEMON — Mrs. Doris Phelps, Loxton North, South Australia, 5333.
CALYTRIX — Mrs. Joan Doney, 64 Cary Street, Wyoming, N.S.W., 2251.
CYCAD and ZAMIAD — Mr. Leonard P. Butt, 25 Ortive Street, Yeronga, Queensland, 4104.
DRYANDRA — Mr. Tony Cavanagh, 16 Woodlands Drive, Ocean Grove, Victoria, 3226.
EREMOPHILA — Mr. Geoff Needham, 2 Stuckey Avenue, Underdale, S.A., 5032.
EUCALYPTUS — Mr. L. J. Daniels, Post Office Box 201, Biloela, Queensland, 4715.
FERN — Mrs. Molly Murray, 25 Nowill Street, Rydalmere, N.S.W., 2116.
GREVILLEA — Mr. Peter Olde, 138 Fowler Road, Illawong, N.S.W., 2234.
HAKEA — Mrs. H. Blackney, 23 Devon Street, Eaglemont, Vic. 3084.
HIBBERTIA — Mr. Bernard Dixon, 82 Gilbertson Road, Kardinya, W.A., 6163.
MELALEUCA — Mrs. G. Holmes, Briggs Road, Brighton, Tasmania, 7403.
PROSTANTHERA — Mr. Les Taylor, 4 Prospect Street, Blacktown, N.S.W., 2148.
RUTACEAE — Dr. Mervyn L. Turner, 'Bush Gems', Old Emerald Road, Monbulk, 3793.
STYLIDIUM — Mr. Richard Davidson, P.O. Box 51, Melton South, Victoria, 3338.

Rooting Hormones

Their Effect on the Rooting
of Some Australian Species

R. K. ELLYARD, *National Botanic Gardens*

Cuttings of some species of Australian plants root readily without the need to apply a rooting hormone. The great majority of species, however, root more quickly and produce a superior root system following treatment with a rooting hormone. The two rooting hormones most widely used are indolebutyric acid (IBA) and naphthaleneacetic acid (NAA) and are usually applied diluted with talc in a rooting powder. They may also be applied dissolved in a liquid, either by soaking the cuttings for a period of hours in a very dilute solution or by dipping the basal tip of the cutting in a stronger solution for a shorter time (e.g. 5 seconds). This latter method is often referred to as the quick dip method. Further details on its use are given later in this article.

Until 1976 rooting powders containing IBA only were routinely used at the National Botanic Gardens for striking cuttings. At that time a decision was made to switch to "quick dip" liquid preparations. The reasons for this were:

1. published data available showed that "quick dip" liquid preparations were more efficient than powdered preparations.
2. published data with exotic species indicated that hormone type as well as concentration greatly influenced the rooting of cuttings. Some species have been shown to root better with IBA and others with NAA. With a few species a combination of IBA and NAA has been shown superior to the use of either hormone separately.
3. it is easier with liquid preparations to make up mixes containing different hormones in a range of combinations and concentrations.

In 1976 studies into the effect of hormone type and concentration on the rooting of Australian native species was commenced. This work is continuing. The results of some of this work are now presented.

Methods

In all experiments tip cuttings from field grown plants are employed; taken and prepared on the same day. A cutting medium of equal parts river sand, perlite and sieved German peat is used and cuttings are struck in 100mm square plastic pots, maximum of 25 cuttings per pot, under mist. The cutting medium is heated to $25 \pm 2^\circ\text{C}$ by electric cables buried in a 75mm layer of sand on the cutting bench.

The quick dip hormone solutions are prepared by dissolving the pure hormone in 50% ethanol-water. These solutions are stored in dark glass bottles in the freezer compartment of a refrigerator when not in use. Under these conditions they are stable almost indefinitely. The solution is allowed to warm to room temperature before they are applied to cuttings. In applying the hormone a small quantity, sufficient for immediate use, is poured from the bottle into a shallow container such as a petri dish or jar lid. Care is taken that this is not placed in a warm spot as this will result in the evaporation of the solvent and a change in the hormone concentration. Ideally a cover should be placed over the solution while cuttings are not being dipped.

The base of the cutting is placed in the solution to a depth not greater than 5mm for 5 seconds; a longer time can result in the cutting taking up too much hormone and possibly killing it. Excess solvent is allowed to evaporate from the cutting base before the cutting is placed in the cutting medium. Any solution remaining in the petri dish is discarded and not returned to the bottle.

All pots of cuttings are rearranged (re-randomised) weekly to remove any effect position may have on rooting. Fungicide is applied weekly.

When harvested the cuttings are carefully washed to remove the cutting medium from the roots. The number of cuttings rooted and the average number of roots/rooted cutting for each treatment is recorded.

Experimental Results and Discussion

In May, 1976, an experiment was set up to compare the effect of the previously employed rooting powder, which contained 3000 ppm IBA (Seradix 2), with a quick dip preparation containing both IBA and NAA (1000 ppm of each). A control treatment, ie. no hormone, was also included. Seven species were used. The results of this experiment are given in Table 1. Five of the seven species, *Boronia heterophylla*, *Calothamnus validus*, *Callistemon viminalis*, *Prostanthera ovalifolia* and *Phebalium rotundifolium* showed a higher percentage rooting for the concentrated dip treated cuttings than with either the Seradix 2 treated or control cuttings. This was most marked in the case of *Prostanthera ovalifolia*. Three of these five species, *Prostanthera ovalifolia*, *Phebalium rotundifolium* and *Callistemon viminalis*, also showed a higher number of roots per cutting following concentrated dip treatment.

For *Boronia heterophylla*, no difference was observed between the concentrated dip and Seradix 2 treated cuttings as to the roots per cutting. A difference was observed, however, in the amount of callus and the position of the roots. The Seradix 2 treatment produced a bulb of callus on the basal tip. Roots were confined to this area. The concentrated dip treatment, by contrast, produced callus extending up to 2.5 cm back from the basal tip. Root formation occurred in the extended callus region producing a better root system.

Melaleuca pulchella and *Correa pulchella* showed a high percentage rooting for all three treatments. For both species, however, there were twice as many roots per cutting in the concentrated dip treatment than in the other two treatments. In the case of *Correa pulchella* a difference was also observed in the position of the roots. For both Seradix 2 treated and control cuttings, roots were confined to the basal tip while the concentrated dip treatment produced callus and roots extending 2cm back from the basal tip.

TABLE 1. Effect of rooting hormone on the percentage rooting (%R) and roots per cutting (R/C) of seven Australian species.¹

TREATMENT	<i>Boronia heterophylla</i>		<i>Calothamnus validus</i>		<i>Callistemon viminalis</i>		<i>Correa pulchella</i>		<i>Melaleuca pulchella</i>		<i>Prostanthera ovalifolia</i>		<i>Phebalium rotundifolium</i>	
	%R	R/C	%R	R/C	%R	R/C	%R	R/C	%R	R/C	%R	R/C	%R	R/C
Control	34	1.4	0	—	14	2.0	97	8	90	2.8	32	2.9	22	1.9
Seradix 2	52	1.9	6	1.6	30	2.3	87	10	96	2.8	20	3.0	16	2.0
1000/1000 ppm dip ²	70	2.1	30	1.5	52	4.9	100	19	96	5.6	100	15	64	3.0

¹ Each treatment contained 50 cuttings (2 replicates of 25). All cuttings were harvested after six weeks.

² 1000/1000 ppm = 1000 ppm IBA: 1000 ppm NAA in 50% alcohol.

The results clearly showed the superiority of the IBA/NAA concentrated dip over the talc powder preparation containing only IBA. Further experimentation was required, however, to establish if this was due to the greater efficiency of the liquid preparation or to the presence of both IBA and NAA.

In February, 1977, an experiment was set up to investigate the relative efficiencies of talc versus liquid hormone preparations. In this study five species were employed. The results are presented in Table 2.

The great effectiveness of liquid quick dip preparations is evident. With four of the species the 500 ppm IBA liquid "quick dip" preparation proved superior to the 3000 ppm talc powder formulation. With the remaining species there was little difference between these two treatments and the control.

Better rooting is not necessarily produced with increasing hormone concentration. With two of the species tested, *Bauera rubioides* and *Grevillea baueri*, 4000 ppm IBA applied as a "quick dip" produced considerable hormone burn, inhibiting rooting. For these two species and with *Agonis juniperina* 500 ppm IBA produced the highest rooting. *Prostanthera ovalifolia* was the only species to show an increase in the percentage rooting with increasing hormone concentration.

TABLE 2. Effect of IBA on the percentage rooting (%R) and average roots per rooted cutting (R/C) of five Australian species.¹

TREATMENT	<i>Agonis juniperina</i>		<i>Bauera rubioides</i>		<i>Melaleuca armillaris</i>		<i>Prostanthera ovalifolia</i>		<i>Grevillea baueri</i>	
	%R	R/C	%R	R/C	%R	R/C	%R	R/C	%R	R/C
Control	4	1.0	78	4.1	38	1.9	40	4.0	80	2.3
Talc powder formulation										
3000 ppm IBA	20	1.5	66	4.5	40	2.2	22	3.9	86	2.5
Liquid formulation										
500 ppm IBA	46	2.0	96	4.2	54	2.0	66	4.1	86	2.6
1000 ppm IBA	30	1.5	92	3.7	44	2.5	80	3.5	60	2.9
2000 ppm IBA	20	1.7	94	2.6	46	2.2	82	3.5	82	3.1
4000 ppm IBA	48	2.5	46	2.6	48	2.6	98	2.1	36	4.2

¹ Each treatment contained 50 cuttings, 2 replicates of 25. Cuttings of *Agonis juniperina*, *Bauera rubioides*, *Melaleuca armillaris*, *Prostanthera ovalifolia* and *Grevillea baueri* were harvested after 8 weeks, 6 weeks, 7 weeks, 5 weeks and 6 weeks respectively.

As a result of these findings liquid "quick dip" formulations have been used exclusively at the National Botanic Gardens since the end of 1977. For routine work 500 ppm IBA/500 ppm NAA has been employed with excellent results.

Of particular interest in these two experiments is the difference in the R/C values obtained for *Prostanthera ovalifolia* in the two experiments. The possibility that this was due to the presence of NAA in the hormone mix in the former experiment and its absence in the second has recently been tested.

Cuttings of *Prostanthera lasianthos* taken in March, 1980, were treated with a range of "quick dip" formulations. The results are presented in Table 3.

The results suggest that NAA does indeed produce more roots per cutting than does IBA. A similar trend was seen with cuttings taken in January and May.

With *Westringia fruticosa* cuttings taken in February, 1980, NAA at low concentration separately or in combination with IBA, also stimulated the formation of more roots than IBA (Table 4). With this species, however, NAA in contrast to IBA, failed to increase the rooting percentage above that obtained with the control.

TABLE 3. Effect of auxin type and concentration the percentage rooting (%R) and the average number of roots/rooted cutting (R/C) of *P. lasianthos*¹.

TREATMENT	%R	R/C	TREATMENT	%R	R/C
Control	87	4.8	2000 ppm IBA	83	7.8
500 ppm IBA	93	6.0	1000 ppm IBA/1000 ppm NAA	93	13.0
250 ppm IBA/250 ppm NAA	100	7.1	2000 ppm NAA	100	13.1
500 ppm NAA	93	9.0	4000 ppm IBA	100	9.5
1000 ppm IBA	100	6.3	2000 ppm IBA/2000 ppm NAA	93	18.0
500 ppm IBA/500 ppm NAA	100	9.2	4000 ppm NAA	100	15.7
1000 ppm NAA	100	12.0			

¹ Each treatment contained 30 cuttings, 2 replicates of 15. All cuttings were harvested after 8 weeks.

TABLE 4. Effect of auxin type and concentration on the percentage rooting (%R) and roots/Rooted cutting R/C of *W. fruticosa*¹.

TREATMENT	%R	R/C	TREATMENT	%R	R/C
Control	67	9.1	2000 ppm IBA	83	13.8
500 ppm IBA	67	7.8	1000 ppm IBA/1000 ppm NAA	67	13.8
250 ppm IBA/250 ppm NAA	97	24.1	2000 ppm NAA	67	39.6
500 ppm NAA	67	18.5	4000 ppm IBA	93	18.9
1000 ppm IBA	93	12.8	2000 ppm IBA/2000 ppm NAA	73	18.1
500 ppm IBA/500 ppm NAA	83	18.0	4000 ppm NAA	57	17.9
1000 ppm NAA	53	19.8			

¹ Cuttings were taken on 7.2.80 and harvested after 40 days. 30 cuttings, 2 replicates of 15 per treatment were used.

Species of the genus *Grevillea* are not, as a general rule, difficult to strike from cuttings. The number of roots produced per cutting, however, is generally small; 1 or 2 roots/cutting is common. As a result of the above findings, therefore, an experiment was set up to investigate the effect of IBA and NAA on the rooting of six *Grevillea* species. Cuttings were taken at three times during the growing season. The species used were specimen 1, *G. arenaria* — sp. 2, *G. biternata* — sp. 3, *G. X gaudichaudii* — sp. 4, *G. 'Poorinda Peter'* — sp. 5, *G. rosmarinifolia* and sp. 6, *G. willisii*. In all cases the best rooting percentages were obtained with cuttings taken in May. Data on the effect of IBA and NAA on the rooting of the May cuttings of these six species is presented in Table 5.

With all species excellent rooting was obtained with IBA with no sign of hormone burn at high concentrations. A concentration of 1000 or 2000 ppm IBA would seem suitable for all species, except *G. willisii*, for which a higher concentration is required for optimum rooting. In contrast to the results obtained with *Prostanthera*, NAA did not stimulate the production of more roots and in terms of percentage rooting was inferior to IBA.

The sensitivity of different species to hormone concentration obviously varies greatly. *Crowea saligna*, for example has given excellent rooting with IBA and NAA, separately and in combination, at concentrations from 500 ppm to 4000 ppm.

By contrast *Banksia ericifolia* and *B. spinulosa* in studies at the Gardens have proved to be sensitive to both IBA and NAA. Hormone burn has occurred following hormone treatment as low as 500 ppm. Further work is planned with this genus. Possibly very low concentrations of hormone, especially NAA, may give better results.

TABLE 5. Effect of hormone type and concentration on the percentage and on a number of roots/Rooted cutting (R/C) of six *Grevillea* species¹.

Specimen TREATMENT	1 %R	1 R/C	2 %R	2 R/C	3 %R	3 R/C	4 %R	4 R/C	5 %R	5 R/C	6 %R	6 R/C
Control	40	1.5	45	1.4	8	1.3	8	1.0	80	4.6	13	1.0
500 IBA	25	1.1	63	1.8	83	1.9	75	1.3	95	5.9	30	2.2
250 ppm IBA/ 250 ppm NAA	45	1.2	48	1.2	60	1.8	55	1.2	95	4.8	28	1.3
500 ppm NAA	35	1.5	30	1.6	78	2.0	58	1.4	98	4.3	15	1.2
1000 ppm IBA	55	1.7	78	2.0	100	3.6	78	1.5	98	6.6	40	1.9
500 ppm IBA/ 500 ppm NAA	45	1.8	53	1.5	65	2.2	83	1.3	98	5.1	20	1.4
1000 ppm NAA	55	1.5	20	1.6	83	1.8	68	1.7	100	5.0	13	1.2
2000 ppm IBA	70	2.8	80	2.0	90	3.0	90	3.4	98	5.6	50	1.8
1000 ppm IBA/ 1000 ppm NAA	85	2.7	38	1.6	93	2.5	65	1.6	95	4.7	15	1.2
2000 ppm NAA	33	1.5	15	1.8	65	2.5	45	1.6	98	4.3	28	1.4
4000 ppm IBA	70	1.8	73	1.8	100	4.1	80	3.3	88	5.7	88	1.8
2000 ppm IBA/ 2000 ppm NAA	55	2.8	18	2.1	65	3.9	43	2.6	100	4.7	10	1.5
4000 ppm NAA	50	1.5	8	1.7	58	2.3	28	2.3	50	5.1	8	2.0

¹ Each treatment contained 40 cuttings; 4 replicates of 10. Cuttings of *G. arenaria*, *G. biternata* and *G. X. gaudichaudii* were harvested after 6 weeks; *G. 'Poorinda Peter'* and *G. rosmarinifolia* after 8 weeks; *G. willisii* after 13 weeks.

Conclusion

The results presented in this article provide some support for work published on exotic species which has indicated that species respond to hormone formulation as well as concentration. Many *Grevillea* species would seem sensitive to NAA and root best following the application of IBA. *Prostanthera* species, by contrast, root best following treatment with NAA. The research work and the results obtained in the general propagation programme at the National Botanic Gardens, however, suggest that good results can be expected with many species by employing a 500 ppm IBA/500 ppm NAA mixture. Work is continuing at the Gardens with the aim of identifying the requirements of particular genera which have proven difficult to root. At present the genus *Persoonia* is under investigation. Some progress has been made and this work will be published shortly. Work is planned in the near future with the genus *Eriostemon*, which contains both easy and difficult to root species. ■

The Proteaceae Of The Sydney Region

A. M. Blombery and B. Maloney

The 86 species of the family Proteaceae, found in the Sydney region, are presented in fabulous colour in this limited edition, 224-page (490 x 387 mm) book, available at a cost of \$750.00. The art work of Betty Maloney and the descriptive text of Alex Blombery make this book a prestige collector's item. Before the full page illustrations with descriptions opposite, is an introductory section leading the reader, by illustrated description, through the simplified technicalities of the family, how the plants are grown, illustrations of fruits and seeds and finally the geology of the Sydney region with a map. All enquiries to the Editor, Australian Plants.

Gardening With Wildflowers

Price \$8.95 plus \$2.05 postage

Another book on the general cultivation of wildflowers in the garden by Aleck Blombery. Aleck has been producing books on this subject for over twenty years and his main appeal is practical advice for the beginner. He does not attempt to list thousands of plants but confines his practical advice to the few hundred that he is confident will grow if you follow his advice.

Root-knot Nematode

Susceptibility of Some Australian Plants to Root-knot Nematodes

By G. R. STIRLING*

Root-knot nematodes (*Meloidogyne* sp.) are parasites of many agricultural, horticultural and ornamental crops in Australia, and heavy infestations often contribute to poor plant growth. Root-knot nematodes are particularly important in areas where plants are grown in warm, moist, sandy soils.

Experience suggests that Australian plants also suffer the debilitating effects of root-knot nematode when grown in warm, irrigated sandy soils, such as along the River Murray. Thus the susceptibility of some Australian native species to root-knot nematode was examined.

In a glasshouse experiment pots were filled with steam-sterilised sandy soil into which roots of tomato plants heavily infested with *M. javanica* had been incorporated. Twenty-five native species were planted in these pots, and tomato seedlings were planted in each of six additional pots. The plants grew in an unheated glasshouse for 10 weeks (April to early June), and then were removed from the soil and their roots examined under a microscope for the presence of root-knot nematode females. Root galling was indexed as follows: 0, no galls; 1, 1 to 24 per cent of the roots galled; 2, 25 to 49 per cent; 3, 50 to 74 per cent; 4, 75 to 99 per cent; 5, all the roots galled.

TABLE 1 — PRESENCE OR ABSENCE OF FEMALES AND THE ROOT-KNOT INDEX ON PLANTS INOCULATED WITH *MELOIDOGYNE JAVANICA*

Plant Species (Nematode Females Present)	Root-knot Index†	Plant Species (Nematode Females Absent)	Root-knot Index†
<i>Acacia notabilis</i>	4.0	<i>Callistemon</i>	
<i>A. saligna</i>	4.5	<i>macropunctatus</i>	0.5
<i>Eremophila decipiens</i>	4.0	<i>Cassia sturtii</i>	3.0
<i>E. denticulata</i>	4.5	<i>Eremophila glabra</i> v. 2 ...	5.0
<i>E. glabra</i>	4.5	<i>E. maculata</i>	5.0
<i>E. glabra</i> v. 1	3.0	<i>Eucalyptus woodwardii</i> ...	0.5
<i>Eucalyptus brockwayi</i>	1.0	<i>Pimelea ferruginea</i>	1.0
<i>Indigofera australis</i>	2.0	<i>Acacia pendula</i>	0.0
<i>Melaleuca armillaris</i>	1.0	<i>A. sowdenii</i>	0.0
<i>Prostanthera striatiflora</i> ..	3.5	<i>Callitris preissii</i>	0.0
<i>Lycopersicon esculentum</i>		<i>Calothamnus quadrifidus</i>	0.0
(Tomato)	5.0‡	<i>Eucalyptus dundasi</i>	0.0
		<i>E. flocktoniae</i>	0.0
		<i>E. nutans</i>	0.0
		<i>Gossypium sturtii</i>	0.0
		<i>Grevillea rosmarinifolia</i>	0.0

† Mean of two plants.

‡ Mean of six plants.

The data on root-knot indexes and the presence or absence of *M. javanica* females are recorded in table 1. Females were found in galls on the roots of 10 species. The genera *Acacia* and *Eremophila*, which are of interest to native plant enthusiasts, both contained species which were good hosts of *M. javanica*. They were extensively galled, and *Meloidogyne* females were readily found within the galls. On some plants galls were present on the roots, but females did not occur. These species probably have some resistance to *M. javanica*, as necrotic tissue within the galls suggested a hypersensitive reaction following the invasion of roots by *Meloidogyne* larvae. Nine of the plants tested showed no sign of infection by *M. javanica*.

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In the field, roots from apparently healthy native plants growing in areas likely to have been infested with root-knot nematodes were also collected and examined under a microscope. Females were identified from their perineal patterns. Absence of females did not reliably indicate that a plant was not a host of *M. javanica*, because the nematode may not have been present in all situations. Therefore, only plants with females of *M. javanica* in the roots were recorded (table 2). Heavy infestations were observed on *Acacia* sp., which were irrigated. *Myoporum parvifolium*, a hardy species often used as a ground cover plant, was also a good host of the nematode.

TABLE 2 — AUSTRALIAN NATIVE PLANTS GROWING IN THE FIELD IN WHICH FEMALES OF *M. JAVANICA* WERE OBSERVED IN THE ROOTS

<i>Acacia baileyana</i>	<i>Eremophila maculata</i> (v. <i>aurea</i>)
<i>A. cultriformis</i>	<i>Hakea laurina</i>
<i>A. longifolia</i>	<i>Melaleuca incana</i>
<i>A. podalyriifolia</i>	<i>Morgania glabra</i>
<i>A. salicina</i>	<i>Myoporum parvifolium</i>
<i>A. sophorae</i>	<i>Prostanthera aspalathoides</i>
<i>Brachysema</i> sp.	

ACKNOWLEDGEMENTS

Technical assistance was provided by Loxton High School students P. Miller and C. Nott as part of a school project. Plants were identified by F. van der Sommen and I. Bond. Their help is gratefully acknowledged. Reprinted from South Australian Department of Agriculture and Fisheries, Agricultural Record, Vol. 3. January, 1976. ■

Successful Cultivation Of Wild Plants In Gardens W. H. Payne

Much of the amazing diverse flora of Australia has tremendous horticultural potential. As recorded in *Australian Plants* over the past 20 years, much has been done to select or develop good forms amenable to cultivation but this is just "the tip of the iceberg". There is a huge range of plants that have been grown but many have not flourished or survived in 'captivity'. Why?

'Plants should be grown in conditions similar to the native environment?'

No doubt this is true within limits but how wide can these limits be stretched? Many plants survive despite their environment because more vigorous plants have taken their preferred situations. There is a theory that as we continue to try to grow a species outside these limits we will eventually develop forms that are more adaptable. This requires persistence and a degree of dedication as we watch some favourites die.

Many plants may be successfully grown in containers and it is only when they are planted in the ground that they are difficult. So what is the problem? Obvious answers include root competition and moisture control. One clue is the paragraph by David Hockings on page 160 —

"Any *Eucalyptus* species, within its natural range of occurrence, is more or less in equilibrium with the animals it feeds. When we grow species a long way from their natural range they are often very susceptible to the local range of pests."

The rest of the article on pests is equally pertinent. Here he is talking mainly of above ground pests but the principle, no doubt, applies to underground conditions. Wildflowers grow well in containers or in newly constructed gardens, even mounds of sand. It is underground health and balance of nature that may be our major problem. The article above on nematodes is relevant, but why restrict ourselves to a few hardy plants?

The old English style gardener with his flourishing exotics is continually replacing his garden soil and caring for it. To take advantage of the robust beauty of our Australian flora in low maintenance conditions, what is necessary to maintain healthy, productive, underground conditions? Every one associated with monoculture throughout the world wishes they knew the answer to this. What we need is scientific guidance on a programme designed specifically for cultivation of our wildflowers in home garden conditions! ■

Phytophthora Control

Notes prepared by W. H. Payne

A major scourge of the Australian forest is a fungal disease known as *Phytophthora cinnamomi*. It has spread through most of Australia's forests to the degree that most are threatened, even to extinction. For the horticulturalists, especially the grower of the Australian flora, this fungal disease would appear the major problem, even greater than nematode infection.

The way this fungus regenerates and attacks plants is described more fully on page 270 of Volume 10, Australian Plants. The spore may be readily spread by transport of soil or plants, even by a little soil on boots or clothing. It "swims" more readily through moist soil but the microscopic threads travel more slowly through all soils. It multiplies and spreads prolifically in wet conditions so that the danger is often not realised until after a wet spell when plants with very few effective roots left, collapse and die.

The spores penetrate near the root tip with fine threads that grow throughout the root tissue causing decay.

At last there is hope. The Swiss chemical company, CIBA-GEIGY, has introduced two new fungicides that have proved effective in many instances and early trials indicate that it is indeed the "saviour" of the Australian Flora. The fungicides carry the trade name of Ridomil and Fongarid. Ridomil has been released for agricultural use and Fongarid for horticultural use. Both are in the Acylalanines group of chemicals and are effective only on the Oomycetes group of fungi. Fortunately this group includes the dreaded *Phytophthora* and *Pythium*. Hence as well as controlling *Phytophthora*, the chemical is effective on root rots, damping-off and foliage Downy Mildew diseases.

Fongarid is very rapidly taken up by growing plant roots where it quickly kills any disease infection and prevents the production of fungal spores which are the means by which these diseases multiply and spread.

Fongarid is very versatile in the way it can be applied. It may be:

- (a) dry mixed with soil or potting mixtures prior to planting.
- (b) mixed with water and drenched or watered in to soil or potting mixtures prior to or after planting.
- (c) sprayed on to soil surfaces and either mechanically mixed into the soil or watered in.

Fongarid will be available in 500 gram pack for about \$30.00, and in 2 gram sachets, 5 to a box for about \$3.50 a box. One sachet will be adequate for watering around two plants, so the chemical companies, as usual, get their pound of flesh.

As is usual with chemicals, care should be taken not to use them continuously to reduce the risk of developing a resistant strain of pathogen. Use when you consider a plant is at risk or as a preventative in the spring months of September-October and again 6-10 weeks afterwards.

The brochure and pack label warns that Fongarid has caused injury to some species of *Banksia* and *Grevillea*. This has been in the form of minor leaf burning and could be tolerated at least for trial periods.

"Research into the biology and cultivation of the Australian Flora"? Here is a research project amateurs throughout Australia can engage in. Try this product and report results. The results may be an important factor in guiding the resources of The Australian Flora Foundation into more scientific experiments.

Blandfordia punicea is a Tasmanian endemic and occurs from sea level to 4000' and varies in size inversely to the altitude. It may be of interest to your readers to know that this plant grows successfully at Kew Gardens in England. The first successfully raised was a plant collected at 3000' on Mount Read by Lord Talbot de Malahide in 1968. It was grown in a pot using a compost of equal parts of sand, peat and lime-free soil. During the summer it was stood out-of-doors but in winter was given the protection of unheated glass. This plant flowered for the first time in early May (late spring in the Northern Hemisphere) two years later when it had reached a height of 0.6 m. Flower spikes have continued to increase in number in subsequent years and the plant became too big for the pot. As some action was necessary and more of this attractive plant was required it was decided to divide it. It did not respond to this treatment for the divisions sulked and most of them eventually died.

In 1974 seed which had been collected on Bruny Island was sown and it germinated well. Two years later one of the seedlings was planted in a warm sunny border out-of-doors. The Kew soil is a sandy river silt which is acid. The young plant grew away slowly and flowered for the first time 3 years later. Flowering has continued in successive years but has been a month later than the other plant. Unlike the other plant which reaches 0.6 m in most years this second one rarely exceeds 20 cm even when in flower. It has suffered no winter damage outside even in the much colder winter of 1978-79.

Phaleria octandra

Notes from David Hanger, Cloverdale Nursery, Queensland

My first association with *Phaleria octandra* (L.) Baill. of the family Thymelaceae was when I collected a heap of droppings (cassowary)? from the rainforest floor somewhere in North Queensland about seven years ago. I planted the droppings and several seedlings of various types started to grow, among which were 2-3 plants of *Phaleria octandra*.

Five of these plants are growing in my garden and all are thriving. At six years old none are more than 60 cm. tall. Flowering first occurred about 2-3 years after germination, small white perfumed flowers in a cluster followed by deep red berries 10-20 mm diameter. Following a reasonably wet summer for Brisbane (1980-81) all plants flowered and fruited. In the previous two years when summer rainfall was very poor, the plants survived very dry conditions without obvious water stress although none flowered.

In cultivation, from my experience, this plant exhibits a phenomenon common to many dryland plants, which flower and fruit more in response to rainfall than temperature or photoperiod. Seed germinates well. Early growth is slow. I have not seen the plant in its natural habitat, but it is found in the pastoral districts of Cook, North Kennedy and South Kennedy in Queensland. It is a sub-shrub 1-2m tall. I would think it is worthwhile trying as a flowering and fruiting indoor plant. In my garden, it is growing in filtered shade under *Eucalyptus*, *Commersonia* and *Acacia* spp. in a very well drained sandy soil with a mulch of dead leaves and a pH of 5-6.

Flora Of Central Australia — Ed. J. Jessop

\$35.00 post free from Editor

I have now studied this book and can highly recommend it to all. It is the result of a co-operative effort by The Systematic Botany Society, a group of dedicated scientists used to producing their work to conform with strict international standards, and it is usually highly technical and wordy. Hence my cautious review in our previous issue. But! This is a book for all. An essential reference for every botanist and student of the flora. An essential reference also to anyone interested in Australia's wildflowers. The text is shortened to describe in clear terms, the critical features of each plant. Many line drawings illustrate the text. For instance, for the 56 species of *Eucalyptus* of Central Australia, each has a description that includes the trunk, the bark, etc., and a sketch of buds and fruits; the species of *Hakea* have sketches of leaves and fruit, etc. Order now, post free from the Editor, Australian Plants.

Drosera

Their Biology and Cultivation

By KINGSLEY W. DIXON, University of Western Australia

The predatory palate of sundews has aroused interest since the time of the first ethnobotanists. Gerard's Herbal of 1597 listed a host of bodily remedies attributable to the mucilage secreted by *Drosera* tentacles. Countless authors since then have pondered the mechanisms, benefits and extent of plant carnivory. Amongst the plant world no other group has been subjected to media distortion to such an extent as the carnivores. Magazine articles in the late nineteenth century often cited lurid observations of exotic man-eating plants. Unfortunately only sensationalized line drawings exist as evidence of young maidens falling foul of these demoniac plants. Needless to say, an excursion into the bush will not be fraught with fears of being accosted by marauding sundews! Quite the contrary—many of them exhibit showy blooms atop tall slender stems with leaves displaying a myriad of mucilage drops—lethal to most insects, but otherwise completely harmless.

Western Australia contains a superabundance of carnivorous plants. Over half of the known 90 species of *Drosera* occur in Western Australia, and a much larger proportion of the tuberous species are endemic to this region. A typical example is *D. erythrorhiza*, a conspicuous rosette species of the winter flora of the coastal sandplains of South Western Australia. It is a member of the subgenus *Ergaleium* and senesces each summer back to a subterranean tuber. Each season a new tuber is produced directly into the cavity of the old expended tuber, the successive years of "skin" or epidermis of the parent tubers building up layers of protective sheathing around the tuber (Fig. 1A). By counting these sheaths around the tuber it is possible to obtain a minimum estimate of the age of the plant in years. Tubers can be sheathed by up to 50 epidermal layers in plants from certain habitats; up to 20 layers is more usual. The protective sheaths enable the tuber to resist a temperature of 60°C for up to four hours and no doubt enhance its capacity to avoid desiccation in the long hot summer. *D. erythrorhiza* will flower only after a summer fire, releasing the small, ornamented seeds (Fig. 1B) in late autumn.

Germination, though a rare event, occurs in nature only in seeds older than three years. Experiments using a variety of conditions failed to produce any germination of one and two-year old seeds. Seeds of greater age have not been subjected to experimental testing. A single plant of *D. erythrorhiza* can produce up to 13 daughter tubers each season, each tuber forming terminally on a swollen lateral rhizome developing horizontally from the parent stem (Fig. 1A). These daughter tubers sprout to produce small plants the following winter and produce full-sized leaf rosettes after three or four seasons of growth. If lateral rhizomes are removed from the parent plant before forming their tubers and stored in pots of moist sand, they will then develop small tubers, indicating that the process can occur without further nutrients or stimuli from the parent. *D. erythrorhiza* exhibits a circular conformation of its colonies, each group of plants up to 2 m in diameter and containing up to 200 individual plants. Clones may merge to produce a continuous lawn of glistening rosettes, which at the height of winter comprise a veritable graveyard of digested insect corpses.

Preliminary studies indicate that *D. erythrorhiza* can obtain a significant portion of its annual requirement for nutrients (particularly nitrogen for protein manufacture) from trapped, digested insects. Other nutrients (e.g. phosphorus, magnesium, potassium) gleaned from insects and soil, and starch formed in photosynthesis of the leaf rosette, are conserved in tubers from season to season, and certain nutrients (e.g. phosphorus and nitrogen) are mobilised from vegetative parts to developing tubers at the end of the

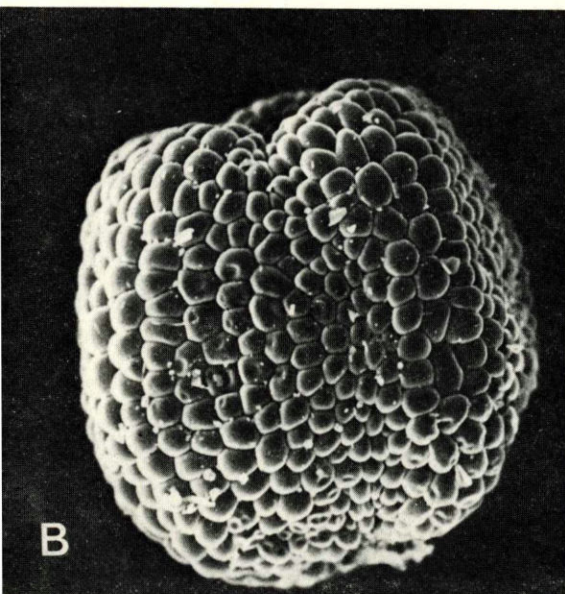
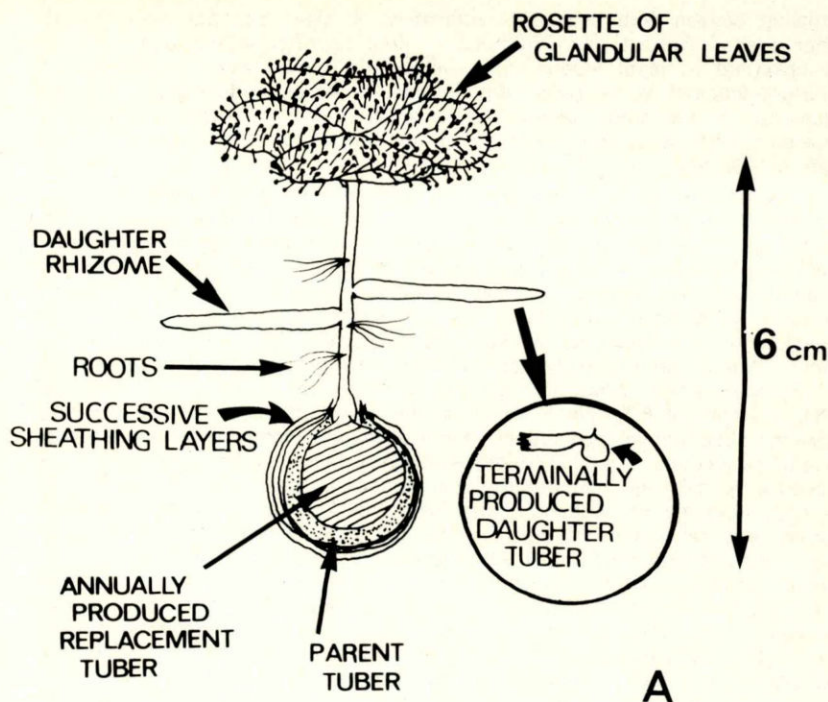


FIG. 1.—Features of the S.W. Australian tuberous sundew, *D. erythrorhiza*.
 (A) Representation of whole plant at maximum growth during spring.
 (B) Scanning electron micrograph of ornamented seed (x160).
 (C) Scanning electron micrograph of leaf surface showing tentacles and small sessile glands (x50).

growing season with over 80% efficiency. A plant can therefore survive a poor season without any additional nutrient imports. In pot culture no loss is observed in plant vigour when tubers are grown with distilled water in nutrient-deficient white sand. Vigour was, however, reduced in consequent seasons. In the wild, tubers are replenished with phosphorus and other nutrients after a season's growth in soil enriched with nutrients from the ash of the fire.

Under extreme nutrient, water and temperature stress a plant can respond by mobilising the reserves of its parent tuber into daughter tubers, locating these up to 15 cm from the parent tuber. This strategy allows the clone of plants to exploit new soil profiles for nutrients in ensuing seasons of growth. Repeated severe drought can result in complete death of clones, as occurred recently in Western Australia in the dry seasons of 1976 and 1977. Plants developing from daughter tubers often relocate their subsequent replacement tuber at progressively greater depths by production of a vertical stem or dropper which grows through the base of the parent tuber. Eventually, after a depth of 8-11 cm is reached, the plant replaces its tuber *in situ* to give the sheath-enveloped tubers typical of mature plants, as mentioned above. Seedlings engage a similar depth-seeking system of tuber replacement, and because of the high temperature and dryness of the upper soil layers there is high mortality of seedling plants over the first few summers, when their tubers are still relatively high in the soil profile. Although the studies to date have concentrated on *D. erythrorhiza*, many other members of the subgenus *Ergaleium* show corresponding strategies, although habitat differences are vast. For example *D. bulbosa* and *D. gigantea* will often grow completely submerged in water in swampy depressions, whilst *D. stolonifera* and *D. macrantha* are typical of very dry habitats. Many of the tuberous *Droseras* can be grown from seed or daughter propagules and some produce showy flowers in pot culture (e.g. *D. bulbosa*, *D. macrophylla*, *D. stolonifera*). *Drosera zonaria* grows well in pot culture, but like *Drosera erythrorhiza* requires fire before flowering. Our experience with the Western Australian sand plain *Droseras* is that their tubers should be stored dry in pots of sand throughout summer. Gradual addition of water to pots in early autumn will promote early rosette growth and, in certain species, flower production.

Although flowering of *D. erythrorhiza* in nature requires burning of the habitat, removal of tubers from soil and storage in closed paper bags for a week or so, followed by replanting, can result in up to 20% of the tubers producing inflorescences. Burning litter on the soil surface of plot-grown plants will, if sufficiently hot, induce flowering. However, the addition of cold ash to non-stimulated tubers has no effect. Studies are yet to confirm the nature of the stimulus caused by fire. Ethylene concentrations in soil during and after fires may well be a key factor in initiating floral primordia (Smith, 1977).

***Drosera sulphurea* (opposite, top right)**

One of the many species of climbing or leaning *Drosera*, *D. sulphurea* is found in the south-west of Western Australia. They climb on vegetation by using the longest of the three peltate leaves produced at each node. The leaf adheres to the supporting vegetation with the aid of sticky mucilage produced from the glandular tentacles. Flowers are produced from the stem apex and in this species are similar to those of *D. menziesii* below but having an almost luminescent yellow colouring of the petals (viz. sulphur yellow — hence the name).

***Drosera platypoda* (opposite, top left)**

This plant grows to 30 cm favouring moist to wet soils, frequently on the margins of peat swamps. The flowers on the tip of the stems usually follow a summer fire. The species is noted for its exuberance of tacky mucilage, produced from the stalked glands.

***Drosera menziesii* (opposite, bottom)**

The flower is typical of the southwestern *Drosera*. The five petals framing the five yellow stamens and the numerous hair-like styles slightly shorter than the stamens, are clearly shown. In the case of *D. menziesii* the flower is 1.5-2.5 cm across, often clustered in a 1-6 flowered inflorescence. The plant is short, erect to 15 cm tall, and is found naturally in populations of many hundreds of plants on swampy or seasonally inundated land.

Drosera sulphurea



Drosera platypoda



Drosera menziesii

Fig 2

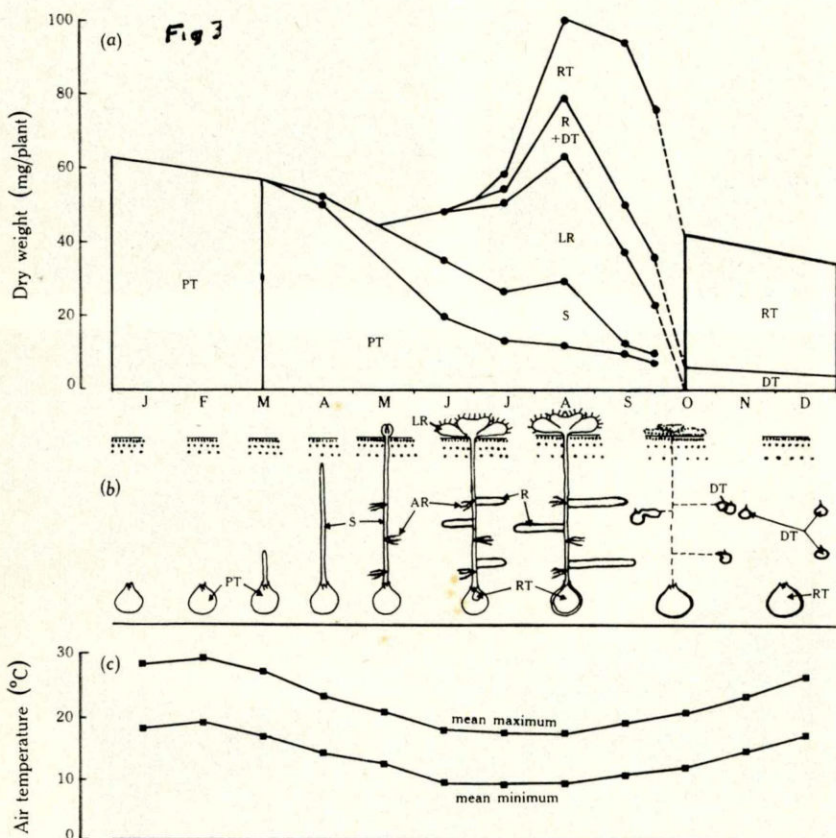
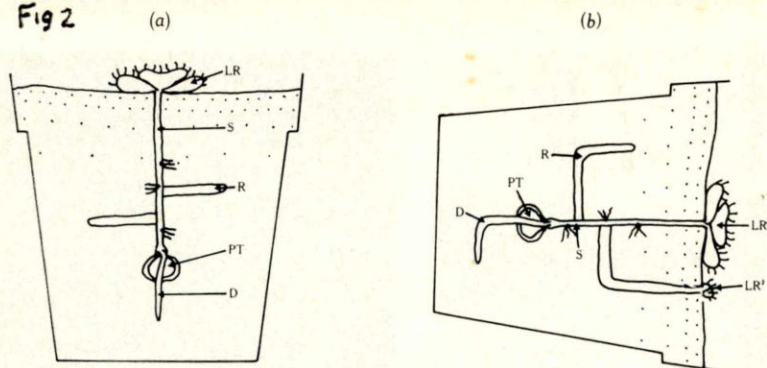


Fig. 2 Effects of gravity on rhizome and dropper growth in potted plants of *Drosera erythrorhiza*. (a) Untreated plants with two rhizomes (R) and a dropper (D); LR, leaf rosette; PT, parent tuber; S, main shoot. (b) Response of same plant 3 weeks after placing pot on its side. Note diageotropic growth of rhizomes, positive geotropism of dropper. One rhizome has formed a leaf rosette (LR) on reaching the soil surface.

Fig. 3 Phenology, growth cycle from a clone of *D. erythrorhiza* during 1975 in native habitat at Shenton Park, Perth. (a) Dry weight changes in plant parts. (b) Morphological changes during the season. (c) Mean monthly air temperatures. AR, adventitious roots; DT, daughter tuber; LR, leaf rosette; PT, parent tuber; R, lateral rhizomes; RT, replacement tuber; S, main shoot.

Carnivorous Plants

— A Guide By W. H. Payne

Plants that feed on victims of animal origin! They are small plants and the animals devoured are insects, but they are fascinating. What is more they can be grown in the home.

How can you learn about these plants?

Carnivorous Plants is a new book by Adrian Slack, available from The Editor, *Australian Plants* for \$19.95, post free. These notes are not to promote this book, but rather to persuade as many readers as possible to cultivate these plants. This book is an ideal guide. It describes how these fascinating small plants can be grown in pots on a window sill, cultivation under artificial light, in a terrarium, in a greenhouse, a coolhouse, a coldhouse, a warm house, a store house or out of doors.

This is an ideal opportunity for the beginner with very little space for a garden, to enter this fascinating world of small unique plants. Not only are the plants intriguing but many are stunningly beautiful. Can I stir up a dozen individuals throughout Australia prepared to give it a go and help each other?

How do you go about it?

Carnivorous Plants describes the insectivorous plants throughout the world with suitable prominence to the many that occur in Australia — the Western Australian Pitcher Plant, *Cephalotus* and the beautiful Rainbow Plant, *Byblis*, the Tropical Pitcher Plant, *Nepenthes* of Queensland, to the many fascinating Sundews, *Drosera*, the Bladderworts, *Utricularia* and the dainty Pink Petticoats, *Polypompholyx*. It does this so graphically with sketches of the mechanisms of the plants and beautiful colour plates, that the book will also be a wonderland for the young.

I would recommend:

1. That readers buy this book even if you are not silly enough to take up my challenge to grow these plants.
2. Purchase Volume 4 of *Australian Plants* and read the articles on these plants and their cultivation.
3. Send to the editor for the book "Plants Of Prey" by Rica Erickson, a book that describes all Australian species. (Price \$11.00 post free).
4. Readers advise the Editor.
 - (a) If they would like to join a group to develop a terrarium. This is the cultivation of small fascinating plants such as these carnivorous plants, orchids, etc., in glass containers such as an old fish tank.
 - (b) If they would like to join a group to study the cultivation of carnivorous plants.
 - (c) and Help!! anyone who can supply plants, or has experience in their cultivation or knows how to care for a terrarium, please contact the Editor.

The Propagation Of *Drosera binata*

By A. D. CHAPMAN

[from notes taken from *Trans. Bot. Soc. Edinburgh* 8: 542-544 (1866)]

Drosera binata is an upright plant to 40 cm high with stalked leaves, once or twice divided into long linear lobes, which are covered in sticky hairs used to hold and digest insects. It is native to the swamps of coastal New South Wales, Victoria, South Australia, Tasmania and Queensland, and is also found in New Zealand.

It was introduced into cultivation virtually by accident when it came up among some soil imported from Australia to the Royal Botanic Gardens at Kew in England in 1823. Since then it has become widely cultivated throughout the world, but is rarely seen in Australian gardens. The most common method of propagation is by subdivision of the crown of the root in early spring before the new leaves unfold. However, this is a fairly slow method of propagation, as the plants need to be of considerable size before one has enough plant for subdivision.

Continued on page 182

SIEGFRIEDIA

by G. J. Keighery — Kings Park and
Botanic Garden, Perth, W.A.

Siegfriedia C. A. Gardn., a genus of one species, *Siegfriedia darwinioides* is perhaps the most unusual member of the plant family Rhamnaceae. Instead of possessing small white or cream flowers as is usual for the family, *Siegfriedia* has pendulous golden bell-like inflorescences, not unlike a bracteated *Darwinia*, hence the specific name.



Siegfriedia darwinioides C A Gardn.

An erect multistemmed shrub, 50 cm-1 m in height. Branches glabrous. Branchlets, new leaves and under surface of mature leaves invested with a rufous close stellate tomentum. Leaves opposite, oblong, obtuse, 2-3.5 cm long, 7-9 mm broad, pedicillate, coriaceous with revolute margins. Inflorescence a cyme condensed into a pseudo-head of 6-10 flowers, terminating at short branchlets. Flowers covered by bracts, heads nodding. Bracts yellow, imbricate, 10-12, 1.8 cm long, 1.7 cm wide, orbicular, obtuse. Flowers yellow hermaphrodite, calyx tube fused to ovary, limb divided into 5 lobes. Calyx tube glabrous, whole 4-5 mm long, lobes 2-3 mm long. Petals absent. Stamens yellow, exserted, 6-8 mm long. Style as long as stamens. Ovary inferior, 3 celled. Ovules solitary in each cell. Fruit a capsule.

Ecology and distribution:

Siegfriedia occurs naturally between the Stirling Ranges and Esperance, never more than 50-70 km from the coast of Southern Western Australia. The species has only been recorded from sandy or loamy lateritic soils. Flowering occurs between May and November, according to herbarium specimens, but only between August and November in cultivation.

Cultivation:

Siegfriedia darwinioides grows readily from seed, planted in autumn. Flowering first occurs in the following spring, 18 months later. *Siegfriedia* has an attractive growth habit, especially during autumn to spring when the new growth is covered by a rusty tomentum.

Plants like full sun, and a well drained loamy soil. No information about the length of life is yet available.

The species is pollinated by birds, and should make an attractive addition to any native garden. ■



Franklandia triaristata (Photography above by G. Keighery) by Ken Newby

This species has much more handsome flowers than *F. lucifolia* (see Australian Plants 9, P321), chiefly in their larger size and extremely strong vanilla/chocolate scent.

In the wild this species has an extremely restricted distribution being found only in the Busselton-Boyanup-Capel region of Western Australia in grey sandy soils or swamps.

The flowers open in late morning, reaching peak scent production during the early evening. They are visited and pollinated by both day and night flying moths. Flowers will remain open for up to a wee kin water.

It is possible to grow the plants from cuttings or seed, however no mature plants have been raised by either method at Kings Park. In the wild seedlings are rarely found, most populations contain only large mature plants which possess very large lignotubers making transplantation difficult to impossible. ■

Planchonia

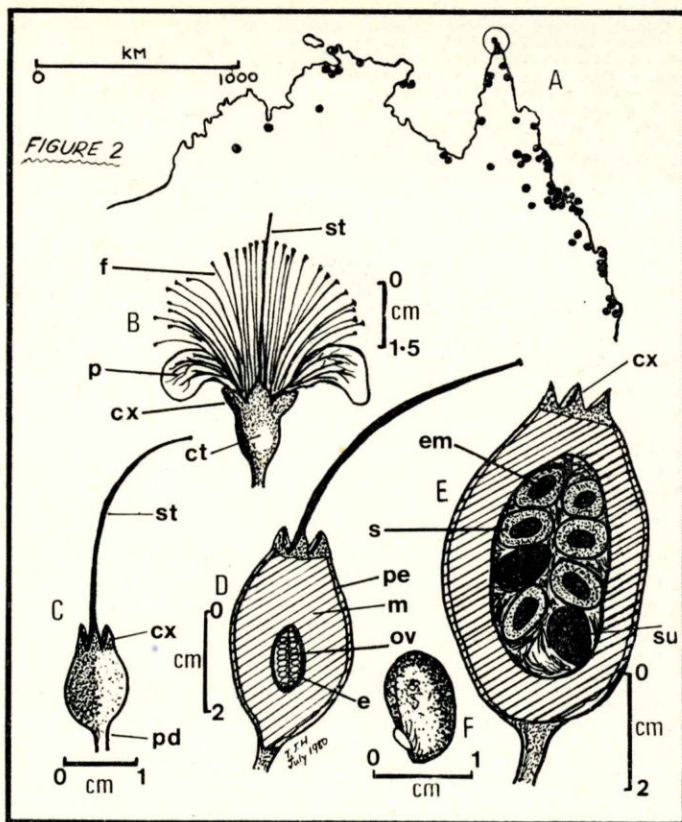
The genus *Planchonia* Blume in Australia,
by T. J. Hawkeswood, Dept. of Botany,
James Cook University, Townsville.

The family Lecythidaceae contains about 450-500 species in 25 genera and has a pantropical distribution. The most noteworthy member of this family is the Brazil Nut (*Bertholletia excelsa* Humb. et Bonpl.) which is a beautiful, elegant, fast-growing tree with a shady crown and is widespread in South America, the headquarters of the family. Only 2 genera and about 5 species occur in Australia. *Planchonia*, a genus of 5 species, has one representative in Australia, *P. careya* (F. Muell.) Knuth.

Members of the Lecythidaceae are shrubs to medium-sized (or rarely large) trees, with simple, alternate or spirally arranged leaves which are usually entire or sometimes toothed. These leaves do not possess oil glands as occurs in a closely related family, the Myrtaceae. In addition, the leaves do not usually possess stipules, but if present, they are tiny and fall off at an early stage (i.e. they are caducous). The inflorescence is usually a terminal or stout (or slender) lateral spike, but in *Planchonia*, the flowers may be in a raceme or simply solitary.

The zygomorphic or actinomorphic flowers are showy, medium-sized to very large, red, pink, white or yellow, and often have a "fluffy" appearance due to the presence of numerous stamens. The calyx-tube is 4-6 lobed, while the petals number 4-6 and are usually joined at the base to the very numerous stamens. The stamens are usually joined at the base and to the petals around a ring-like disc. The ovary is usually more or less inferior, with 2 or more chambers (locules) each with 1 to many axile ovules. The style is mostly simple, long, and the stigma is capitate (enlarged and globose at the tip) or lobed. The fruits are medium-sized to large, fleshy outwards and woody or fibrous inwards, indehiscent and crowned by the persistent calyx-lobes.

Members of the genus *Planchonia* are usually trees and rarely shrubs. They usually have simple, spirally-arranged, glabrous leaves with pinnate and densely reticulate venation and are crowded at the end of the branchlets. The leaves of the various species are usually somewhat coriaceous, entire or denticulate (or crenulate) and are without oil glands. The caducous petiole possesses narrow membranous wings. The large flowers are arranged in terminal racemes, spikes or may be solitary in the upper axils. Each flower has 2 deciduous bracts and 1 bracteole at the base of the pedicel. There are 4 green sepals which are connate (fused) at the base into a turbinate or campanulate calyx-tube with a somewhat gibbose margin in between the lobes. The petals and sepals in bud are imbricate. There are 4 free, veined petals which are attached at the base to the staminal tube. There are also numerous stamens in whorls, the inner one of which has sterile anthers, and the basal part of the stamens are fused into a tube. The staminal filaments are filiform and longer than the petals. The anthers are small, mostly 0.8-1 mm long, 2-celled, basifixed, ovate-oblong to oblong in shape, longitudinally dehiscent; the base and apex are emarginate (notched). An intra-staminal, epigynous disc, consisting of a vertex of the ovary and the rim is present. The inferior, 3-4 locular ovary is turbinate and fused (adnate) to the calyx-tube. The ovules are numerous, horizontally placed, have central placentation and are biseriate in arrangement. Each ovule has a long, suspended funicle. The style is slender, longer than the stamens, while the stigma is small, capitate and lobed. The staminal tube and corolla are caducous as a whole. The fruit is fibrous but without pulp (although it may be only slightly pulpy in *P. careya*) and is indehiscent, obovoid to ovoid to ellipsoid or globular in shape and initially 1-4 locular. A distinctive feature is the persistent calyx-lobes which crown the fruit, and the fibrous pericarp and somewhat coriaceous endocarp. There are one too many ovoid, smooth, angular seeds without endosperm, in each locule. The seeds are embedded in the thick mesocarp. The embryo possesses a radicle which is very long and clavate in shape and is spirally convolute around the cotyledons or curved as in *P. careya* (E. K.



- A — Distribution map showing most of the localities recorded (one dot = one locality record).
- B — The flower showing petals (p), calyx lobes (cx), calyx tube (ct), staminal filaments (f) and style (st).
- C — Young fruit, 2-4 days after anthesis showing pedicel (pd), calyx lobes (cx) and persistent style (st).
- D — Immature fruit, 5-8 days after anthesis showing pericarp (pe), mesocarp (m), endocarp (e) and developing ovules (ov) in the ovary.
- E — Enlarged fruit almost mature, 2-4 weeks old showing seeds (s) embedded in the centre of the fruit. The black areas in the cut seeds are the developing embryo (em). Two uncut seeds (su) are shown.
- F — The seed of *Planchonia careya* — Drawings by Trevor Hawkeswood

Kuswata, 1965, "The genus *Planchonia* Blume (Lecythidaceae)" Bull. Bot. Surv. India. 7:162-187). The cotyledons are small, foliaceous and folded longitudinally, but in *P. careya*, they are straight and attached to the radicle.

The genus is found in Malaysia, the Philippines, Papua-New Guinea, Indonesia, Sumatra, the Solomon Islands and northern Australia, *P. careya* being locally common from the Kimberley area of Western Australia to Rockhampton and Bundaberg in central-eastern Queensland. *Planchonia*, (pronounced plancho-nee-are) was named after the noted French botanist J. E. Planchon (1823-1888) by Blume in 1851. The name *careya* (pronounced carry-uh) was named after the Indian linguist Dr. Carey. Another genus in this family, *Careya*, also commemorates him.

A description of the only species found in Australia follows:

A deciduous, often straggly tree from 3-15 m high with suberose, scaly, deeply fissured, grey to brown bark up to 1 cm thick. Branchlets more or less terete, striate, grey to grey-brown, (2-) 3-6 (-8) mm thick, covered in lenticels; leaf-scars also prominent.

Leaves somewhat coriaceous, slightly paler on the adaxial surface, somewhat glossy on the abaxial surface, slightly areolate, obovate to broadly oval to ovate-elliptical (smallest leaves spatulate), (2.5-) 4.5-7.5 (-10) cm long, (1.5-) 3-6 (-8) cm wide, emarginate to bluntly acuminate; leaf margin usually finely crenulate or sometimes entire; base slightly decurrent; midrib strongly prominent on the abaxial (lower) surface; flat above (adaxial); petiole 1-1.8 cm long. Flowers few in terminal racemes; rachis 0.5-7 mm long, pulverulent to puberulous. Pedicels puberulous, (2-) 8-10 (-15) mm long, c. 2 mm thick. Bracts sometimes absent and pedicels subtended by small leaves. Bract-eoles cordate-ovate, 4-6 mm long, ciliate-denticulate, especially at the apex. Calyx-tube and lobes puberulous outside, glabrous within; calyx-tube smooth, green, 9-12 mm long, campanulate, attenuate at the base; calyx-lobes 4, coriaceous, ovate to orbicular, distinctly or obscurely ciliate to fimbriate, unequal, (the largest 5-6 (-7) mm long, 5-6 (-7) mm wide; the smallest 3-4 (-5) mm long, 3-4 (-5) mm wide. Petals cream to white, pink at the base, pale green on the back and streaked with green veins, thin, papery, obovate-oblong, not ciliate, (20-) 23-28 (-32) mm long, 15-18 mm wide, with an obtuse apex and tapering base. Stamens 3-5 cm long; staminal tube pink to scarlet, 3-7 mm long; upper part of the free filaments white or cream, lower portion pink to scarlet; anthers 0.8-1.2 mm long, 0.5-0.8 mm wide. Style 4-6 (-8) cm long, slender, pale green, glabrous. Ovary 4-celled with 10-12 ovules in each cell. Rim of the disc c. 1 mm high. Fruit obovoid to usually ellipsoid, smooth, not angled, green (when immature), brown (in herbarium specimens and when mature), 5-8 cm long, 2.5-3.5 cm wide with a thick, fibrous pericarp, crowned by the persistent calyx-lobes. Seeds 2-10 per fruit, 4-5 mm long, testa (seed coat) brown to silvery-brown, 0.2-0.3 mm thick. Wood light grey outside, red in the centre, tough with close grain; easily worked as a timber but liable to crack, unless carefully seasoned (J. H. Maiden, 1889, "Useful Native Plants of Australia", p. 161).

Distribution

This species has an extensive distribution in Northern Australia. G. Benth (1867, "Flora Australiensis", Vol. 3, p.289) recorded this species (under *Careya arborea* Roxb.) as being found at Brunswick Bay (collected by Allan Cunningham), Victoria River and islands in the Gulf of Carpentaria (all in the Northern Territory). In Queensland, Benth recorded it as being found at Cape Grafton (specimen collected by Banks and Solander), Rockhampton and the Burdekin River. Kuswata (1965) records specimens collected from Nightcliff (Darwin), Oenpelli (N.T.); Cape York, Mackay, Pinalba, Rockhampton, Port Curtis and Bingera (Queensland). White (1920, "A revised account of the Queensland Lecythidaceae", Proc. Linn. Soc. N.S.W. 44: 822-825) stated that *P. careya* (under *Careya australis*) is "very common in Queensland and generally known colloquially as 'Cockatoo Apple'. It is (recorded) as far south as Fraser Island (Coll. W. R. Petrie, who states he has also seen it growing on the mainland opposite Torquay); from thence it extends practically all around the Queensland coast to the Gulf of Carpentaria". *P. careya* is also recorded from Papua-New Guinea. Harmer (1976, "Northern Australian Plants", p.16) records that this species is also known as Billy-goat Plum in the Northern Territory. The author is unsure of the origin of the vernacular names of *P. careya*.

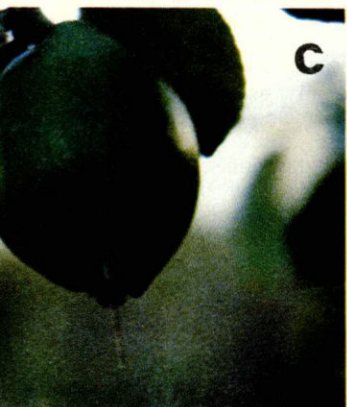
The seeds of *P. careya* have been reported to be eaten by the aborigines of Northern Australia (Tennison-Woods, 1882, "Botanical notes on Queensland." Proc. Linn. Soc. N.S.W. 7: 76-83) where "they roast and eat the fruit as well". The bark also has been used by the aborigines for poisoning fish and for making twine. The leaves, when mashed into a pulp, are considered to be a sure and safe cure for ulcers (Kuswata, 1965). Harmer (1976) also states that the wood was used as a fire-making tool.

Webb (1949, C.S.I.R.O. Bulletin 241:27) reported (under the name *Careya australis*) that the leaves of this species do not contain any alkaloids. However, the bark and leaves have since been shown to contain the chemicals known as triptenes (Simes et al., 1959, C.S.I.R.O. Bulletin 281: 10, 15). This plant is suspected of causing death in cattle characterised by posterior paralysis and leading to death in several days (Kuswata, 1965).

P. careya is often a dominant species in savannah woodlands, on the edges of monsoon forests in sandy or lateritic soils throughout northern Australia. In the Townsville area, it is often a co-dominant species with *Eucalyptus alba* of the prevalent savannah woodlands in this area.

Of much scientific interest, *P. careya* is an attractive but small, deciduous tree to about 7.5 m high, with dark grey to grey-brown, coarse, fissured, hard bark with transverse furrows.

Kuswata (1965) in his excellent review on the genus did not, however, mention the phenology of the species. In northern Queensland, individual plants have been observed to flower during very late September (mainly in the first week of October) to early and late November. A small number of flowers (often less than 20) bloom on any plant at any one time. Occasionally, flowers open in the late afternoon after sunset, but usually they are open by the early evening and remain open to the early morning. By about 0800



a. The coarse deeply fissured, hard grey bark of *Planchonia careya*.

b. Flowers and leaves showing leaf shape.

c. & d. The obvoid to globose fruit with persistent styles.

hours or so, most flowers have fallen to the ground leaving behind the calyx-tube and the long slender style. The flowers do not possess any marked scent detectable to the human senses. The method of pollination in *Planchonia* is not known at present, but in *P. careya*, self-pollination may be operating. Members of the related genus *Barringtonia* appear to be pollinated by nocturnal insects such as moths. Observations during the night, but the author, during nights in early November, 1980 indicated, that although small, brown weevils were often common amongst the stamens, no moths or other large insects were attracted to the flowers. The small weevils (0.5 cm long) probably feed on the soft tissues of the staminal filaments and do not come in contact with the stigma so that pollination could occur.

A most distinctive feature of *P. careya*, which was first noted by Tonnison-Woods (1882), is the colour of the leaves, which "are very often a brilliant crimson with every intermediate shade of yellow, orange, and red, a few of the older leaves being a pale grey-green." The species is easily recognised during the non-flowering months by the orange-red or red leaves intermingled with the grey-green older leaves. During the flowering months, all trees are totally green and new leaves appear immediately before and during the early stages of flowering.

Nothing has been recorded on the cultivation of *P. careya* in Australian gardens. Harmer (1976) states that it can be easily germinated from seed but is a very slow grower. Being a tropical tree it is probably not suited to southern gardens. Experiments are being undertaken by the author in order to investigate seed germination and the results will be provided in another article.

ACKNOWLEDGEMENT: The author would like to thank the Director of the Queensland Herbarium, Dr. R. W. Johnson, for permission to examine specimens lodged in the Queensland Herbarium. ■

The Propagation Of *Drosera binata*

Continued from page 175

Work at the Royal Botanic Gardens in Edinburgh in the 1860's led to an attempt to propagate this species by root cuttings, and this proved quite successful. The roots used for propagation are generally taken from the strong-growing plants during the process of crown subdivision. They are black and of wiry consistency, and are cut into numerous pieces from one to two centimetres or more in length. These short pieces are laid on the surface of shallow earthenware pots or pans, on a mixture of sandy peat soil, and are then covered with about 1 cm of the same mix. "They are enclosed under a bell-glass" and placed in a damp warm place.

After about a fortnight, swellings begin to appear on the surfaces of the detached roots, which increase until they reach the surface of the soil mix. This generally takes about five weeks. The binate leaves soon cover the surface of the pot like a crop of seedlings. When the plants reach a height of about 5 cm they are pricked out into small pots of a similar mix to which has been added chopped sphagnum moss.

The author of the article goes on to say that "this Sundew may be grown to a large size and will flower abundantly, either under basket culture in sphagnum moss, or in pots covered with sphagnum and placed in a damp but sunny position, or in shallow pans of water". Plants cultivated in the open air apparently become black with dust and insects collected by the viscid secretion given out by the leaf glands.

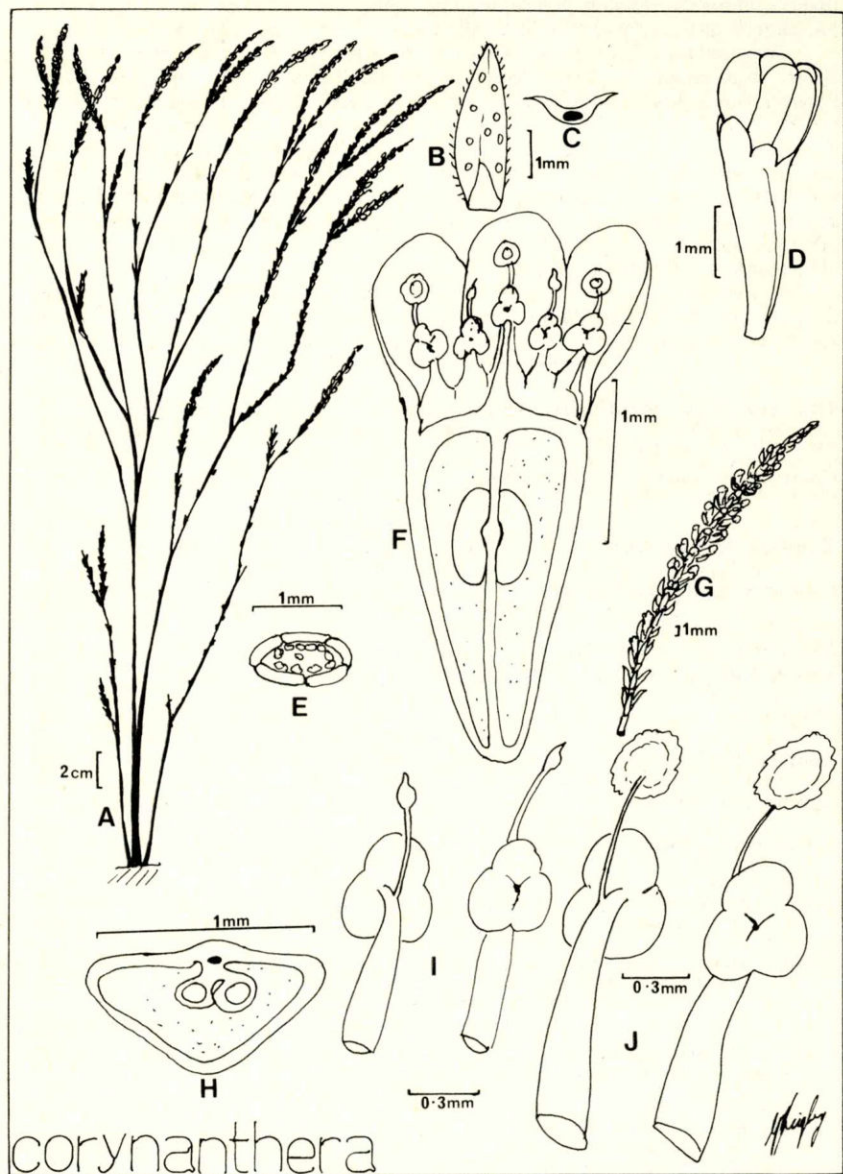
Interested readers may like to try this method and report results. ■

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Corynanthera A new genus in Myrtaceae from W.A., by G. J. Keighery, Kings Park and Botanic Garden, W.A.



Key to the Plate:- *Corynanthera flava*

A-J : Scales as indicated

A : habit

B-C : leaf, lower view and T.S.

D : lateral view of flower

E : top view of flower

F : lateral section of flower

G : inflorescence

H : t.s. of floral tube, ovary with 2 ovules

I : anther between petal

J : anther opposite petal

Corynanthera (the name refers to the large club-like appendages of the anthers) is a monotypic genus, closely allied to *Micromyrtus* and *Thryptomene*, recently described by J. W. Green (Nuytsia 2: 368-374, 1979). It differs from these genera in having trisporangiate, unilocular anthers with club-like appendages, and in the spike-like inflorescence of closely appressed flowers.

Corynanthera flava J. W. Green is an erect slender shrub to 1.75 m. The leaves are small, to 4 mm long, narrow-elliptic with prominent oil glands. Flowers are solitary, sessile, ca 3 mm long, zygomorphic, crowded in the axils of the upper leaves forming a terminal or sub terminal spike-like raceme. The floral tube is enclosed in a pair of yellowish, keeled bracteoles. The sepals are yellowish, the anterior longer than the posterior ones. There are 5 petals, yellow in colour. 10 stamens, in two scarcely distinguishable whorls, those opposite the petals having the filament produced into a large globular appendage. The ovary is inferior, unilocular, with 2 ovules, giving rise to a single seeded indehiscent fruit.

Corynanthera is confined to the Eneabba heathlands, between Eneabba, Coorow and Watheroo. Within this region it occurs on pale grey-brown loamy sands over laterite. Flowering occurs between September and February. ■

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Wildflower Nurseries in New South Wales

Bundara Native Nursery — 37 Carters Road, Dural, Sydney, 2158. Tel. 651-1962. Specialising in *Grevillea*. Open weekends. Weekdays please ring first.

Cranebrook Native Nursery — R23 Cranebrook Road, Cranebrook, N.S.W. Tel. (047) 77-4256. Four miles north of Penrith, between Tadmire and Taylor Roads. Open 10.00 a.m.-6 p.m. Closed Sundays.

Denovans Nursery — 188 Marco Ave., Panania, 2213. Tel. 77-8891.

Forest Native Nursery — 9 Namba Road, Duffy's Forest. Tel. (02) 450-1785. We specialise in a wide range of native plants. Catalogue \$4.50 posted. Open 7 days.

Floralands — Parry's Nurseries Pty. Ltd. Kariong via Gosford, 2250. Tel. (043) 40-1142. Preservation by cultivation. Send. \$1.50 for descriptive catalogue.

Kentlyn Native Plant — 96c George's River Rd., Campbelltown, 2560. Tel. (046) 25-1583. Open 7 days.

Sylvan Nursery — Portsmouth Road, Erina. Large range. Open weekends. Mon.-Fri. Please ring first (043) 67-7417.

Wirrimbirra Native Nursery — Hume Hwy, between Bargo and Tahmoor E. side 2574 (3 km N from Freeway entry). Wide range including unusual plants. Tel. (046) 84-1112.

Wirreanda Nursery — end of Wirreanda Rd., Ingleside, 2101. Tel. (02) 450-1400. Over 20,000 advanced and semi-advanced native trees, shrubs, ferns and indoor plants. Public and trade welcome. Open 7 days. Send S.A.E. for list.

Deanes Orchid Nursery — Specialist in Australian Native Orchids, 29 Hemers Rd., Dural 2158. Tel. (weekdays) (02) 651-1798. Nursery closed Friday. Plants sent anywhere. Please send for descriptive list.

Wildflower Nurseries in Queensland

Fairhill Nurseries — Fairhill Rd., Yandina 4561. Tel. (071) 46-9193. P.O. Box 100. Trees, shrubs, ground covers, climbers, ferns, palms and orchids for the sub-tropical and tropical east coast. Extensive display gardens 8.30 a.m. to 5 p.m. anyday. Catalogue \$1.50.

Lakkari Native Plant Nursery — Specialist growers of Australian Plants, retail & wholesale. Large range available. Browse through our display gardens. Many selected natives unique to Queensland as well as new cultivars and hybrids. *Grevilleas* and rainforest species our speciality. Catalogue \$1.00 posted. Open 6 days (closed Saturday only). 477 Redland Bay Road, Capalaba, Queensland. Tel. (07) 206-4119.

Utingu Native Plant Nursery — Wholesale and retail. — 37 Sorbiston St., Wellers Hill, 4121. Tel. (07) 397-5706. Open 7 days. Trees, shrubs, ground covers, ferns, hanging baskets.

Wildflower Nurseries in Tasmania

Banksia Nurseries P/L — Waratah Hwy., Elliot 7325. Tel. (004) 36-3128. Open 7 days, 9-5. Grower of rare and common Australian native plants. Available in most sizes at certain times of the year. Advanced and tube lines a speciality. Send S.A.E. for list.

Preserve Our Flora — Selection of Best Forms



Anthoceris albicans

Normal form, photo by P. Althofer

Notes by Rosemary McLaren

Outstanding form, photo by R. McLaren

I have discovered a form of *Anthoceris albicans* which is most attractive and has only been reported from this area, Barmedman, N.S.W., 2668. A botanist from the botanic gardens came to see it and felt it should be released to the nursery trade. It has silvery foliage and becomes a mass of yellow flowers. I am frightened it will die out, as sheep graze the one areas it grows on. Fortunately the area is rocky and cannot be cleared or it would be extinct now. It likes a well-drained soil, and although I have had two doing beautifully in the garden, I have lost them both — one from a wet year and the other from over-watering when we were on holiday. It propagates from cuttings quite easily, but I lose them when I pot them on, probably because I am very much an amateur. Who will help me save this lovely plant?

Wildflower Nurseries in Victoria

Austraflora — The nursery with the "Native Know How" — Belfast Rd., Montrose 3765. Tel. 728-1353. Mon.-Sat. 9-5.30 p.m. Sun. 10-5.30 p.m.

Belbra Nursery — Box 12, Halls Gap, 3881. In the heart of the Grampians. Large range of Australian natives. Closed Wednesday only.

Grass Tree Native Plant Nursery — Brown's Rd., Rosebud S. 3939 (opposite Hyslops Rd.) 10 a.m.-5 p.m. Wed. to Sun. inc. In natural setting.

Flora Terra Australis — Cnr. Bellevue Cres. and Seaford Rd., Seaford 3198. Kevin Reed — Native Plants specialist, a collectors nursery. Huge selection from ground cover to trees, rare and the common, sizes large or small. Closed Mon. & Tues.

Tasmania's Wildflowers

Launceston Field Naturalists Club

A book for amateurs and bush lovers, prepared by the amateurs and keen observers of the Launceston Field Naturalists Club. The whole range of wildflowers you will normally find are described and illustrated in 300 full-colour plates. This 120 page (24 x 16 cm) book is available post free from The Editor, Australian Plants for \$24.00.

A Wilderness In Bloom

by Bill & Betty Hinton Price \$6.90, post free

"Wildflowers Of Tropical Queensland" is the sub title of this beautiful little 68 page (23 x 17 cm) book. The exceptional quality of the photographers is maintained by good colour printing in the 103 large colour plates.

Seaweeds Of Australia

Ed. I. Christianson \$17.95 post free from Editor

This is a project of members of the Australian Society for Phycology and Aquatic Botany. Hence it is an authentic reference to all the seaweeds found along the Australian coastline. What is remarkable, however, is the photography of Bruce Fuhrer. Every species of seaweed is illustrated in a large half page colour plate, 180 of them, so life-like you get the impression that if you touched the page you could feel them. Anyone, and I mean anyone including children, could identify the seaweed they have found by just flicking over the pages until it almost jumps out at you. Similarly the descriptions are short, simple and interesting.

BOOKS ON WILDFLOWERS

This is a mail order services of books, postage free with, in some cases, a discount. You may be able to buy the following books a little cheaper and some groups in the society are offering certain books at a bigger discount so if you want to shop around after reading my reviews, then do so. However the service we offer will be convenient and any small profit made is reinvested in the production of Australian Plants. You may pay a little more through this service but the donation will be well used.

Books On The Flora (Some including fauna) Of Discreet Areas

For N.S.W.		
"National Parks of N.S.W."	— Mullins, Martin, Baglin	\$12.95
"The Cradle of Incense"	The Wellington, Dubbo Area	\$15.00
"Kosciusko Alpine Flora"	— Costin, Gray, Totterdell & Wimbush	\$25.00
For Queensland		
"Native Plants Of Queensland"	by Keith Williams	\$30.00
"Wildflowers Of Tropical Queensland"	— A Wilderness in Bloom by Hinton	\$6.90
"National Parks of Southern Queensland"	by Mackness	\$13.00
For Victoria		
"Handbook to Plants in Victoria"	Willis — Vol. 1 \$18.80; Vol. 2	\$30.00
"Flowers and Plants of Victoria and Tasmania"		\$24.95
For South Australia		
"Flora of South Australia"	— Part 1, Black	\$16.90
"Flora of South Australia"	— Parts 2 & 3. B/red	\$6.50
For Northern Territory		
"North Australian Plants."	Harmer	\$8.00
"Flora Of Central Australia"	Aust. Systematic Bot. Soc.	\$35.00
For Western Australia		
"Flowers and Plants of Western Australia"		\$24.95
"West Australian Plants — A Descriptive Catalogue"	Beard	\$8.00
"West Australian Plants For Horticulture"	— Part 1	\$8.00
"West Australian Plants For Horticulture"	— Part 2	\$8.00
"How To Know West. Australian Wildflowers"	Fresh supplies in August, '81	\$10.50
For Tasmania		
"A Guide To Flowers and Plants Of Tasmania"	Ed. M. Cameron	\$24.00

About Specific Groups of Plants

Orchids	— "Australian Indigenous Orchids"	— Dockrill	\$32.00
"Orchids of The West"	— Erickson		\$9.95
"Asian Orchids"	— Teoh Eng Soon		\$39.95
Ferns	— "Australian Ferns and Fern Allies"	— Jones & Clemesha	\$19.95
Eucalypts	— "Eucalypts" Vol. 1 and Vol. 2, by Stan Kelly	each	\$22.50
"A Gardener's Guide to Eucalyptus"	by Ivan Holliday		\$17.00
Mint Bush	— "Prostanthera" — "The Cradle Of Incense"	— Althofer	\$15.00
Wattles	— "Acacias of N.S.W." — Armitage		\$8.00
"Acacias Of South Australia"	— Whibley		\$8.00
"Aquatic Plants Of Australia"	— H. Aston		\$24.00
"Useful Wild Plants In Australia"	— A. B. & J. W. Gribb		\$16.00
Darwinia and Homoranthus	— A Guide to — T. L. Blake		\$6.90
Stylidium	— The Trigger Plants — Rica Erickson		\$11.00
Plants of Prey	— <i>Byblis</i> , <i>Drosera</i> , etc. — Rica Erickson		\$11.00
"Seaweeds of Australia"	Ed. 1; Christianson		\$18.00

On The Cultivation Of Australian Plants For All States

Australian Plants—The best reference. Bound volumes 2-9, @ \$15.00 plus 10c post. For details of previous issues see inside the rear cover.

"A Horticultural Guide To Australian Plants"	— Sets 1.6 @ 3.00 each; Set 7	\$6.00
"Encyclopaedia Of Australian Plants"	Volume 1 — Elliott & Jones	\$35.00
Volumes 2-3	will follow in 1981, 1982, 1983.	
"Australian Native Plants"	— Wrigley & Fagg	\$35.00
"Growing Native Plants"	Nos. 1-3-6, 7, 8-10 — National Bot. Gardens,	each \$2.50

The Best Book On Pest and Disease Control in The Garden

"Friends and Foes in Your Australian Garden", special offer for 1980/81 \$24.95 post free.

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Because of the vast wealth of our flora there is very little repetition, each volume becoming a valuable reference book in itself. Each volume has a separate abridged index. A composite index of volumes 1-8 is available for \$2.00 plus 60c postage.

It is intended to maintain all volumes in print in bound hard-cover form, beautifully presented with gold-lettered green vinyl covering. Each volume has bound with it another Society book as indicated below and is available for \$15 plus 50c per vol.

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- VOLUME No. 6. Issues 45-52, with "West. Aust. Plants for Horticulture—Part II".
- VOLUME No. 7. Issues 53-60, bound with "North Australian Plants".
- VOLUME No. 8. Issues 61-68, bound with "The Cradle of Incense".
- VOLUME No. 9. Issues 68-76, bound with Aust. Plant Genera in August, 1981.
- VOLUME No. 10. Issues 77-84. Individual issues only available at \$1.50 post free.
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- "THE LANGUAGE OF BOTANY", by C. N. Debenham, \$6.90 plus 60c postage. An outstanding reference to botanical terms with examples from Australian flora.
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The Society is for people interested in the Australian flora, its preservation and cultivation in the wild, in parks, and in public and private gardens. Preservation of our magnificent flora will, in the long term, depend on the knowledge accumulated, on its cultivation under a wide range of conditions. We hope to learn more about this by cultivating wildflowers in the garden, encouraging research on this aspect, and to record this in "Australian Plants". Enquiries for membership should be directed to:

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Darwinia macrostegia

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 but can only be seen by looking into the 'Bell'.

This description is taken from the book "A Guide to *Darwinia* and *Homoranthus*" mentioned below. The book provides a $\frac{3}{4}$ page sketch with inserts of flower and fruit detail to illustrate the above description followed by details of its natural habitat and cultivation.

Darwinia* & *Homoranthus

by Trevor Blake — \$6.90

This excellent 88 page book published by the SGAP Maroondah Group describes all the 45 named species of *Darwinia* and the seven species of *Homoranthus*. The descriptions are excellent and well illustrated by line drawings. Each description is supported by records of keen observation under the headings *habitat*, *cultivation* and distinguishing features even to the extent of various forms. The 12 full colour plates are good and support the text and excellent line drawings of the plant include flower detail inserts. What makes this of special value is that it is a production by the Society to a very high standard on art paper by competent growers of Australian Plants for keen growers and students of the Australian flora. Many more books are planned on important segments of the flora if readers will give their support for this hard work by purchasing a copy.