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Photography by E. A. Wilksch—See page no. 342 for technique used.

CALYTRIX BREVIFOLIA Meisn.

A beautiful small wildflower for the garden. The small white-flowered plant in the left is a *Stylidium*, "Trigger Plant", and that a little to the front of it is a *Laxmannia*.

GROWING WILDFLOWERS

by Len Miller, Toowoomba, Qld.

Having been associated with the growing of native plants for the past twenty years, I fail to see why some writers make it seem that the growing of same is very difficult and takes so much study in choosing "suitable" plants. I have read in this periodical, not one writer, but several, propounding the difficulty of growing any native plant.

Now the whole concept in founding S.G.A.P. was to encourage interested garden lovers to plant natives, as they were, or are, much more reliable and showy than their exotic counterparts. As I see it today, after fourteen years, approximately (according to these writers), it is harder to grow and establish these natives than their imported counterparts.

Don't get me wrong, I am not belittling these people, but how are we going to encourage people in this new field if the chances of these plant's survival is practically nil.

I guess I know what I'm talking about because I am a professional gardener (horticulturist) and have had forty-four years practical experience in Britain as well as in five States in this country, and at present am gardens foreman with Toowoomba City Council, and have had the pleasure of introducing Australian native trees to the streets of Toowoomba.

My hobby is also collecting seeds, plants, etc. of native plants and propagating same. Have travelled far and wide over the past twenty years doing this collecting. My garden, which is ten years old, bears witness to my earlier remarks about the growing of Australian native plants. When I first bought this property, a house and one-third acre of land, there were no plants of any description except kikuyu, three feet high.

The property is situated on the eastern slopes of the Great Dividing Range, so of course I get "seepage", top soil is red volcanic of medium texture, up to four feet deep with good drainage, and it is protected from the west by a belt of trees farther up the slope. I have no water laid on and the whole garden relies solely on rainfall, which over the last ten years has been very erratic, ranging from 21" to 36" and falling mostly in summer time. Now the foregoing gives one some idea of the conditions existing, apart from the fact that there is seldom frost but still cold mornings and summer temperature is approximately 85°F average.

Now, over this period of ten years I have planted some three hundred plants, more or less (trees, shrubs, groundcover, etc.) collected from all the mainland states, choice of position is limited to the extent of "where can I put it" chiefly so this art of choosing a specific position is out as far as I am concerned. I always mix the species and have built up quite a number of "rockeries" but this is only to give the garden a lift and not to plant any specialized stuff. I have always maintained that the ideal size of a plant for transferring to the garden is four to six inches, thereby cutting out any check the plant may have if allowed to continue as a potted plant. Once this plant is in the garden it is watered once each week for about a month and then it is "on its own". I have found that I get very few losses. The plant is more robust than one which has been "molly-coddled".

(Continued on page 358 where Len lists plants that he has grown successfully, following a review by the Editor on page 356 of the advice given in previous issues.

GROWING IRIDACEAE

EXPERIENCES IN GROWING IRIDACEAE IN VICTORIA by David L. Jones

Plants of the family Iridaceae are ideal garden or container subjects. Most are very showy during their flowering period and their foliage provides a break from the other types. Some are ideal rockery plants while others are hardy enough to withstand blazing summer sun in arid clay or sandy areas. Few are disappointing in the garden. Propagation is by division of the rootstock or seed. Most species seem to germinate from fresh seed.

THE GENUS PATERSONIA

The Native Flags are probably the best known members of the Australian Iridaceae. Most species form radiating open or loose tussocks and produce a succession of flowers from a papery spathe like inflorescence over many months. The flowers are fragile and short lived usually blue or purple in colour but at least one species from the west, is yellow. Colour plate, page 341.

Patersonia longiscapa Sweet. Probably the best known species at least in Victoria. It does best in wet-clay areas and makes an ideal border. Plants quickly become unthrifty in dry situations. The flowering stems are up to 2' long and the flowers a clear pale-blue. Old tussocks tend to become very matted and flower poorly. A good rejuvenation procedure is to set the tussock alight in late summer or autumn. The species is adapted to these conditions and comes away very vigorously, flowering in the next season.

Patersonia glabrata R.Br. This species is another good garden subject and excellent for the rockery. Unlike the previous species it does best in a hot dry position. The flowers are a clear blue.

Patersonia sericea R.Br. A very beautiful species covered with long white silky hairs and vivid purple flowers. It is easily grown in a hot dry position. The tussocks tend to be open and loose.

Patersonia longifolia R.Br. An attractive little species that forms a neat clump and bears numerous flowers from stalks less than 6" long. It does well in a rockery preferring a semi-shaded position and will stand moisture around the roots.

Patersonia fragilis (Labill.) Druce. An unusual species which has long terete twisted leaves and bears its flowers in almost sessile scapes at the base of the plant. It is very difficult to grow in the garden and seems to require a dry exposed position in a sandy soil. Results in clay are very poor with some success being achieved in coastal sandy soils.

Two more species described and illustrated in colour on page 340-341.

THE GENUS LIBERTIA

Libertia pulchella (R.Br.) Spreng. This little gem of the high rainfall shaded forests of eastern Victoria, N.S.W. and Tas., is not an ideal garden plant. However it makes a perfect pot plant and is a splendid asset to any fernery. The species forms a neat tussock of many fans each with leaves up to 6" long. It grows into vast clumps in nature usually in shady humid areas and often in running water. It grows quite robustly in a pot and produces short racemes of dainty white flowers during late Spring. In the garden, plants need a very shady protected position, but even then they do not really do well. The leaves burn in the summer winds and the plant quickly dies if allowed to dry out.

Libertia paniculata (R.Br.) Spreng. This species makes a far more suitable garden subject than the previous one. In Victoria it is relatively uncommon and found in cooler protected situations. However in the garden it will take full sun without any difficulty and is extremely drought resistant, although the white fragile flowers last better in a shaded or protected situation. It is a robust plant with deep green leaves about 15" long and bears branched flowering stems to 2'. Flowers early Summer to Autumn.



Diplarrena moraea Labill. The "Butterfly Flag" above is a beautiful acquisition to any garden. It forms a stocky tussock with blue green leaves about 12" long. In the late spring months the plant sends up wiry flowering stalks to about 3' tall. These over the next couple of months produce odd flowers at intervals. As with most Iridaceae the flowers are very frail but lack nothing in beauty. They reach their best development in the morning and quickly shrivel on hot or windy days. In cool weather the flowers may last longer. Naturally, the species grows in heavy clay or rocky situations usually in cooler protected areas. Best results in the garden are obtained in wet clayey soils in a protected position. The species is long lived.

THE GENUS ORTHROSANTHUS

Orthrosanthus multiflorus Sweet. A western species that must be amongst the hardiest and at the same time prettiest of our irises. Its longevity is prodigious. I have a division from a plant that is at least 30 years old and still going strong. It thrives in full sun or shade, in clay soils or sand and never fails to give a late springtime display that arouses comment. The flowers are a delightful pale blue—reminiscent of the chicory plant that is now a common roadside weed. They are very short lived and quickly shrivel in hot weather. The plant is very vigorous and forms a dense tussock of pale green leaves about 2′ high.



Orthrosanthus laxus (Endl.) Benth. This species is a Westralian species with which I have only limited experience. However it has proved to be even more vigorous than the preceding one and that in an exposed position in a clay soil. The flowers are very similar to the preceding species.

Further details on page 341.

KANGAROO PAWS

Mr. K. R. Oliver described his research into the development of garden hybrids of the paws in issue no. 46 and now advises of his cultivation methods. Colour plates on rear cover.

Manures and Fertilizers

My first experiment was to divide a bed of sand in two halves and mix in cow manure in one half. Plants of *Anigozanthos manglesii* were planted and those in the manured half grew better and with apparently no adverse effect. Fowl manure, "rose manure" and other balanced fertilizers have been used, mainly on *A. flavida* hybrid plants and *A. flavida* itself without ill effect. I would not recommend blood and bone as this contains no potassium and there is circumstantial evidence that potassium deficiency, especially when much nitrogen is present, encourages ink disease. Or perhaps it is one of the trace elements that is needed from the "complete" fertilizer. Last winter for the second year running I had little ink disease, this I think may be attributed to my switching from blood and bone to complete fertilizers. Some people have reported good results against ink disease by the use of Potassium permanganate spray or drench; as this rates very poorly as a fungicide it may be the potassium (or the manganese?) that the plant receives that increases resistance to ink disease. It has been reported that plants in the field are free of ink disease after a fire and as the soil is rich in potassium after a fire there may be a connection here also. It is almost certain that the fast lush growth that occurs in our rich soil with much watering results in very bad ink disease attack, even on plants that show good resistance when grown without too much forcing. Plants which were forced at a wildflower nursery grew to enormous size but succumbed very badly to ink disease, while genetically identical plants in my garden have shown little attack in three years. They were grown at a much slower rate. To sum up as far as I know at present, fertilizers or manures are necessary, at least in the poor sandy soils around Perth. Complete fertilizers (NPK and Trace Elements) appear to be best. Excess forcing of the plants should be avoided.

Watering—The paws need a lot of water when in flower. The first sign of lack of water is a drooping of the flowering stem (if fully grown) and this must be corrected at once or the flowers will be aborted and lost. Stunted aborted stems can nearly always be attributed to lack of water at flowering time. In our long dry summers here I water at least twice a week, as this is necessary to keep *A. flavida* and its hybrids in good condition. Other species may or may not go dormant and the leaves die off completely. Watering of the dormant plants along with the others does not appear to be harmful. Excess summer watering of *A. manglesii* has been known to be fatal, apparently causing rotting of the rhizome, the lush foliage withering off in a matter of two or three days. It is doubtful if overwatering of *A. flavida* or its hybrids would cause rotting of the rhizomes but this probably could occur with all other species.

Soil—It is said that the paws grow on very poor sandy soils. This is not usual of *A. bicolor* which grows on heavy loam soils and of *A. flavida* which can grow alongside the huge Karri trees on what must be very good soil. In cultivation *A. flavida* and its hybrids grow well in sand or in a sand loam mixture, growing bigger and better in the better soil. I have no experience of growing paws in heavy soil, but at least some species and

hybrids should do well. A. *flavida* has been reported to be "hardy in cultivation in almost any soil".

Ink disease—I do not spray for ink disease as it is my aim to develop ink disease resistant plants by selection of resistant hybrids. Ink disease can probably be minimised by the following measures.

By correct nutrition of the plants;

By growing in full sunlight;

By removing all dead leaves etc. which tend to keep the plants wet;

By not overcrowding the plants or allowing the clumps to become overlarge (which makes them self shading).

By preventing damage to leaves by snails, etc;

By watering where practicable the soil only, and not wetting the leaves;

A pebble mulch may help as this prevents the splash of soil particles onto the leaves, forming wet patches on the leaves.

RAISING FROM SEED

I use a commercial seed raising mixture mixed about 1 part to 2 or 3 of sand in 6" plastic pots. A light covering of sand (1/16") is given to the seed which has previously been pressed firmly into the soil. I then scatter on the top small crushed rock similar to that used in road building to help prevent too much disturbance of the soil when watering.

Seed is kept under glass protected from heavy rain and is watered daily. I do not think that overwatering can occur before the seed germinates as seed of A. *flavida* has been germinated in water alone. However overwatering should be avoided as soon as germination takes place as damping off is very likely to occur in the first two months after germination. The use of sterilized sand and pots should be a help here but if damping off does occur the seedlings should be sprayed immediately with a suitable spray.

Germination takes place after a minimum of 23 days but it may take much longer in some cases. Seed of A. *flavida*, A. *manglesii* and A. *viridis* usually germinates well, while A. *humilis* and particularly A. *preissii* are very difficult. I have experimented with treating the seed in sulphuric acid before planting, working on the theory that an impervious seed coat is the cause of poor germination and that corroding away part of the seed coat may improve germination. I have found that the seed is not harmed by moderate acid treatment (½ hour in 50% acid) but have not done enough tests to determine if a definite improvement has resulted. Others have reported good results by burning waste material on top of the pot after planting. Possibly heat treatment at a correct and controlled temperature would be effective. Abrading the seed between two sheets of glasspaper may be helpful.

LATENESS OF ISSUES OF "AUSTRALIAN PLANTS"

This issue is despatched late. This has often happened in the past. Every effort is made to produce the issues on time. One factor that often causes delay, is the final checking for correctness. Page 376 gives corrections for many errors missed last issue and we have increased our checking officers to assure accuracy in the future. We all work in an honorary capacity to provide this periodical for you and we are doing our best. I feel sure that issues next year will be on time—Editor.

THE FAMILY IRIDACEAE

Cultivation of other genera in this family and other species of Patersonia is given on page 335. Previous issues have described other species, especially issue 42, page 274, the South Australian species 38:56-7 where *Patersonia glabrata* is shown in full colour, the N.S.W. species 40:161 and plants for rockeries 42:243, 245. The Tasmanian species *Isophysis tasmanica* is shown in full colour in 42:273 with details of cultivation.



Photography by R. Gibbons

Patersonia occidentalis R.Br. A tall Westralian species with a tussock very similar to Orthrosanthus. The spikes are up to 3′ tall and produce a fantastic succession of clear blue flowers. Flowering is during the summer months. This seems to be one of the most suitable species for garden culture, tolerating a wide range of soil conditions and moisture.

Patersonia xanthina F. Muell. This is a relatively unknown species in Victoria. It is an attractive yellow flowered species from Western Australia that is very similar to *P. umbrosa* except for the flower colour. Plants have been tried with mixed success seeming to prefer a shaded position.

Patersonia are excellent garden plants easily grown and easily raised from seed. These are plants a beginner could be very successful with so who would like to be in a study group and grow as many species as we can supply seed for—Editor.



PATERSONIA XANTHINA

ORTHROSANTHUS MULTIFLORUS—by J. Jackson

"Native Iris" is common here on Kangaroo Island on limestone soils but I have also found it growing on clay. Most are blue but white and pink flowered forms are found near Postman's Hut at Flinder's Chase. The inflorescence is 2-4 ins. long and contains up to 8 flowers on a stem 6-12 inches high.

Editor's Note: I have found *Orthrosanthus* particularly hardy in light soils also, the plants being many years old and withstanding repeated division. I know the plant as "Morning Iris" as it flowers only for the first half of a day.

PHOTOGRAPHING WILDFLOWERS

by E. A. Wilksch

The cover plate of this issue, *Calytrix brevifolia* Meisn. won first prize in a competition run by the N.S.W. Region of the Society. The photograph was taken at Bullsbrook (Pearce), Western Australia on 5-10-70 at 10 a.m. The weather was overcast light drizzle. The camera was a Topcon R.E.2 S.L.R., T.T.L. Meter using Kodachrome II film.

Due to the rather bad weather, the exposure was made with the camera on a tripod using a shutter speed of 1/15 sec. and lens opening of F5.6.

Excess water from the drizzle had to be shaken from the subject, which was specially chosen being a small specimen, enabling it to be photographed from fairly close up, which besides showing the general growth, habit, and shape, enabled the individual flowers to be appreciated.

What is often regarded as bad weather is excellent for good soft colour rendition with almost no shadows.

Shadows are easily eliminated with aluminium foil reflectors. Crumple it, flatten it out and stick on a flat surface. Once you discover how a reflector will add life to your pictures you will never do without it. You can throw the light right into the flowers and leaves—take on that living gloss.

Short pieces of dark florist's wire are very useful to use as hooks to improve the shape of your subject where nature needs a little assistance to pull a twig into a better position.

Don't forget to leave a few dry leaves or stones in the right position. A few small neighbours should not be removed provided of course that they are complimentary and not distracting.

Take your time, never hurry, and consider various angles. Use a tripod whenever possible. You can compose better, the picture is sharper and you have a free hand to hold the reflector to best advantage.

My reflector is mounted on a stiff cardboard magazine folder which folds together to slip into the back of the camera gear bag which by the way is an airlines cabin bag (with shoulder strap).

Better Than Times One Flower Photography

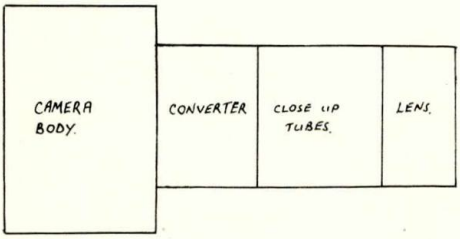
by R. C. Nash

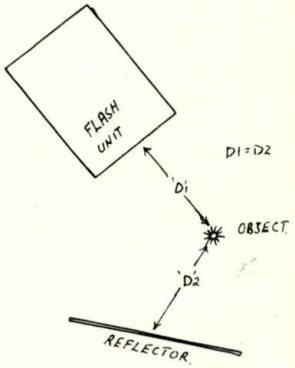
Until recently the average amateur flower photographer has not been able to take photographs that enlarge the flower without expensive equipment, a microscope or an arrangement of close up lenses before the camera lens. Usually when a very close up photograph of a flower is taken the lens is placed so close to the object that difficulty is experienced with lighting. Often the aperture must be left open far too wide to allow sufficient light from the object to reach the film or long exposures are made. In the first case depth of field is lost and in the second, movement spoils the shot.

With the advent of the cheap Teleplus Converter a system is now available to the amateur to break this one to one barrier. These converters are really intended to make the normal camera lens into a telephoto lens. By using a 2x or 3x converter and the close up tubes, it is now possible to make close up photographs of almost four times natural size on the 35 m.m. slide. This method leaves ample room between the lens and object to manoeuvre a small flash unit and reflector. An even greater magnification than the above may be obtained by using converters in cascade, however

there could be difficult lighting problems if a good depth of field is required.

The camera used by the author is a Praktica FX model. The normal lens for this instrument is of medium to good focus at its centre, that is little distortion occurs in this region, the edges do have a small amount of focus error. By using the converter the image that is exposed upon the film is mostly from the centre of the lens, giving few errors. A variable 2x/3x converter was purchased and after trying various systems the following method has proved the most satisfying. First the converter is fitted to the camera body, followed by the required number of close up tube pieces, the lens is now fitted into the tube's open end. A tripod is a must, as also is a trigger extension cable, and should be fitted at this stage.





With this system the shortest distance from lens to object is about six inches, this leaves ample room for the flash unit and a reflector. The focus is set to the nearest part of the flower or the nearer part of this object of greatest interest, with the lens aperture wide open (the lowest value of f). Some form of artificial illumination may be needed to brighten the object for good focussing. The aperture is now closed down to the required value of f, depending upon the strength of the flash unit, the magnification of the converter and tubes used, and the speed of the film used. When the flash unit and reflector have been sited at the desired angles and distance from the object, then the picture is taken.

In the author's case when the 3x converter is used with all close up tube pieces in place, the aperture is closed down to f16 (film speed 50 ASA). The flash unit is held approximately one inch from and a little to the front of the flower, with the reflector on the other side, also held a little to the front. If the 2x converter is used then the aperture is set at f22 for this lighting distance. The aperture may be left at f16 and the flash unit and reflector both moved back to two inches. If the flash and reflector are moved back to four inches then the aperture must be opened to f2, this will give a shorter depth of field so it is best to use a higher f value and bring the lighting in closer. A background may be used behind the subject at an equal distance away from it as the lens is. Most backgrounds reflect light back into the lens which causes hazing and are therefore not advisable.

The reflector is a small rectangular piece of sheet aluminium which can be either flat or slightly curved, its surface is not polished but is bright.

When using the above method variants will be found to occur with other makes and models of cameras, experience and a bit of common sense should soon correct any troubles.

FAIRY FANS

CULTIVATION OF UTRICULARIA by B. Whitehead



Photography by B. Whitehead

UTRICULARIA ULIGINOSA

Introduction: Among the many carnivorous plants to be found in Australia are quite a few species of *Utricularia,* or Bladderwort. Rica Erickson, in "Plants of Prey" (Lamb Paterson 1968) lists 39 species and two of its close relative, *Polypompholyx*. The common name is derived from the usually whitish-transparent bladder-like structures possessed by the plants, which serve to supplement the plants' nutrition by the capture of small insects and other micro-organisms which inhabit wet places.

Ten species are featured in full colour in the No. 35 issue of Volume No. 4 of *Australian Plants* where Rica Erickson describes the characteristics of these fascinating plants.

In most species, the bladders are not prominent, and in some it is necessary to search carefully in the soil beneath the tiny leaves before a bladder can be found attached to the rhizoids. In their native habitat, two distinct types can be found. The aquatic species, comparatively few in number in Australia, are free floating plants of swamps and still waterways. The majority of Australian species are terrestrial. Even though they may be submerged often, they still retain their contact with the earth and grow in it.



Photography by B. Whitehead

UTRICULARIA DICHOTOMA var. *UNIFLORA*

Leaves may or may not be evident above ground and this seems to depend, possibly on the species, but more likely on the moisture level of the soil. Some species may normally have leaves 1-2 mm. in length, but if submerged for any period of time in shallow water, the leaves can reach 5 times this size. The bladders likewise are small, and in the largest forms are usually no longer than 4 mm. at the most. Most species have bladders 1-2 mm. long.

The terrestrial species are always found in places where moisture is above average for surrounding areas, and where this moisture level is maintained for considerable periods of time. Consequently, their small flowers may be sought around the edges of swamps, and especially in shallow wet soil in heaths and around rocks. The cultivation of the plants presents no insurmountable problem, and the reward can be a large dish full of very tiny but dainty purplish-mauve, pink or white flowers. The size and nature of the plants make them more suitable for cultivation in pots.

A. AQUATIC SPECIES OF N.S.W.

1. *Utricularia aurea* Lour. To be found in dense masses floating just below the surface in swamps during the warmer months. Its leaves, arranged around a central prominent stem, are finely divided into narrow segments which have bladders attached near their bases. Flowers are yellow, with brown veins on the palate, produced in summer. During winter, the plant dies back leaving only some small reproductive structures, like miniature tightly rolled plants, at the end of each of its several branches. These over-winter in the water and grow into full sized plants as its gets warmer.

Cultivation: Attempts to cultivate this species in large tubs of water have been disappointing. Plants reappear, but never attain original size.

Some localities: Wyong, Burrawang.

2. *Utricularia gibba* ssp. *exoleta*. To be distinguished from the above species by its very fine, entangled stems with fine leaves and very small bladders. Flowers are yellow, in summer, smaller (about 5 mm) than *U. aurea*.

Cultivation: This aquatic species grows well in a large container of water, and increases. Eventually it could fill the whole container. Aquatic surface plants (e.g. Azolla, Duckweed), can be grown with it to make the container more attractive.

B. TERRESTRIAL SPECIES OF N.S.W.

3. *Utricularia lateriflora* R.Br. Areas of wet heath and damp soil and moss over rocks are favoured by this species. Numerous purple flowers about 5-6 mm. long are produced from Spring till at least late Autumn, if the moisture level is maintained throughout the season. The tiny leaves are usually insignificant, but become quite long if the area is under shallow water for some time. Plants in the Illawarra are usually mauve to purple. In sandstone areas around Sydney and further north a white form occurs. This form consistently has a smaller flower and relatively taller scape.

Cultivation: A small piece placed in a 5" pot of bush sand, kept permanently in 1-2" of water, will spread rapidly by means of underground stems to fill the pot. If a bud or scape is damaged before flowering, the plant will produce a new scape from near the bract on the old one. In the N.S.W. eastern coastal climate, the plants should be given plenty of sunlight.

Some localities: Mt. Keira, Belmore Falls.

4. *Utricularia uliginosa* Vahl. (including *U. cyanea* R.Br.). Again a small flowered species growing in colonies with dense masses of linear leaves. Flowers are produced in summer, and the plants will flower freely and continuously till late autumn. Flowers are pale bluish with a pronounced hump and stripes on the lower lip.

Cultivation: As for *U. lateriflora*, except that the water level can be kept at just about soil level or ½" above the surface of the soil.

Some localities: Raymond Terrace, Wedderburn.

5. *Utricularia dichotoma* Labill. This species has the tallest scape (to 15") and largest flowers (10-15 mm. long) of the N.S.W. species. It occurs mainly in higher country in heavy soil or sandy soil in very wet areas,

frequently being covered by water. It is sometimes found by the edges of creeks. Leaves are usually linear, up to 20 mm. Flowers occur in pairs near the top of the scape, and can be seen from Spring to Autumn.

Cultivation: As for *U. lateriflora* except that the plant seems to do much better if grown in peat moss than in other media.

Some localities: Kangaloon, Clyde Mountain.

Utricularia dichotoma var. *uniflora*. Though named as a variety of the preceding, this plant frequents a different habitat to and has a more inflated spur than *U. dichotoma*. Flowers are single, and the leaves are tiny (2 mm), almost circular, occurring in dense masses. The plant is found usually in areas where water seeps but never lies for any length of time. The single flower is pale pink or blue, with several yellow ridges on the palate. Flowers can be seen from Spring to Winter, some to mid-Winter.

Cultivation: As for *U. lateriflora*. Unlike *U. lateriflora*, this species does not renew its flowering scape if damaged.

Some localities: Jamberoo Mtn., Loddon River.

Key to the N.S.W. species. The key is based largely on easily observed sections of the flower in the N.S.W. species, i.e. the 'spur' at the bottom of the flower, and the lower lip, situated above the spur, and which, in most of the N.S.W. species, is the most conspicuous part of the flower. It is usually horizontal or slightly downwards pointing.

A. Aquatic plants, floating in water or lying in mud, but having no permanent connection with the ground.
  B. Central stem thick and well-defined. Flowers yellow, with brown veins on the raised circular portion of the lower lip ..... *U. aurea*
  B' Stems fine, entangled. No central stem evident. Flowers yellow, without brown veins on the lower lip .... *U. gibba* ssp. *exoleta*

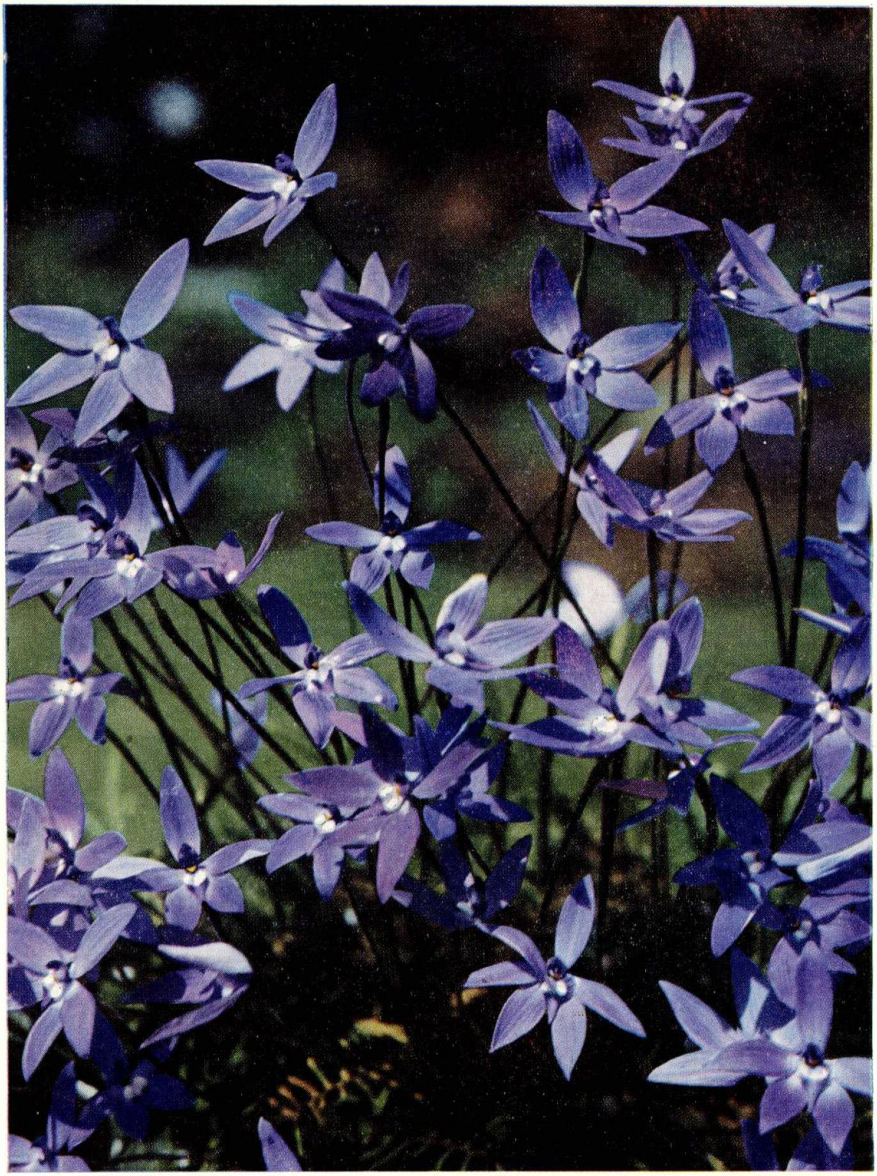
A' Terrestrial plants, rooted in sand, soil or mud, or leaves submerged but still attached to the ground.
  C. Spur much longer than the lower lip.
    D. Lower lip distinctly and broadly two-lobed . *U. biloba*
    D' Lower lip not distinctly two-lobed ..... *U. caerulea*
  C' Spur shorter than, equal to or only slightly (less than 2 mm) longer than the lower lip.
    E. Lower lip exceeding 8 mm. in width (usually 10-12 mm.)
      F. Flowers in pairs, opposite each other on the scape, or whorled at the top of the scape, purplish with 2-3 yellow ridges at the base of the lower lip ..... *U. dichotoma*
      F' Flowers single at top of scape, pink, mauve or purplish with 4-6 yellow ridges at the base of the lower lip ..... *U. dichotoma* var. *uniflora*
    E' Lower lip less than 8 mm. in width (usually 4-6 mm.)
      G. Lower lip with a pronounced hump in the forward section, whitish, pale blue or blue, with darker stripes on the hump ..... *U. uliginosa*
      G' Lower lip without a pronounced hump (but with a gradual rise to the rear), blue or white ..... *U. lateriflora*

When using the key it should be noted that the more widespread N.S.W. terrestrial species occur in the section under C'. The plants *U. biloba* and *U. caerulea* appear to be rare or very rarely collected in this State. They will most likely be found along the North Coast of N.S.W. The author would like to hear from anybody knowing of the existence of these plants in N.S.W.

AUSTRALIAN ORCHIDS

In may issues past I have requested to see good colour slides of any orchid not already illustrated in colour. It seems that Iahve used all slides of epipyhitic orchids that readers have. The objective has been to hold up articles until I can get suitable slides to illustrate them. It now seems best to present the articles and produce colour plates later as they become available.

Our next issue will feature the genus *Sarcochilus* however, and there must be some good slides of these species. Please forward as soon as possible.



Photography by Frank Hurley *Blocks by courtesy of John Sands Pty. Ltd.*

Cultivation of the beautiful Glossodia is described opposite.

CULTIVATION OF THE ORCHID GENUS

CALADENIA

WITH REFERENCE TO *GLOSSODIA* AND *ELYTHRANTHERA* by *David L. Jones*

The genera *Caladenia, Glossodia* and *Elythranthera* contain some very showy and intriguing terrestrial orchids. Caladenia is a fairly large genus of some seventy species, the vast majority of which are confined to Australia, reaching their greatest development in the west. Glossodia and Elythranthera are both small endemic genera, each of only two species. Glossodia is confined to eastern Australia while Elythranthera is only found in the west.

I have lumped the three genera together because they are not only similar botanically but also in their response to cultivation.

In general, members of these genera grow as solitary individuals or in small groups, rarely close together in massed colonies. The underground system consists of a pearly rounded tuber partly or wholly encased within a fibrous sheath. Usually there is a series of these old fibrous sheaths in a chain from the tuber to the soil surface. Most species only produce a solitary new tuber each year, and often, particularly in shady areas, these may be at considerable depth.

I have tried both species of Glossodia, one Elythranthera and thirty species of Caladenia in cultivation. The results, with a few exceptions, are disappointing. The general tendency is for a good couple of years after collecting and then a slow decline and death. Some species do not even came up at all after collecting and these appear totally impossible. Many people have suggested that these orchids are short-lived in nature however the long chain of old fibrous sheaths seems to tell otherwise. In my opinion they are quite long lived but rely mainly on seed for dispersal and reproduction. The growth of seedlings in pots around parent plants is quite rapid and seems to support this thought.

I have tried many soil mixtures in an attempt to cultivate them successfully but without any really significant effects. These have included pure coarse river sand, river sand and peat moss, river sand and half rotted leaf mould, pure leaf mould, tree fern mince, tan bark, sieved), coastal sandy loam, mountain soil, granite topsoil and various mixtures of each with the leaf mould mixed evenly throughout or mulched heavily on the top.

In general flowering of the Caladenias and Glossodias in cultivation does not seem to be a major problem particularly in the earlier years after collection. Elythranthera however does seem to be very shy of flowering in cultivation.

Despite the general rather gloomy response of these species to cultivation a considerable amount of information has been learned about their preferences.

(1) They do better in a plastic pot than a terracotta pot. Indeed some species, especially those with a deep root system, do reasonably well in 6" narrow plastic tubes. My best results have been obtained using plastic pots in an unheated glasshouse. The plastic seems to restrict extreme drying fluctuations and watering can be accurately controlled in the glasshouse. With this method leaf growth has been much more vigorous and the period above ground extended.

(2) The plants do better in a heavier soil such as a mountain soil or granite loam than in a sandy mix.

(3) Repotting annually into a new mix does not seem to offset their decline. In fact it may hasten it. These orchids have a fibrous lifeline to the soil surface and if the fibre is broken clean away from the tuber the plants don't seem to come up again.

(4) Mixtures containing a high proportion of broken down leaf-mould give best results.

(5) Although they do not reproduce by vegetative means it seems a worthwhile practice to sprinkle seeds around the base of the parent plant. These do come up fairly freely.

Out of the thirty species of Caladenia I have tried only four species appear to do very well in cultivation. It is interesting to note that all of these do reproduce vegetatively forming colonies of sorts in nature.

Caladenia latifolia. A robust species which may form very dense colonies in nature. In cultivation it increases freely and soon builds up to a potful. Repotting every couple of years is necessary to avoid rotting in congested clumps. Unfortunately it is rather shy flowering and seems to rarely do so in cultivation. It really responds to a dose of liquid fertilizer. In nature the leaves get up to 8" long and ¾" across but in the pot usually assume more modest proportions. A form from the You Yangs shows a tendency to be more free flowering.

Caladenia paniculata. This orchid from West Australia appears to be very similar to C. *latifolia* and possibly would grow just as well.

Caladenia menziesii. This is a most un-Caladenia like Caladenia. Its leaves are short, broadly-ovate and entirely glabrous. Most Caladenias have densely hairy leaves. This species forms dense congested colonies and is especially conspicuous in coastal districts. It usually flowers sparsely but after the stimulus of a fire, hundreds may flower en masse in a colony. In cultivation it grows quite vigorously and a few can even be induced to flower. It seems to prefer a coastal sandy mixture.

Caladenia reptans. This is a West Australian species with which I have only had a limited experience. However I have included it with this group because it seems easy and has increased in cultivation. The plants are growing in a terracotta pot of mountain-soil mix.

Caladenia hirta. My experience of this West Australian species is limited however a friend has had a potful for a number of years and it thrives. His plants are grown outside under a large deciduous tree and appear to increase regularly by vegetative means.

Five other species appear to be reasonably successful in cultivation or at least they are long lived. These are *Caladenia alba* which I have had now for eight years and *Caladenia patersonii, C. dilatata, C. cucullata* and *C. reticulata* all of which I have had for five years. All are grown in terracotta pots in a mountain soil/coastal sand mixture and have never been repotted.

Other species tried with little success have included *C. filamentosa* (both varieties), *C. pallida, C. tessellata, C. clavigera, C. roei, C. rigida, C. pectinata, C. flava, C. sericea, C. angustata, C. testacea, C. praecox, C. lyallii, C. carnea* and its many forms, *C. caerulea, C. deformis* and *C. aurantiaca.* As stated earlier the general result is a good couple of years followed by a decline and disappearance. Two species do not even appear to come up the year after collecting. These are *Caladenia iridescens* and *C. congesta.*

Although I have painted a rather gloomy picture, in concluding I must say that further work should be done on the cultivation of these species, particularly with respect to their successful raising from seeds.

CARE OF TERRESTRIAL ORCHIDS

This is the fourth of a series of notes on this subject by B. C. Kowald, Katanning, W.A. Previous ones are in Vol. 5, No. 42 issue and No. 44 issue and Vol. 6, No. 46 issue.

I fertilize my own orchids and even cross them by just putting the yellow pollen from one part onto the green sticky part of the flower.

I feed yeast to seedlings and to full grown plants.

One teaspoon of any yeast (I use Tandaco) as long as it works (bubbles), two teaspoons full of sugar (white) into ¾ of a cup of luke warm water. Keep warm until it works. Dilute with warm water to make up a pint in volume and water into new potting material. You cannot give too much and a little soon works so there is no need to be fussy. I like to give two teaspoonfuls early in the plant's growth. My 70 pots are all starting to come up although they have been treated only once so far.

Sowing the Orchid Seed in Prepared Flasks

I think I would have given up this sowing of seed after a while if I still followed the method I described on page 271 of Volume No. 5. My method is now much simpler and I have not had any fungus in the flasks. All seeding must be done over a hot fire or stove. The flasks are prepared as described except that I do not bother with holes in the plastic or cork stoppers. All is done quickly. The flasks with the sterilised medium in them stand on a chair nearby. Leaning over the stove, pour or syphon off the lime from the phial containing the seed. Add half an eyedropper of distilled water, shake and pour in quickly. The top or stopper is then replaced loosely and then covered with cotton wool and a piece of plastic sheeting, both being tied with plastic string. This gives the air they need and saves holes in stoppers.

Storing Tubers in Fridge

When the leaves of an orchid plant have died, I pack the tubers in dry sawdust in a cardboard box and store for a month away from pests and rodents. This dries them out just enough. They are then stored in a plastic bag kept in a crisper in the refrigerator.

MY EXPERIENCE WITH **CYMBIDIUM SUAVE** IN MELBOURNE

by Joan Stephens

I purchased a piece of *Cymbidium suave* in August 1969. It was mounted on tree fern and had three small leads. Happily I came across an article in *Australian Plants* of June 1966 on native cymbidiums.

The following weekend I went "bush" to find a fallen tree and get some of the rotten insides, so I could give the plant the best start I could. I potted the Suave—still mounted on the tree fern, into a crocked 7" soft black plastic pot, in the rotted tree insides I had acquired.

It has steadily increased in size and now has nine leads. It carried one spike in November 1969, one in 1970 and three in 1971.

This plant is growing in a 6 x 8 unheated glasshouse which runs north and south, and its constructed of walls which are fibro cement up three feet from the ground, then glass to a gable roof. The roof is a fairly dark green fibre glass. It is placed on a shelf 15" from the ground where it gets early morning and late afternoon sun. No direct sun overhead through the day as the dark roof diffuses this.

Watering is done every day through the summer and once or twice a week in the winter, depending on conditions.

Fertilizing consists of a very irregular Aquasol program—maybe only once a month through the growing season.

AUSTRALIAN DESERT PLANTS

by J. R. Morris, Broken Hill

Only in the past few years has the value of our desert flora been realised. A few have grown them in their gardens for years and I was brought up to save and grow our precious wild things even if we did not know their correct names.

The plants grow in areas having an unreliable rainfall varying between 5 and 10 inches. The evaporation is very high and the natural drainage via tableland crabholes or desert sands, is very complete. They grow in red clay-loams and the soil is sometimes heavily covered with rock fragments or drift sand. The organic content of the soil is low and it is often impregnated with mineral salts. The plants are accustomed to high summer temperatures, plenty of sun on long warm seasons and yet withstand severe desert frosts.

Many of them, i.e. *Acacia*, other legumes and *Eremophila*, have seeds which may lie for years in the earth until flooding rains accompanied by high temperatures initiate germination. Much of the seed germinates in small sand drifts gathered beside a rock or a bush.

The shrubs themselves are distinguished by tough, leathery or woody leaves, some of them highly ornamental in themselves. Such leaves are characteristic of the plants growing in nitrogen—poor soils as in compensation, the leaf cells work harder (absorbing and changing carbon dioxide from the air) than do those of more succulent vegetation. Desert plants are more woody and can withstand a moisture loss of up to 20 per cent before wilting, so I have been told.

It would be useless to grow desert plants in waterlogged or badly drained areas. They like clayey soils but they should be loose in texture and a sand mulch would be appreciated in a warm sunny position. Keep the soil around the young plant bare as they cannot compete with grasses and weeds of the wetter areas. Do not cultivate the soil as it will destroy the delicate network of near surface roots characteristic of many desert plants. Water heavily but infrequently.

Plants that I have grown in my garden are:

Acacia gladiiformis to 10 ft. A lovely bush in flower June-July.
Ajuga australis. Small plant to 1 ft., purple blue fls. grey green leaves. Seems to need a damp soil.
Blennodia trisecta (previously *Arabidella trisecta.* This hairless undershrub to 2 ft. has 4-petalled white flowers. Dies out if watered too much.
Clematis microphylla. A lovely light creeper with creamy flowers in July. It is very hardy. Does not need watering. Have had a plant for 20 years.
Clianthus formosus, "Sturt Pea". Only comes after very heavy rain and a wet season, flowering right through the winter despite frost.
Cassinia laevis. A white summer flowering everlasting needs a damp place.
Crinum flaccidum. A lily that seems to pop up after heavy rain—white.
Cynanchum floribundum. A semi climbing, green leaved plant with white flowers.
Eucalyptus gillii. Mallee with grey or silvery leaves and cream flowers.
Glycine clandestina. Pink/lavender flowered creeper needs a little water.
Goodenia sp. Have had plants for a short while.
Frankenia sp. Hardy plant requiring little water. Pink flowers in spring.
Hakea leucoptera. Grey green sharp needle leaves with white fls. in spring.
Isotoma petraea. A lovely little plant with white flowers for a damp patch.
Jasminum lineare. A creeper with highly scented white fls. in summer.
Minuria cunninghamii. This hairless undershrub to 2 ft. has tiny white daisy flowers. Hardy and can be heavily pruned.
Prostanthera striatiflora. Needs an acid soil and some water. While flowers, lavendar throat.

Rhagodia nutans. With its tiny red berries this would make a pretty plant for a hanging basket. Easy to grow with little water.
Sarcostemma australe, "Snake Plant or Caustic Plant". Makes a nice pot plant with tiny cream flowers and no leaves. Easy to grow with a little water.
Scaevola spinescens. Prostrate with cream flowers. Limited success.
Pittosporum phillyraeoides. The orange berries look nice hanging from the willowy branches of this small tree. Hardy but a slow grower.
Senecio gregorii. An annual with yellow "daisy" flowers grows only after rain.
Senecio magnificus. This annual has grey leaves with yellow daisy flowers.
Swainsona greyana, "Darling Pea". Lavender pea fls. Easy in acid soil.
Templetonia egena. Brown pea flowers on a green shrub to 10 ft. that appears leafless.
Teucrium racemosum. Low shrub with creeping roots, grey leaves and white flowers.
Trichodesma zeylanicum. Blue flowers, likes a damp place.
Thysanotus baueri. A fringed violet with mauve flowers.
Wahlenbergia sp. Blue bell flowers most of year in sunny moist position.
Psoralea patens. Pink peaflowers in spring. Needs a damp spot.
Olearia pimeleoides. A great little shrub with grey-green leaves. The white flowers start in June and last when picked.

There are many others such as *Ptilotus* but getting the seed and getting it to germinate is the problem.

SALTBUSH

AUSTRALIAN SPECIES WITH GARDEN POSSIBILITIES by T. S. Henshall

The saltbushes are small shrubs and herbs belonging to the Chenopodiaceae, a large family with about 102 genera and 1400 species. They are found throughout the world, many of the plants being characteristic of semi-desert, saline, and coastal habitats. Others occur as weeds of cultivated ground and waste places.

Horticultural interest is based on the form, foliage and fruit.

Flowers are small and insignificant. In many cases only the style and stamens are visible, in others there may be a small perianth consisting of one to five lobes. The seeds are generally enclosed in the perianth tube which may enlarge and take the form of spines, berries, wings, or other shapes. Genera is determined by the form of the fruit, and ripe fruit is essential for specific determination.

The saltbushes have been with us for a long time. Fossil records are few, but fragments have been found in Diprotodon remains at Lake Callabonna in South Australia.

In dry areas of Australia many but not all saltbush provide valuable fodder. Very often those species which are preferred by stock have been eaten out and become extinct over large areas, eventually being replaced by less palatable or even troublesome species. Owing to overgrazing and rabbits it is doubtful if the stock carrying capacity of inland Australia is even half that of 150 years ago. Browsing by stock and kangaroos keeps the wild plants shapely. Garden plants which have become leggy can be kept in good shape by judicious pruning.

State Forest Commission nurseries have plants of some species for sale, but in most cases the intending grower would need to collect and raise the seed himself.

Unless stated otherwise, the plants described are compact perennial small shrubs, useful for their form and foliage. In their native state irregular flowering and fruiting follows rain which may occur at any time of the year. Plants described are typical of the Victorian Mallee.

KEY TO AUSTRALIAN GENERA

A. Branches not jointed or fleshy; leafy plants.
  B. Leaves flat, often broad.
    C. Fruiting perianth replaced by 2 bracteoles ..... *Atriplex*
    C. Fruiting perianth membraneous 1 to 3 segments ..... *Dysphania*
    C. Fruiting perianth herbaceous of 4 to 5 segments.
      D. Fruit a berry ..... *Rhagodia*
      D. Fruit dry ..... *Chenopodium*
  B. Leaves narrow, entire, often sausage shaped.
    E. Fruiting perianth with dorsal appendages.
      F. Appendages consisting of spines ..... *Bassia*
      F. Appendages 3, soft, spreading ..... *Malacocera*
      F. Appendages membraneous, winglike.
        G. Wings of fruiting perianth nearly vertical ..... *Babbagia*
        G. Wings of fruiting perianth nearly horizontal.
          H. Flowers in pairs, joined at base ..... *Didymanthus*
          H. Flowers solitary.
            I. Leaves prickly ..... *Salsola*
            I. Leaves not prickly ..... *Kochia*
    E. Fruiting perianth without dorsal appendages.
      J. Fruit clustered ..... *Suaeda*
      J. Fruit solitary.
        K. Fruiting perianth succulent ..... *Enchylaena*
        K. Fruiting perianth dry ..... *Threlkeldia*
A. Branches jointed, fleshy; leafless plants with embedded flowers.
  L. Flowers 5 to 7 in the row ..... *Salicornia*
  L. Flowers 3 in the row.
    M. Seed falling off, usually with the perianth ..... *Arthrocnemum*
    M. Seed embedded in enlarged bony axis of the spike ..... *Pachycornia*

ARTHROCNEMUM Samphire. Small shrubs to 1M. of estuarine and saline habitats throughout the world. Fleshy stems sometimes more or less resembling strings of beads or occasionally jointed as crayfish legs. 6 Australian species of more botanical interest than beauty, the best being *A. arbuscula, A. halocnemoides, A. lylei.*

ATRIPLEX. About 120 species widespread in temperate and subtropical regions, in Australia mainly on saline sandy loams and clay. The leaves are an attractive mealy blue-grey, and are particularly useful for foliage contrast. Worthwhile species are *A. acutibracta,* 1M.; *A. angulata,* 1.30 M.; *A. eardleyae,* small prostrate annual.

A. inflata. Annual to 40 cm. One of the best with upright form and attractive pop fruit which turn pink when frosted.

A. limbata. Could be useful in rock gardens.

A. nummularia. "The Old Man Saltbush" of inland on which many pastoral fortunes were founded. Growing to 2M. this plant makes a splendid hedge or specimen. Plants available from Vic. Forest Commission.

A. semibaccata. Procumbent, the fleshy ripe fruit are an attractive red.

A. spongiosa. Rather similar to *A. inflata.*

A. stipitata. 1M. small foliage.

A. vesicaria. 1M. Interesting large fruit.

BABBAGIA. Squash-bush. 4 species of no horticultural interest.

BASSIA. About 60 species of which 50 are Australian. Leaves are less than 2 cm. long and resemble squashy sausages. The fruit, notoriously known as Bindi-eye or (N.S.W.) Burr are often unpleasantly spiny and few are suited to gardens. Notable exceptions are:

B. biflora. 70 cm. Woolly fruit resembling tiny teddy bears.

B. eriacantha. 60 cm. Densely woolly shrub.

B. paradoxa. 1.30M. Densely woolly shrub with particularly attractive young foliage. Highly recommended.

CHENOPODIUM, DIDYMANTHUS and *DYSPHANIA*. No horticultural value.

ENCHYLAENA. Plants resemble *Bassia*.

E. tomentosa. Prostrate or bushy; yellow, orange and red berries. Good ground cover and weed stopper. Very ornamental. Worth trying.

KOCHIA. Of the 50 Australian species most are well worth a place in the garden. Naturally they grow on a variety of saline, loam, and limestone soils. Leaves resemble Bassia, but the shrubs are generally larger, and the fruit are distinguished by large and often brightly coloured wings. Very worthwhile are:

K. georgei. 1M. Spreading shrub covered for long periods with spectacular satiny fruiting perianths. If you have room for one saltbush, this is it.

K. oppositifolia. 60 cm. Upright neat plants.

K. pyramidata, 1.30M. Large spreading shrubs, bearing masses of glistening pale green fruiting perianths.

K. sedifolia, "Bluebush". 1.30M. dense spreading shrub with particularly good blue-grey foliage.

MALACOCERA. Small shrubs resembling Bassia.

M. bicornis, 60cm. Worth a place if you have plenty of room.

PACHYCORNIA. Small fleshy shrubs, the upright jointed stems of which resemble crayfish legs.

P. triandra. 50cm. Vivid green. Sufficiently unusual form to be quite distinct from anything else in the garden. Well worthwhile.

RHAGODIA. About 12 Australian species, small or large shrubs, often with mealy grey leaves. Generally undistinguished excepting *R. nutans*. A very good prostrate ground cover, which will scramble gracefully up and through surrounding small trees and shrubs. Attractive foliage and delicate red berries. Highly recommended.

SALICORNIA. Estuarine plants similar to *Arthrocnemum*, but hardly recommended as garden plants unless your soil is so saline it will grow nothing else.

SALSOLA. Roly-Poly (U.S.A.) Tumble-weed. An annual of botanical and chemical but little horticultural interest.

SUAEDA and *THRELKELDIA* are small shrubs of no great interest.

SALT BUSHES—A note by Albert Hargreaves

From a garden angle some of the genera I have had experience with, make excellent garden plants, they are very suitable for a dry corner and will withstand drought conditions. The Rhagodias make desirable plants for rock banks, and rockery work generally.

Rhagodia nutans has a grey and dense foliage and the red berries produced make a nice contrast. *Rhagodia hastata*, a procumbent grower, has leaves less dense and not so grey as *R. nutans*. They often have a meally-white appearance when young. This species is also very suitable for rock work. *Rhagodia spinescens* is a straggly grower of ascending habit, growing to 3 ft. The smaller branches are spiny but with larger red berries.

Threlkeldia diffusa is a glabrous semi shrub, mostly prostrate to make a good ground cover with its small succulent nearly cylindrical leaves. It is one of the coastal species.

Enchylaena tomentosa is a rapid grower and makes a good ground cover with procumbent branches nearly 3 ft. long. The fruit is either red or yellow. This is the sole species in the genus *Enchylaena*.

Atriplex nummularia (Old Man Salt Bush), is a greyish scaly upright shrub 3 to 5 ft. high, with orbicular leaves with flowers in terminal spikes.

HOW DO I GROW WILDFLOWERS?

A Review of Advice and Practices by the Editor

Is the growing of wildflowers as easy as Len Miller makes it seem (see p. 334). There are many beautiful gardens where wildflowers grow quite successfully. The major objective of this publication is to provide information that will enable all readers to grow wildflowers in their garden so let us review what we have achieved.

We have described hundreds of species of wildflowers of horticultural potential and included recommended methods of cultivation. If you want to grow a *Boronia*, a Eucalypt, or say an orchid, look up the species in the index in front of each volume. To assist a complete index to all six volumes is to be included in Volume 6 when bound or may be purchased separately in December 1972 at $1.50 plus 15c postage. Growers with considerable experience will advise you on the conditions most suited for its cultivation.

ESTABLISHING A WILDFLOWER GARDEN

Reference to previous issues is recommended in the following order.

Read what **experienced growers** can **advise** in:

"Growing Wildflowers" & "Cultivation of Sandstone Flora" by H. M. Hewett, Vol. 5: 158 & 159.
"Wildflower Gardens" 6:58, 147; 3:297; 4:162.
"Establishing A Wildflower Garden" by E. M. M. Boddy, 3:51 with plants 4:67.
"Think Before You Plant", 5:302; "The Root And The Soil", 4:208, 313.

You must now consider your own situation and ***evolve a plan:***

"Landscaping In The Country", 5:58; "A Suburban Garden", 5:308; "Plan A Garden", 6:54, 69, 146.

For the more showy small plants ***built-up bed*** or rockery:

"Experience With Raised Gardens" by W. R. Nottage, 6:307; "Pond", 4:367, 5:13.
"Rock Gardens", 3:98, 101, 102, 133, 5:243. "In Sand", 4:102, 5:210.

For the general garden area you may have ***clay or heavy soils:***

"Heavy Soil Gardening—In Sydney", 3:341; "—In Melbourne", 3:343, 5:195; "—In Adelaide", 5:291.
"Wildflowers In Clay", 3:298, 299, 339, 4:26, 105, 5:211.
"Water Absorbing Plants", 4:25; "Clay In Monsoon Area of North", 4:198.

For gardening ***near the sea*** you have special problems:

"Wildflowers For Seaside", 3:116, 117, 205, 207, 335; 4:55, 199.

Where ***frost*** is a problem or in cold climates:

"Frost Hardy Natives", 3:207, 275; 4:68; 6:134.
"Garden Eucalypts"—A series of special value to cold areas, 4:69, 128, 213, 303; 5:263.

In inland ***low rainfall areas*** with all types of soil considered:

"Gardening In Low Rainfall Areas" by T. R. N. Lothian, 5:54.
"Hardy Wildflowers" by K. Warnes, 6:294.

Garden ***care*** is important with similar problems in most areas:

"Mulching and Watering", 2:13, 14, 93; 4:314; 5:212.
"Ground Covers", 6:67, 239, 241—All articles on this aspect indexed 6:238.
"Fertilise When Planting", 5:357; "Iron Chlorosis", 5:27, 6:131.
"Phosphorus Nutrition of Heath Plants", 3:323; "Nutrition of Grevillea", 4:39.

Finally, give the plants a fair go. One reader from Queensland reports, "I was astounded when visiting the house of a very keen grower to see his plants struggling among couch grass. It seems a pity as he must eventually become discouraged. Could you perhaps find room in the journal stressing that these plants will do better if given a fair chance! A vigorous healthy plant will give much more pleasure."

Why am I Not More Successful in Growing Wildflowers?

After reviewing the many thousands of words published as above, I feel we have still failed to provide adequate answers. We have supplied the answer to "How These Wildflowers Should Grow" and in fact have been grown quite successfully. The reason for failure must lie in the following:

Natural Enemies

The plants are Australian so that we have all their natural enemies. By using nature's controllers I feel we have conquered the above ground predators. Encourage the birds and remove more persistant or plague proportion enemies by physical means. Chemical sprays should not be necessary although No. 50 issue recommends some of the less harmful for thoe who are desperate. What better method of control could you have than that found by Jim Webb as described on page 367? Birds can give you so much pleasure.

The below ground enemies have been more difficult to control. We have created good growing conditions for the plants in the soil but this has also encouraged pests. The article in this issue "A Discussion on Plant Collapse" sets down the results of many years of research by an observant experienced grower and at last offers hope of an effective control. It seems that at this stage of research we must revert to some form of chemical control until we can find nature's way of maintaining the balance. The article "Control of Nematode By Feeding" in the issue offers hope of finding non-toxic control.

The Environment Above and Below Ground

I consider that many mistakes have started from attempts to emulate nature's environment. Many plants survive in nature despite their environment and would prefer better conditions that exist naturally, but that are dominated by more vigorous or robust plants or enemies. The death rate is also very high except in ideal seasons. The principal mistakes arise however from mere man's interpretation of what the natural conditions really are. Who knows what is below ground, where the water table is or just how rigorous the climate is to the plant?

On my visits to other States I have been impressed with the number of plants that do equally as well in similar garden conditions if due allowance is made for the major climatic limitation of the area such as the heat of the direct sun in the north, the frost in Canberra and inland areas, the winds of Adelaide and the alkaline water of Alice Springs. Many plants as listed by Len Miller for Toowoomba, Qld., can be grown in garden conditions from Townsville right around to Perth and Geraldton. Groups in the Society in towns throughout this range produce small booklets for the advice of new members and it is surprising how similar they are. It can be concluded from this that not only are a wide range of natives quite hardy, but if due allowance is made in a particular area for its principal local limitation by providing shade, windbreaks, shelter, water sensibly applied, etc., the soil conditions necessary can be achieved. In Len Miller's case he has the ideal, a good deep garden loam of volcanic origin, natural drainage at depth, reasonable natural water and an elevated temperate climate. Where necessary we too can import or build-up good garden soil in built-up beds to provide depth and drainage.

The Understanding

As with all things in life it gets down to the individual and what he can achieve. There is no doubt we have a lot to learn and it is encouraging that there is a new interest and purpose in our study groups as mentioned in this issue. Future issues will keep you informed but why not join one and share the fun.

GROWING WILDFLOWERS—continued from page 334

Now let us look at some of the plants Len Miller has grown:

Grevillea juncifolia, pteridifolia, albiflora, petrophiloides, dryandrii, nematophylla, longistyla, floribunda, striata, singuliflora, leiophylla, leucopteris, acanthifolia, thelemanniana.

Hakea verrucosa, sericea, purpurea, glauca.

Melaleuca incana, M. wilsonii, M. polygaloides, M. nesophila, M. laterita, M. tamarascina, M. fulgens, M. steedmanii, M. radula, M. violacea, M. thymifolia, M. microphylla, M. elliptica, M. armillaris, M. neglecta, M. pulchella.

Isopogon dawsonii, I. dubius, I. formosus. Petrophile biloba, P. shirleyi.

Acacia denticulosa, A. fimbriata, A. spectabilis, A. doratoxylon, A. baueri, A. brownii.

Dryandra praemorsa. Banksia integrifolia, collina, robur, lehmanni.

Calothamnus villosus, C. chrysantherus, C. blepharanthenus. Chamaelaucium uncinatum, axillare.

Hibiscus divaricatus, heterophyllus, splendens.

Anigozanthos rufa, A. pulcherrima, A. bicolor, A. preissii, A. manglesii, A. viridis.

Lotus corniculatus. Leptospermum scoparium var. *rotundifolium, L. flavescens, L. nitidum.*

Eremaea violacea. Phebalium nottii, Calytrix tetragona, sp. yellow, sp. pink.

Ptilotus spp. *Thryptomene* "Payne's", *saxicola. Baeckea densifolia, ambigua, jocunda. Casuarina torulosa, inophloia,* sp.

Pimelea ferruginea, P. decora. Keraudrenia alba. Cryptandra armata, C. propinqua.

Lechenaultia biloba, L. formosa. Chorizema cordatum. Regelia inops. Hypocalymma angustifolium.

Eucalyptus citriodora, E. perriniana, E. wilkinsoniana, E. kingsmillii.

Pandorea jasminoides. Marianthus pictus. Homolocalyx polyandrus. Crotalaria sp. (blue). *Trichodesma zeylanicum.*

I am positive that native plants can be grown successfully in many parts, soils and climates providing people will learn that watering is not the "be-all" and "end-all" of a successful garden. I have never used compost, manure or fertilizer and have never sprayed with insecticides or fungicides.

TASMANIAN WARATAH—YELLOW FORM

Telopea truncata (Labill.) R.Br. *forma lutea* A. M. Gray

A non-stable yellow flowering form of *Telopea truncata;* differing morphologically only in the following minor details: Leaves rather more oblanceolate to spathulate than the normal form, the apices rounded and blunt or minutely apiculate. The margins are thickened and distinctly yellowish in colour. Both surfaces pubescent, the lower surface densely so with the veins of this surface less conspicuous than those of the normal form, the hairs on the veins scarcely brown. All hairs closely appressed.

All parts of the flower are a distinct, bright yellow without trace of red colouring, identical in form to the normal red flower.

The original plant was collected from the Mt. Wellington Range near Hobart, Tasmania, and is now well established in a garden belonging to Miss E. Huxley at Longley, 14 miles south of Hobart.

Cuttings and layerings have been successfully propagated and established, and all produce completely yellow flowers in all cases.

Seedlings, when grown to flowering age exhibit variations in form and colour, some showing complete reversion to the normal red form, in colour and in form, whilst others exhibit characteristics midway between the two extremes or weighted toward one or the other.

The average proportions of variations and of the two distinct forms, raised from a given quantity of seed from the *forma lutea* has not yet been determined.

Forma lutea tends to flower somewhat earlier than the red form.

This description was compiled by the kind permission of, and on behalf of Miss E. Huxley, Longley, Tasmania.—A. M. Gray.

A DISCUSSION ON PLANT COLLAPSE

by H. M. Hewett, Plant Recording Officer, N.S.W. Region

This article is directed not towards the growing of those hundreds of well known and reliable species seen so frequently in our gardens, but is an attempt to promote understanding of those others which have so frequently proved a disappointment. As a mere enthusiastic layman without qualifications in the field of Botany I realise that in some respects I am, to speak colloquially "sticking my neck out", but I am hopeful that I may be able to stimulate the continued research necessary to the end that all aspects of the growing of these species may be adequately documented, with resultant performances considerably improved.

I have read in our Journals, many and varied success stories on the growing of our indigenous flora and have myself been a "trier" for some fifteen years, during which time I can claim some degree of achievement, but I have the greatest envy of those fortunate few whose voices are occasionally raised in horror at the suggested necessity for consideration of the likes and dislikes of particular species.

As Plant Recording Officer, for N.S.W. Region I have had an excellent opportunity to study the growth performances of many plants in the Sydney area under varied conditions and to attempt to emulate in my own garden some of the outstanding results of other members' efforts. This has induced consideration of a wide variety of aspects pertaining to growth, but in particular to those "mysteries" which beset some of our most desirable species, after a very promising start of some eighteen months or two years. In fact I have even been told by some of our more experienced members that they have given up attempting to grow certain plants because of repeated failure.

Many reasons have been suggested for plant collapse such as:

Unsatisfactory microclimate
Incorrect exposure to sunlight
Incorrect soil texture, acidity or capillary moisture
Inappropriate nursery preparation
Incorrect time of planting such as during the natural dormancy period of the species
Attack by borers, scale, leaf eating insects, etc.

While all of these and many other considerations are certainly at times significant and in fact frequently deliver the knockout blow, I have seen enough evidence to satisfy myself that by far the greater number of failures in Sydney's temperate summer rainfall climatic region can be attributed basically to either one, or a combination, of three factors, all of which originate at or below ground level and are therefore not readily detected until the initial weakening of the plant has already taken place.

The hazards to which I refer are:

(a) "Root Rot", or attack by the fungus *Phytophthora cinnamomi.*

(b) "Collar Rot", or attack by certain other fungi of the generas *Phytophthora* and Pythium.

(c) "Root Knot", or attack by one of the types of parasitic Nematode prevalent in many of our Sydney soils.

Editor's Note: This article is the result of years of careful observation and study. Max Hewett will continue to study this problem. He would be especially pleased to receive comments from anyone who can contribute to this study. An effective control to the fungus *Phytopthora cinnamomi* has become a problem of national importance and a number of professional scientists are engaged in this crisis. Can we assist them in any way?

A—Root Rot

Attack by the fungus *Phytophthora cinnamomi* is perhaps the greatest destroyer of plants of the family PROTEACEAE, which include such sought after representatives of our flora as the Banksias, Isopogons, Petrophilas, Dryandras, Hakeas, Conospermums, Grevilleas, etc. It has also been very troublesome with members of the family LABIATAE, and our Sydney Records show attacks on many other species such as *Pimelea rosea, Lechenaultia formosa,* etc.

This fungus has been recognised in horticulture for many years and was earlier known as the disease of partial die-back, a characteristic which at times indicates its presence.

It is transported by ground waters and after periods of summer rainfall can play havoc with a garden bed.

To date the only satisfactory answer known lies in the provision of perfect drainage, but many other observations can be made which may lead the way to better understanding of it, and ultimately perhaps, if not to its complete control, at least to an appreciation of the probability of success or failure when plantings of subject species are contemplated.

Examination of the root systems of affected plants will indicate destruction commencing at the root ends and progressing towards the stem of the plant. All roots are not always simultaneously affected, and I believe this fact is responsible for the characteristic partial die-back referred to earlier, as the foliage on one side of a plant bears a growth relationship to the corresponding section of the root system. Complete collapse of the specimen would not be expected until the fungus had reached the central stem which it can soon completely surround showing generally a mushroom coloured discoloration of the cambium. Even at this stage however, a reasonably advanced specimen can maintain a vigorous and healthy foliage appearance under favourable conditions, for a considerable period by drawing upon the reserves of moisture stored in the woody stem and branches. In times of high transpiration rate however, this source dries up quickly, and as the root system can no longer compensate, collapse follows rapidly giving rise to much ill-founded conjecture as to the species ability to withstand certain of the secondary hazards referred to earlier.

As mentioned above, drainage is a most significant factor which could possibly explain a phenomenon observed in virgin country in the South Western Corner of Western Australia, where, although no evidence of the existence of this particular fungus was discernible in the undisturbed condition, the action of dozing trails through the countryside had led to many species becoming affected in the path of the disturbance. It is now, I believe, considered that this fungus is naturally existent in many Australian soils, rather than being introduced by artificial means, and it would seem that if disturbance of the ecology gives rise to its propagation, then more careful study of the factors of ecological balance may suggest a lead to its control in our gardens.

To me it seems apparent that under such natural balance, where the flora consists of both deep and shallow rooted specimens as well as possibly an understorey covering of low growing types or grasses developed under a system of survival of the fittest, the concentration of roots would tend not only to cause more water in wet periods to run away on the surface rather than be absorbed into the soil, but would also considerably restrict the free movement of ground water. In contrast, where soil has been disturbed by dozing, competition is greatly reduced, root penetration is also greatly increased, more water is permitted to penetrate the soil and a form of growth is

induced which is considerably more rapid than in the undisturbed state, but which lacks the protection of competition and is therefore more likely to be attacked by the fungus spreading through the more soggy subsoils. The inference for us therefore must be that we would be more likely to grow these subject species successfully if we could establish a garden more nearly containing the root concentrations of ecological balance and give it the minimum of soil disturbance, particularly after planting. This, in fact, has been achieved in Sydney, and one of our very well known members is the proud grower of a specimen of *Dryandra formosa* of some seven or eight years establishment which flowers prolifically each year.

While the above DRYANDRA is grown in a skeletal sandstone soil medium, the same species, with several other Dryandras and Banksias have been grown successfully for some four or five years in heavy brown clay loam derived from the Wiannamatta shale. In this instace, I believe situation is significant in that the side of a hill has been selected where free drainage is available to a depth of some six feet below the surface, thus allowing good capillary penetration upwards from a permanent moisture track while at the same time permitting free flow at a sufficient depth below the root systems to obviate contact with saturated conditions.

Perhaps in some gardens this drainage and soil moisture condition could be achieved artificially. At least the exercise would be well worthwhile if attempted by members with the appropriate garden topography, and results documented.

I do believe however, that some soils are more likely to be free of this fungus than others, and here, providing adequate care is exercised to prevent its introduction, some success in growing the subject species could reasonably be anticipated. The geologically recent soils associated with volcanic action do seem to offer this advantage. It might be worthy of note here that reports from several of our members in New Zealand also seem to confirm this advantage with such soils.

For the rest of us, gardens in virgin soil seem to offer considerable advantages over long established gardens where it might be reasonable to assume that the fungus had been allowed to build up to a relatively dangerous degree.

A little more needs to be said of *Phytophthora cinnamomi*. Where it is introduced possibly through affected nursery specimens or soil, spread through the gardens in periods of heavy rain is considerably faster downhill than uphill. In fact I am not yet convinced that spreading uphill occurs at all. The above of course must be obvious when one considers, as stated earlier, that the spores are transported by the flow of ground water.

Another interesting phenomenon which suggests the need for research and documentation is the relationship between heavy partial pruning and subsequent attack by the fungus. I have noted this particularly in respect to species of the genera *Prostanthera*, and to some degree with the Grevilleas, where apparently healthy specimens have collapsed under attack by this fungus subsequent to such pruning. If one could hazard a guess, I wonder whether the sudden loss of transpiration by removal of part of the foliage, destroys the moisture balance in the plant, leaving the related roots holding more moisture than normally and so promoting conditions conducive to development of the fungus?

Another possibly related phenomenon occurs in dry seasons, where partial die-back of the upper foliage could conceivably be related to the actual ground water available. When the apparently dead branches are

removed, further die back frequently soon appears, and if the treatment is repeated, complete collapse often occurs, with the appearance of the root system resembling attack by Phytophthora.

On the other hand if the defoliated branches are allowed to remain on the specimen, a change of season frequently promotes new healthy growth and a complete recovery follows.

Obviously, much more documentation of this phenomenon is necessary, but I believe that it could provide evidence that *Phytophthora cinnamomi* is present in many soils, yet only becomes troublesome when natural balance is disturbed.

B—Collar Rot

The position with regard to Collar Rot, or as noted earlier, attack on the stems of plants, at, or just above ground level by one of a number of fungi is considerably more hopeful of treatment by physical and chemical means than is the case with Root Rot as discussed above.

Discussion with members of our Society from the Victorian and South Australian Regions suggests that it is probably their major growing problem, and in Sydney area it is particularly prevalent. Many species are affected, but in particular I would note the families LABIATAE, GOODENIACEAE, RUTACEAE and small members of the inland or Western MYRTACEAE and THYMELAEACEAE as being particularly susceptible.

As with *Phytophthora cinnamomi* the primary cause of collapse is not always apparent to the casual observer and is frequently erroneously attributed to one of the secondary reasons mentioned earlier.

Although the likely period for attack by the fungus is during high humidity in summer, some species seem to have sufficient reserve moisture in their wood to carry them on in a state of at least reasonable if not completely vigorous appearance, until almost the start of winter, before final collapse, which then occurs quickly over a two or three day spell of higher than usual transpiration rate. Recent examination of a specimen of *Banksia ashbyi*, which indicated final collapse at the end of May, showed clearly that the Collar Rot must have done its initial damage probably several months earlier.

As mentioned above, when attacked by Collar Rot, the cambium layer is destroyed at or just above ground level, thus breaking down the canal through which sap is carried to the foliage from the root system. With many species the first indication of impending disaster is a limpness or turning down on the foliage tips, and if the weather remains dry, complete collapse follows quickly. On the other hand, if wet or very humid conditions eventuate, apparent recovery can take place, due to the taking up of moisture by the foliage. This can be misleading and can present a healthy appearance for a considerable period, but inevitably the end must come with a change to drier weather.

I think it is appropriate to mention here that it is quite possible for plants to be grown in containers under humid nursery or glasshouse conditions to a relatively advanced stage merely by foliage absorption of moisture (as also occurs in a cutting frame) even after attack by one of the fungi mentioned. Obviously such stock would give unsatisfactory performance on planting out, even when this is done at the start of winter and the plant derives benefit from several months of high humidity in the promotion of some foliage development.

Perhaps it may be prudent to attempt to ascertain the health of a specimen in this regard by careful examination of the stem, before planting.

As with *Phytophthora cinnamomi* these fungi seem to be present naturally in many of our soils, and perform the function in the ecological balance, of breaking down vegetable matter to provide food for the next generation of plants, and thus, probably help achieve a survival of the fittest when abnormal weather patterns prevail such as extremes of wet or dry.

In Sydney's gardens, Collar Rot is no less a hazard (as is sometimes suggested) in the growing of South Eastern Australia's own endemic flora than it is with importations from other climatic regions of the Continent, e.g. note the difficulties experienced with some of our Boronias, Eriostemons, etc.

Apart from the weather, which of course must be considered the major contribution to this form of attack, I list the following factors as significant:-

(a) Soil which contains too much humus in the surface layers. Although this condition is highly suitable for promotion of quick early growth with some species, it is also an ideal medium for harbouring the fungal spores, awaiting the suitable weather pattern for commencing their destruction. Much of our flora, including many of those highly desirable small species of the Western MYRTACEAE seem to make quite satisfactory growth in the subsoils of the Sydney district, and therefore there is really no point in exposing them to the hazard of a humus rich medium.

(b) *Vegetable mulches which are placed too close to the stem of the plant.* From the previous paragraphs it would be obvious that this condition would retain moisture in an area where it would be most likely to encourage fungal attack. Furthermore, bright light itself seems to be an inhibitor of attack and if the soil is exposed for say 3" or 4" radius from the stem, not only will the soil in this area dry out faster, but the additional light available will be of considerable benefit. Another significant fact is that, in a growing plant, growth itself is related to the rate of cell division, and as with the foliage, where the maximum rate of cell division occurs in leading tips, so with the root system, the maximum rate of division occurs at the root ends, and decreases towards the stem, where the thicker roots are virtually inactive in this regard, being merely sap carriers. It is apparent then that the logical area for provision of soil moisture, and hence plant food, is where the root ends occur, and not only would no useful purpose be achieved in keeping the inner area moist, but actually it should be of considerable benefit in combating Collar Rot to maintain it as dry as possible.

With regard to mineral mulches such as Blue Metal or other gravel it is at least as valid, if not more so, because its presence near the stem must have the effect of leading more precipitated or artificial moisture to this area, whereas if the earth were allowed to cake, and if preferably, this area were slightly mounded, greater run off must occur.

(c) *Abrasion of the stem.* This can occur from several causes and does appear to be a significant factor in development of attack. Perhaps the most common cause is from movement of the plant by wind, when rocking at ground level provides an air space around the stem and abrases the bark.

A similar abrasion occurs when stone is used to stabilise the young plant. In this case the damage does not usually occur until the specimen has grown up to some extent, but the larger the plant grows the more difficult it becomes to stabilise it effectively by this means with consequent damage.

I think the most effective manner of affecting stabilisation is by using several sticks placed at an angle of say 45° through the upper foliage and tied to same. Each plant would probably need to be staked in three directions to be secure in all directions, until such time as growth of adjacent specimens provides alternative means of support.

Chemical Control

From the chemical point of view Collar Rot can be controlled reasonably well by treatment with fungicide, probably the most effective being used to any extent to date by our members being the product DEXON.

For this treatment to be effective, however, it should be regarded as preventative rather than corrective and it is also imperative that the physical controls mentioned above be rigidly applied. A further physical consideration which can assist the DEXON to combat the fungal attack is the provision, where species are sufficiently tolerant, of a freely draining soil medium such as very open sand, or gravel. This latter should not be regarded as conflicting with the comments above concerning a gravel mulch because in the present instance emphasis should be placed on the phrase freely draining which implies that the gravel is used as the predominant growing medium for an adequate depth rather than being merely applied to the surface. By using such a freely drained medium (a) the DEXON can rapidly penetrate the surface and (b) I believe fungal spores could be dispersed more readily from the danger zone.

Dexon is a very slight root inhibitor but except on unrooted cuttings, no apparent serious effect upon plants has been noted by members using it, even when applied at regular intervals of three or four weeks. In gardens where it has been used it is not claimed that complete freedom from Collar Rot casualties has been achieved immediately because, as has been pointed out there are also physical considerations involved, but it does appear that the incidence of attack by the fungi reduces considerably after several applications. Perhaps this is because the soil medium treated becomes progressively more free of the fungal spores due to successive measures which prevent its completing its reproductive cycle.

I would suggest that some artificial feeding of the plants however would be beneficial to compensate for the lack of decayed vegetable matter which the parasitic fungus would otherwise have provided, if growth rates appear to be less than would be expected during the particular season.

When to Apply

As mentioned earlier, Collar Rot attacks during the warmer part of the year, and I consider the period for applications of DEXON in Sydney should generally range from say October till April for Eastern and moderately subject, Western species, and from September to May for very subject Western species such as *Hypocalymma robustum* and some of the Pimeleas.

The weather pattern which is most likely to promote this fungal attack is when overcast conditions prevail for several consecutive days, limiting considerably the temperature range between day and night, and when heavy capillary moisture, is available in the soil from either rain or excessive artificial watering. From experience to date it would appear to be more desirable to make applications of DEXON at the appropriate time according to the above weather phenomenon rather than to embark upon a set programme at regular intervals. DEXON is very soluble agent and is rapidly dispersed by rain or heavy watering.

In the making of applications undue care need not be taken in trying to avoid contact with foliage or flowers as no effect upon them has been noticed.

C—Root Knot

Root Knot, or more correctly speaking Nematode attack is certainly a major hazard for Sydney gardeners, although reports I have received from the Southern states suggest that it does not cause the trouble there that we unfortunately know too well.

As with hazards "A" and "B" many species are subject, but I would name the major families reported to be attacked as RUTACEAE, LABIATAE, GOODENIACEAE, MYOPORACEAE, and to a certain extent, PAPILIONACEAE.

The time of attack is after periods of rain in the warmer months of the year, a fact which could possibly explain the lack of reports of same from Victoria and South Australia, where mainly winter rainfall prevails.

Parasitic nematodes or eel-worms are microscopic in size and are therefore not discernible without very strong magnification. Their eggs can remain dormant for very long periods (several years at least) awaiting suitable weather conditions to hatch out, when they attack the root systems of plants forming irregular but very distinct nodules which completely destroy the root structure, thus preventing the transport of moisture to the foliage, and so initiating plant collapse in periods of high temperature in much the same manner as described for hazards "A" and "B".

In this case plants may survive with reduced vigour for several seasons on occasions, until all of the roots have been structurally destroyed. This comment would particularly apply at times to larger specimens such as some members of the family LABIATAE.

In Sydney soils, parasitic nematodes are found naturally in the light to medium soil range rather than in the heavier types, but they can be transported very easily by potted plants, and on garden tools, boots, etc., and once introduced to gardens in the heavier soil range can soon develop into a serious problem especially as sandy loams from the Nepean flood plain are being used extensively for garden purposes and these have frequently been found to be heavily infested.

Nematode attack has been recognised for many years as a serious problem for gardeners, but until comparatively recently, soil sterilisation has not been readily applicable without damaging established plants.

There are now on the market however several products which have overcome this disadvantage. One such product 'NEMAGON 90" which has been produced by Shell Chemicals has been used for up to two years by some of our members, and the results achieved have been nothing short of dramatic. I have been advised by an Officer of the N.S.W. Department of Agriculture that this product should not be used on bulbous plants, but that another called NEMACUR is satisfactory for this purpose.

In my own garden I have observed improved vigour and appearance of plants in beds where Nemagon 90 has been used and have been advised by the officer mentioned above, that although no ready explanation of this phenomenon is available other reports have been received of similar results.

Mode and Time of Application

As mentioned earlier the eggs of the Nematode hatch under suitable weather conditions, and these are in the warmer months of the year when the soil is damp after rain. In Sydney this condition could be anticipated from October onwards, and I do not consider that earlier application would achieve maximum results. I make this comment in spite of the fact that at the present time conclusive statistics are not yet available from members' experiences with Nemagon 90, although some evidence is available to show that no new infestations have developed since it was first used

up to two years ago and where no new follow up application has been given. Obviously more experimental work and documentation is necessary.

Nemagon 90 is sold in concentrated form and should be broken down with water for use. A concentration of three ounces per gallon of water has been used generally although some members have used as little as one ounce per galoln. Again statistics alone will provide the answers.

Mode of application should be by injecting or pouring into holes in the soil 9" deep spaced 12" apart in each direction at the rate of one fluid ounce per hole. The surface is then sealed with a garden tool or by the boot. Where shrubs are established applications 6" from the stem do not have any apparently serious effect, although obviously as much care as possible should be exercised to avoid damaging the root systems when making the holes. In this regard it would seem to be desirable to treat a complete bed before the root systems have developed too far.

A warning should be given against using Nemagon 90 in the form of a sprayed or poured application over the foliage. This is not intended and can have very serious effect on the foliage of some species.

As with Collar Rot, the treatment for Root Knot should be regarded as preventative rather than corrective, although some evidence is available of plant recovery from attack, after treatment, with species of Eremophila. Perhaps recovery would depend upon a plant's ability to produce new roots from near the base of the stem, an ability which does not appear to be common, and which could not be anticipated with species of RUTACEAE.

Finally, I wish to acknowledge assistance given by Officers of the N.S.W. Department of Agriculture in examining root systems of many affected species, and in identifying the fungus or Nematode attack, as the case may be, considerably assisting what I believe represents a considerable advance in our knowledge of the garden growing of the Australian Flora.

CONTROL OF NEMATODE BY FEEDING

Dr. H. Heimann, Israel Institute of Technology, Haifa, Israel

I came across this interesting report which may offer some hope of control without resort to chemicals. Trials are now needed—Editor.

The sodium-potassium relationship is of utmost importance for the proper functioning of nerves and muscles. Whereas this fact has been given full attention in human physiology and in animal nutrition, it has scarcely been taken into consideration as far as insects, nematodes, and other animal or plant parasites are concerned.

There are numerous cases in the literature of potassium fertilizers affording protection against nematodes, mites, aphids and other pests, an effect usually attributed to a better supply of mineral nutrients in general (high nitrogen, however, often causes a heavier infestation). But potassium fertilizers in soil or foliar applications provide an excess of potassium "easily tolerated by the plants", and the so-called luxury consumption of potassium seems to be detrimental to many of the pests feeding on these plants. Also by controlling parasites that are vectors for certain virus and fungus diseases, luxury feeding of potassium—the K in the NPK formulae—many assist with control of these diseases.

CONTROL OF LEAF GALL ON EUCALYPTUS

by J. H. Webb

Galls are common objects on Eucalyptus trees, they consist of malformations, usually induced by some stimulus initiated by an insect. Insect galls may contain wasp larvae, fly maggots, psyllids, or scale insects. The larvae being surrounded by leaf or stem tissue is very difficult to reach, by spray, and only expensive and dangerous systemic sprays would be of any use and then only on small trees. On these small trees hand removal is possible for bad infestations. But what of bad infestations on large trees?

I was faced with this problem after moving recently to a suburban block cut from a dry sclerophyll forest remnant of *Eucalyptus rossii*—"Scribbly Gum" and *E. macrorhyncha*—"Red Stringybark". Knowing that the gall infestation would not kill the trees I decided there was nothing that I could do but just live with it. But control was to come through a series of events which I did not expect, and from an agent that was not known to me, or indeed to experienced workers in this field, to clear up this disfigurement.

It started with kitchen scraps being placed out for the birds. These attracted all types, but only favoured a few, so we sought to attract the parrots as well by providing a seed only table. Along they came, Eastern and Crimson Rosellas, Grass Parrots, Galahs, Gang Gangs, young and old. Only one of these Crimson Rosella *(Platycercus elegans)* we noticed flew up into the branches and pulled off leaves after feeding at the table.

On examination of these leaves they had been gall infested but had been pulled apart and the insect extracted. They have kept this up and now our trees are clean, with the surrounding ones still infested. We enjoy their company even more so now that we know what a great job they are doing.

The tree crowns have thickened up casting a mottled shade, where the grevilleas and other nectar plants are growing, to eventually supply food for the only group of birds that are missing out on a food source; the honeyeaters. Who knows what other of our pest problems they may solve.

CONTROL OF TREE GROWTH

Growth rate of tree branches can be manipulated by cutting just through the bark of the tree trunk. A cut above a branch, extending about an inch beyond the branch diameter on both sides, will result in faster growth. A similar cut below will reduce growth rate. Thus you can slow down a large limb and accelerate a small one and bring a tree into better balance. How does it work? Cutting below reduces the supply of water and nutrient minerals from the roots, while cutting above increases the supply.—Dawes Arboretum, Newark, U.S.A.

The Department of Ornamental Horticulture, University of California (Davis, CA 95616), has found that pinching the lateral branches on the lower trunks of young trees—removing the terminal bud when the branch is about 5" long—tends to increase the trunk diameter and reduce its height growth. Completely removing the lateral branches, which is often done to make saplings look more "tree-like", has the opposite effect, making it less.

The researchers also noted that pinching the laterals resulted in production of more primary and secondary laterals than did leaving the tree unpruned. "Since lateral branches provide photosynthates and growth hormones to the trunk, more uniformly distribute stress along the trunk, shade the trunk and may discourage vandalism, pinching the branches to keep them shorter is a better practice than complete removal of the lateral branches."

GUIDE LINES FOR STUDY GROUPS

D. K. McIntyre and J. W. Wrigley

Study Groups have been formed in the past to study particular groups of plants, usually genera. One of the original aims of such groups was to collect information about a particular group of plants, and make it available to all through publication.

The main function of most study groups as they exist at the moment appears to be the exchange of cutting material and seed. While this exchange of propagation material must not be discouraged, it should not be the prime function of a study group.

Some groups in the past have done surveys and prepared questionnaires or data sheets to try and collect information about plants being grown in various areas. To date this information has not been published in "Australian Plants". The present review of study group activities and advice on their reporting is to assist them to compile data that may be presented for publication.

A common format of questionnaires in the past has been:-

Species	Height x Width	Age	Soil	Drainage	Sun	etc.

The aim of this type of survey has been to collect data to try and answer a specific problem. The type of questions asked are general and will only provide general answers, which are almost impossible to interpret in a meaningful way, and certainly will not give answers to specific problems. This type of survey could only provide answers within a broad range of height and width of a species, or the overall range of flowering times, etc. Information which could have been obtained more easily by asking direct questions.

To assist study group leaders to assess the conditions that effect the plants under study, the following article has been prepared. They hould first decised on a specific problem or limited range of problems and carefully design a questionnaire to suit.

Factors Affecting Plant Growth Which Should be Considered When Assessing Garden Performance

by D. K. McIntyre, Canberra Botanic Gardens

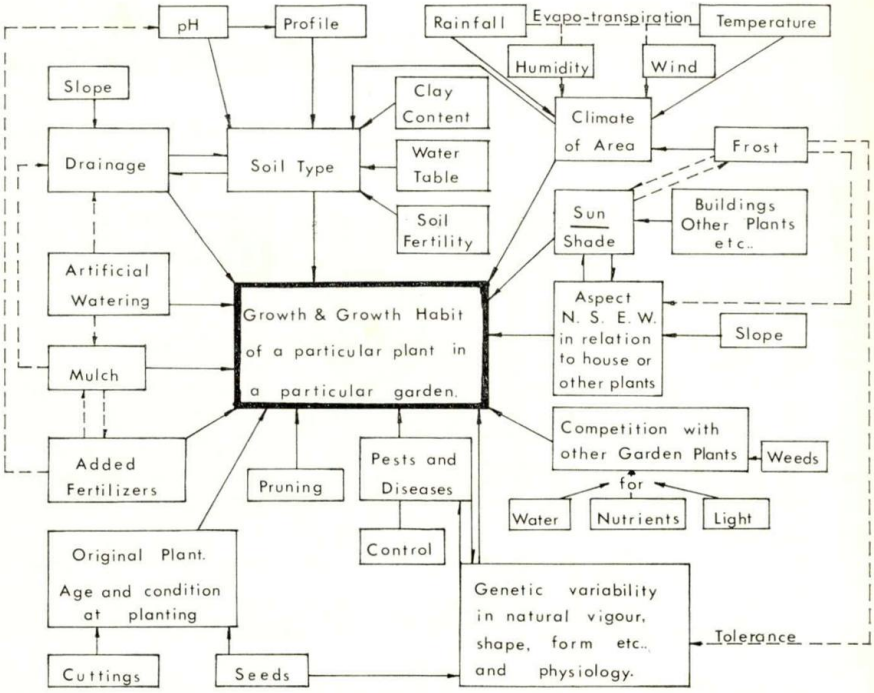
How often do we hear "that doesn't grow in Sydney it's too wet"; "it won't grow in Canberra it's too cold"; "you can't grow that in Perth the summer is too hot" etc., and about the same species you hear "We've grown that in Sydney for years"; "I grow that in Canberra near a wall"; or "it grows in Perth quite well".

Gardeners are prone to generalisations. Very often because a plant has failed in their own garden in a particular area the verdict is that it won't grow in that area. Other generalisations which are so often heard, attributing single factors such as soil, drainage, or a particular fertiliser to the success or failure of a plant in a garden are usually just as imprecise.

Many plants are growing in sub optimal conditions in their natural habitat, because of the necessity to withstand fairly wide fluctuations in a

variety of environmental conditions. Because we tend to narrow the range of these environmental fluctuations in our gardens by such things as artificial watering, covering from frost, and shading, the geographic range of a plant can be greatly increased. The performance of plants under these garden conditions is often quite different therefore from that exhibited by the plant in its natural habitat.

Plants may be very sensitive to small changes in environmental conditions and these will be reflected in the plant's growth. On the other hand the same plants may be able to withstand a very broad range of a particular environmental factor without showing any apparent differences in growth or growth habit.



The above figure attempts to outline factors which can affect plant growth, and to point out how these factors interact with one another in a garden situation. These factors and interactions form very complex combinations which make any site different from any other site in any garden. The following explanation will show how growth is affected by the various factors in a garden. This will be necessarily brief because of the complexities involved:

Soil Type:

The soil type in an area is basically due to an interaction between climate (past and present), parent material and past vegetation.

The actual soil type in a garden is determined by the physical and chemical properties of the soil. The most important aspects of soil type in relation to plant growth are:-

(a) The clay content. It largely determines the soil's ability to hold moisture, and the availability of nutrients.

(b) Other fractions. Silt, sand and gravel are larger particles than clay allowing for greater and more rapid penetration of air and water. Humus and micro-organisms in the soil make up the organic and biotic component.

(c) Soil fertility: It is a measure of the availability of nutrients for growth.

(d) pH: It is a measure of the acidity or alkalinity of a soil. It varies down the profile, and therefore through the root zone of a plant. All of a plant's roots will not be in contact with soil of the same pH, it may vary quite a lot. The most important area is the feeding root zone, near the surface. Usually pH changes the availability of nutrients to plants.

(e) The water table: It may be affected by such impermeable layers as clay and laterite, which can slow down drainage.

Drainage:

Drainage is affected by:

(a) Soil type: heavy soils do not drain as readily as sandy soils, hence the growth of plants may be affected. For example plants often do not grow well in heavy soil.

(b) Slope.

(c) The influence of man: in the building up of beds, building walls and drains, drainage is changed.

Artificial Watering:

This factor increases the total amount of water a plant receives each year, and this increase is usually reflected in the plant's growth. It may grow more vigorously if it can tolerate added moisture. On the other hand its vigour may be reduced if it can't, and death may even result.

Mulch:

The type, thickness and water repellant characteristics of the mulch used will affect plant growth directly and indirectly. The mulch keeps moisture in the soil, so this will affect the fluctuation of soil moisture. Some mulches are water repellant and prevent water from getting in to the soil. Substances leached out of some mulch materials sometimes have an affect on the growth rate of plants and on the pH of the soil over a period of time. The biological break down of the lower layers of some mulches can cause the immobilising of nutrients, particularly nitrogen, and make these unavailable to the plant.

Added Fertiliser:

The use of inorganic or organic fertilisers will directly affect the growth of plants.

The addition of too much fertiliser may cause toxic effects which will reduce growth. The addition of some fertilisers will change the pH of the soil.

Pruning:

This may alter the type of growth of the plant (e.g. more laterals) and hence its shape. It often increases the vigour, by removing old wood and encouraging new.

Pests and Diseases:

Insects and other animals, fungi, bacteria and viruses cause both physical and physiological damage to plants, thus changing their appearance and vigour. These may operate both above and below the ground. The extent of the attack and its control will determine the shape and growth of a plant.

Pests and diseases will interact with such things as soil type, drainage, and general climate.

Original Plant:

The age and physiological condition of the plant at the time of planting out into the garden can affect its later growth. Rootbound nursery stock, root damage at the time of planting, and poorly fertilised nursery stock will affect the mature plant.

Some plants perform differently when raised from seed or cuttings. Some plants from cuttings have poor root systems which greatly influence their future life.

Genetic Variability:

Plants of the same species can show a very broad range of variability in such things as vigour, morphology and physiology.

The interaction of particular genetic variability with a particular environment is quite often evident. Plants from the same seed lot will have different shapes, different frost tolerance, different response to fertilisers and different responses to disease.

Competition:

Competition with other garden plants for light, water and nutrients can greatly affect the growth of a plant. Competition with weeds is also important, but in the garden situation should be controlled. If it is not the plant will suffer.

Aspect:

Aspect must be considered in two ways—firstly in relation to the whole garden, which for instance, may be facing west, and secondly the plant must be considered in relation to something else e.g. house, fence or tree. The plant may be on the north side of a house on a west facing block. Slope will also have an affect on the impact of aspect. The interactions of aspect with temperature, drainage and length of sun/shade will influence the growth

Sun/Shade:

The amount of sun or shade a plant receives will influence its growth—heavily shaded plants may have softer growth than those in full sun. This is related to frost, in that soft plants are usually more prone to damage than others, but the object giving shade often also provides protection from frost.

Buildings and other plants determine the amount, type and duration of shade or sunlight received by a plant, and the time of day it receives it. The time of the year will determine sun/shade e.g. some plants may receive very little sun during the winter, but be in almost full sun during the summer.

Climate:

General climate is usually one of the prime determinants of plant growth in an area. Its effect on soil type has already been mentioned. Rainfall, humidity, wind and temperature independently affect plant growth. Combined they determine such things as evapotranspiration—the net water balance of a plant.

Frost:

This is considered separately because of its influence on what can be grown where and is of great importance to gardeners. The interactions between frost and many other factors such as aspect, sun/shade, and the genetic variability decides a plant's frost tolerance.

The effect of frost on a plant is very difficult to evaluate in general terms.

There are genetic limits to the growth of plants ;no matter how well a small shrub is treated it will never become a tree; some species won't tolerate frost; others cannot tolerate alkaline soil and so on. Facts can be established about a species in relation to a particular environmental factor, but only in relation to its broad tolerances to this factor. These tolerances will ultimately determine its shape, size and whether it will live or die in a particular site.

How do we compare two plants of the same species showing equal size and vigour at the same age? One may be growing in an area with a 20" rainfall, reavy soil, mulch, frequent watering, no added fertiliser but on the northern side of a house in half shade. The other in an area with a 60" rainfall, light sandy soil, no mulch, infrequent watering, frequent fertilising and also growing on the northern side of a house in half shade. Do we say this plant needs half shade and a northerly aspect?

Acknowledgements:

Thanks are due to Terri Woollcott for drawing the diagram, and to staff of the Research Section, Yarrabunda Nursery, particularly Mr. P. Pope, for helpful criticism.

WILDFLOWER STUDY GROUPS

Study groups comprise readers who wish to grow species of a particular group of plants and observe results. They may reside in any part of Australia and contact each other through a leader usually by mail. No special qualifications are required for membership or even for the leader, just an enthusiasm for the cultivation of certain species. This method of organisation is particularly convenient for country members as well as town dwellers who do not, or cannot attend meetings. The leader arranges to keep all members abreast of the activities of others usually by some form of a newsletter and arranges interchange of seed, even plants.

Country members can be especially helpful, even if they do not wish to participate in the groups, by collecting seed from wildflowers in their area. This is urgently needed and we can arrange to have the plants properly identified for you. You can easily have this done yourself by sending a flowering specimen to the Director of the Botanic Garden in your State Capital City.

Some Study Groups and their leaders are:

Acacia: Mrs. J. B. Armitage, 10 Anembo Road, Terrey Hills, N.S.W. 2084.
Banksia: Jim Carney, 28 Linlithgow Street, Mitcham, Victoria, 3132.
Blandfordia: Don McNair, 42 Ingall Street, Mayfield, N.S.W. 2304.
Boronia: Alan Ward, 66 Cecil Street, Gordon, N.S.W. 2072.
Eremophila: Mr. Ken Warnes, "Waldon", Owen, S.A. 5460.
Eucalyptus: Ted Daniels, 23 Dorking Road, Cabarita, N.S.W. 2137.
Hakea: Royce Raleigh, 23 Arlie Crescent, Montrose, Vic. 3765.
Insectivorous Plants: Mr. Steven Clemesha, 18 Wesson Road, West Pennant Hills, 2120.
Pea-flowered Plants: Ross McDonald, 6 Evon Avenue, East Ringwood, Vic. 3135.
Prostanthera: Keith McIntyre, Botanic aGrdens, Dept. of Interior, Canberra, A.C.T. 2601.

MEMBERSHIP OF STUDY GROUPS

Any reader is eligible to join a group. Our most desperate need is for seed so if you live in a country area and can do little more than collect seed, then please do this.

MY EUCALYPTS

Concluding an article "The Obliging Myrtaceae" by Jean Turner of Adelaide

An interesting point in connection with my Eucalypts is the extraordinary range of their natural distribution, which clearly shows the adaptability of this genus. Western Australia has given me *E. caesia, E. erythrocorys, E. stowardi* (twice damaged by wind), *E. spathulata, E. ficifolia, E. websteriana, E. salubris, E. salmonophloia.* From the eastern states I have *E. maculata* and *E. sideroxylon; E. citriodora* from Queensland; *E. globulus, E. linearis,* and *E. amygdalina* from Tasmania and *E. microtheca* from the north of South Australia and the Northern Territory. The "locals" are *E. diversifolia, E. leucoxylon* var. *macrocarpa,* and *E. gillii,* another dry area one which also extends into N.S.W. Eucalypts from every state in Australia all growing well in one suburban garden in Adelaide, could you have any higher recommendation?

These are all well established trees that are growing strongly, recently planted ones are not mentioned, though I am tempted to include *E. alpina* from the Grampions in Victoria, two feet high and looking very healthy, and *E. tessellaris,* a tropical species which grows right across the north of the continent from Queensland to W.A. It is four feet high and growing well though in need of a dose of iron chelate as it is becoming a little chlorotic at the tip. None of the species listed has ever received treatment of any kind except *E. citriodora* which became very yellow when first planted and would have died. It had one dose of iron chelate and has never looked back since, it is now about forty feet and still going up.

Perhaps the most outstanding contrast is between *E. globulus* and *E. linearis* from Tasmania which are both growing only a few yards from *E. microtheca* which marks the courses of the rivers, when they run, in the dry inland of South Australia and the Northern Territory. Two more completely different types of country it would be impossible to imagine.

Some Small South Australian Eucalypts

by I. G. Holliday—Concluding an article in the previous issue

E. cneorifolia—"Kangaroo Island Gum" or "Narrow-leaf Mallee". This species is well known on Kangaroo Island and has been recorded by Black for the Encounter Bay area, 50 miles south of Adelaide. It can be a mallee or single trunked tree to 30 ft. high, distinguished by its very narrow leaves. These are rich in eucalyptus oil for which the tree was once extensively used. The bark of the "Kangaroo Island Gum" is mainly smooth and grey but with rough, dark grey bark on the lower part of the principal stems. Small, white flowers occur in axillary umbels, usually in late summer and the bud caps are dome-shaped, or almost hemispherical. Fruits are sessile and cup-shaped, occurring in rounded clusters, the valves slightly protruding. "Kangaroo Island Gum" is a very useful species as it tolerates most soils, including limestone, frost, mild drought and strong winds. It is used successfully as a street tree in Adelaide.

E. fasciculosa—"Pink Gum", so named because of the colour of its timber, is a South Australian eucalypt indigenous to the poorer, rocky or sandy soils over clay of the Mt. Lofty Range and elsewhere such as the South East and Kangaroo Island where rainfall is 20" or more. It is a small, usually crooked tree, with smooth white bark, sometimes rough at the base and a rounded canopy of foliage to 25 ft. high. Specimens up to 50 ft. are known on deeper soils in the South East of the State.

This is an ornamental tree mainly due to the informal but interesting shape of its trunk and branches which add great character to gardens near Adelaide where this tree has been retained. The flowers are small and white on loose terminal panicles and the fruits pear-shaped with a conical operculum.

A good tree for poor soils with an assured rainfall.

E. gillii—"Curly Mallee" is native to the northern Flinders Range and eastward to the New South Wales border near Broken Hill. A typical mallee growing in dense thickets it is particularly attractive en masse because of its silvery blue foliage which contrasts well with the natural brown of its dry area habitat. "Curly Mallee" is usually of crooked growth up to 20 ft., the stems slender with smooth, grey bark and heartshaped, sessile leaves. The flowers, which occur in the leaf axils, are in pale lemon clusters and are most attractive against the silvery, blue leaves.

This is an ornamental species suited by dry conditions but succeeds in gardens receiving up to 25" of rain. It is a good, small tree for limestone soils.

E. lansdowneana—"Crimson Mallee Box" or "Port Lincoln Mallee" occurs near Port Lincoln and extends northwards to the Gawler Ranges on Eyre Peninsula. It is also recorded for Kangaroo Island.

It is generally a straggly tree to 25 ft. high with rough, grey basal bark and smooth grey bark above. Although fairly popular as an ornamental, it is not, in the writer's opinion, a particularly attractive eucalypt either for its habit or foliage. The flowers, however, can occur in an intensive purple or mauve colour which is unusual in a eucalypt and it is this feature which attracts growers to the tree. Other flower colours are crimson, pink or white. The white flowering form has been given a different name—*E. lansdowneana* var. *leucantha*.

"Crimson Mallee Box" is an easily grown tree suited to most soils including limestone, where rainfall is in the 10"-25" range.

E. leucoxylon macrocarpa—"South Australian Blue Gum" or "Yellow Gum" is the large fruited form of the "South Australian Blue Gum" *(E. leucoxylon)* and occurs as a dense, bushier tree which is much shorter than *E. leucoxylon,* seldom growing taller than 30 ft. This form of the "Blue Gum" is usually associated with coastal conditions and is native to Kangaroo Island, Eyre Peninsula and the South East of the State.

Features of the tree include a large canopy of foliage; the leaves large, leathery and hanging vertically; smooth creamy yellow bark shed in irregular flakes and quite large, showy, red, deep pink or cream flowers, usually in autumn or winter. The fruits are quite large and cup-shaped.

This is an ornamental flowering tree for coastal planting and also inland where rainfall is moderate (not under 15") and is suited to most soil types.

E. pimpiniana—"Pimpin Mallee" is a rare species only known to occur in sand hill country near Ooldea in South Australia's far west. In this habitat it is a small mallee up to 10 ft. high, although cultivated specimens in Adelaide are known to have grown into moderate-sized, single-stemmed trees to 25 ft.

"Pimpin Mallee" is rough-barked at the base, thereafter smooth greyish bark, with thick, stiff, grey-green leaves and drooping umbels of creamy-yellow flowers. Fruits are elongated, pear-shaped and the bud cap conical, tapering into a thick pedicel.

This tree has not often been cultivated but appears to be suited to limestone and clay over limestone, as well as sandy soils.

E. youngiana—"Ooldea Mallee". Once known as *E. pyriformis,* "Ooldea Mallee" is native to the dry Woomera, Tarcoola, Ooldea country of South Australia where it is a straggling, shrubby mallee no more than 10 ft. high. It is also recorded for Western Australia where it tends to merge with the tree *E. pyriformis* and may not appear in exactly the same form as the South Australian plant.

"Ooldea Mallee" is easily distinguished because of its very large ornamental flowers and ribbed fruits which are 2 inches or more across. The flowers can be red, dusky pink, or yellow in colour. Bark is smooth and grey or brownish, rough at the base of the main stems and the leaves, thick and grey coloured.

This is an ornamental species because of its flowers and is suited to well drained soils in areas of moderate rainfall or to dry areas.

THE SUGAR GUM

by Rae Sexton

I would like to point out a small misconception of Mr. Ivan Holliday ("Australian Plants", volume 6, page 286, June 1972) which is not explained in Black's Flora, and which was only made clear to me recently—Rae Sexton.

(1) The Sugar Gum, *Eucalyptus cladocalyx,* FvM 1853, is quite distinctive among eucalypts with its barrel shaped capsules (narrow top and bottom), glossy jade-green leaves with yellow midrib, and smooth creamy-yellow trunk splotched with brown. It is not natural to the Adelaide area but is definitely planted in straight avenues in the National Park, on streets, in the parklands, in country towns with low rainfall, and in Victoria. It occurs

naturally in the mid-north of South Australia, and Kangaroo Is. The habit is stiff and erect with a thick bole and tall branches reaching 100 ft. It is often lopped or "pollarded" to produce a bushy head.

(2) *E. cladocalyx nana* (Hort.) Dwarf Sugar Gum, "is a recent variety of lower and more bushy habit, which comes fairly true from reliable seed" (to quote E. E. Lord, Shrubs and Trees for Australian Gardens, Lothian, 1970)—in other words, it has been raised horticulturally and does not occur naturally. The trunk is short and thick with the branches arising lower. This compact tree is more useful for fodder and shelter on farms, but should not be promoted for street planting, as it may still attain a great size of at least 50 ft. The specimen at the Waite Arboretum Fullarton, is very tall and spreading although short-boled. (Under the terms of the will of Peter Waite this Arboretum is open to the general public during daylight hours and presents a most comprehensive collection of hardy trees, including 300 varieties of Eucalypt).

(3) The dwarf form of *E. cladocalyx* found on Eyre Peninsula has a quite distinctive growth habit and may be an ecological variant. The author, while living at Port Lincoln, was amazed to see attractive groves of these low trees (as at Greenpatch) windswept and gnarled on hilltops, full of grace and movement like the romantic Eucalypts of the early painters. One could almost imagine the long-bodied kangaroos of George French Angas gambolling below. The trunks are slender, often bent and appear greyer. I have studied fresh material of all of these three forms of *E. cladocalyx* and I believe Herbarium sheets would appear almost identical—the real difference lies in their growth habit. It would be interesting to know if the Eyre Peninsula form which grows to about 20 ft. would still retain its decorative form on deeper, limy soils. Although suitable for group planting, it would be too irregular for street use.

The three areas in which the Sugar Gum occurs naturally—Flinders Ranges, Eyre Peninsula and Kangaroo Island—are quite disjunct.

Boomsma, in S.A. Woods & Forests Dept. Bulletin 18, describes these attractive trees as having well developed crowns with a "storied umbrella effect" of dense foliage.

PROPAGATION BY AIR LAYERING

by N. L. Shepard, Florida, U.S.A.

Here in S.W. Florida we, too, do much air-layering. The article describing this technique in your No. 34 issue, page 246 was of interest and I agree 100% with the instructions with one exception. The author suggests a layer of newspaper as the final protective wrapping to discourage birds and to keep the new roots cool. Here we use a piece of aluminium foil, such as you use in the kitchen. I cut a square piece, i.e., about one square foot, and then just crimp it over the plastic which has been tied in place.

The foil adds no aprreciable weight, as will a few layers of newspaper, especially after a rain, and has the further advantage that it is a good heat reflector and thus aids in keeping the roots cool as well as dark.

I once suggested the use of black plastic, such as we find around new construction sites, to nurseryman (in this case a woman) her reaction was instantaneous—the black plastic will heat, rather than cool, the roots.

ISOPOGON ASPER

by D. Lewis, Bindoon, W.A.

Although *Isopogon asper* grows better in the lighter soils towards Midland, we have a patch on heavy clay towards Bindoon. A typical bush here is almost two feet high and a little wider. There are about a dozen stiff branches growing from the top of the large root. A few of these had small branches near the tops of the main stems. There is every indication that this shrub suckers constantly from the root as I noticed both dead and living branches on many of the plants.

Leaves are comopund, with segments flat and narrow in two or three pairs along the central rib. While the leaf could vary in size the ones here are about ¾" long.

Isopogon asper flowers in August. There can be twenty flowerheads in a tight cluster among the leaves near the tops of the branches. The flowerhead are about two inches across. The bracts are red or yellow and arranged around the centre of the receptacle like a rosette. The buds are long and slender and look like needles, but when the petals open, the flower has a tendency to curl. The local flowers are a very pale pink.

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Editor's Note: This is how desperate the supply of wildflower seed has got. We want the nurserymen to supply us with wildflowers but they cannot get the seed. This nurseryman has gone to the expense of advertising for it. Please help him.

ERRATA No. 51 ISSUE

Page 288—Coour plate is not *Helichrysum scorpioides* but either *Helipterum albicans* or *H. anthemoides.*

Page 321—Colour plate labelled *Thelymitra aristata* is in fact *T. nuda* (Editor's apology to Ray Nash).

Page 290—*Cheiranthera linearis* is now *C. cyanea* Brngn. Leaves are flat, linear 1-3" long, 1/16" wide. *Hakea francisiana* is found also between Whyalla and Cowell but not at Tumby Bay as stated.

Page 313—*Tetragonia expansa* is now *T. tetragonoides* (Pall.) Kuntze; *Ranunculus aquatilus* is now *Batrachium trichophyllum* (Chais) Bosch.

Page 315—*Limnanthemum crenatum* is now *Nymphoides crenatum* (F. v. M.) Kuntze.

Page 316—The first paragraph under the sub-heading "Goodeniaceae" is misplaced and should be under "Miscellaneous". *Brunonia australis* is in family *Brunoniaceae.*

The following are misspelt, the page number and correct spelling being:

290 *Callistemon macropunctatus*—291 *Acrotriche depressa; Eremophila macdonnellii; Melaleuca wilsonii*—301 *Correa aemula*—308 *Banksia robur*—311 *Amaranthaceae*—312 *Gymnogramma; Anogramma; Pleurosorus; Amaryllidaceae*—313 *Boerhavia*—314 *Kennedia prostrata*—315 *Viola sieberana*—328 *Callistemon speciosus; Melaleuca tamarisifolia* should read *M. tamariscina.*

I must apologise for these errors. Considerable efforts are made to get the spelling correct. I have introduced a further system of checking in the hope of preventing such mistakes in future—Editor.

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AUSTRALIAN PLANTS—Nos. 46, 47, 48 & 49—issues of 1971.

The demand for these issues has been phenomenal. They are no longer available separately but can be obtained in Volume No. 6 when it is bound in December 1972. I apologise to new readers for this but spare copies are all gone—Editor.

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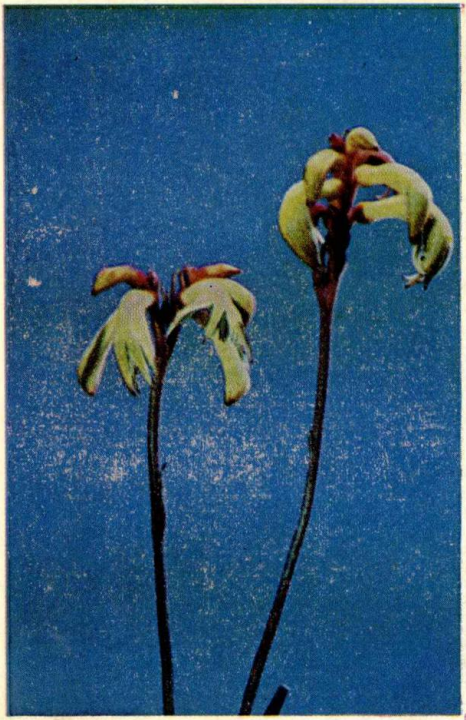
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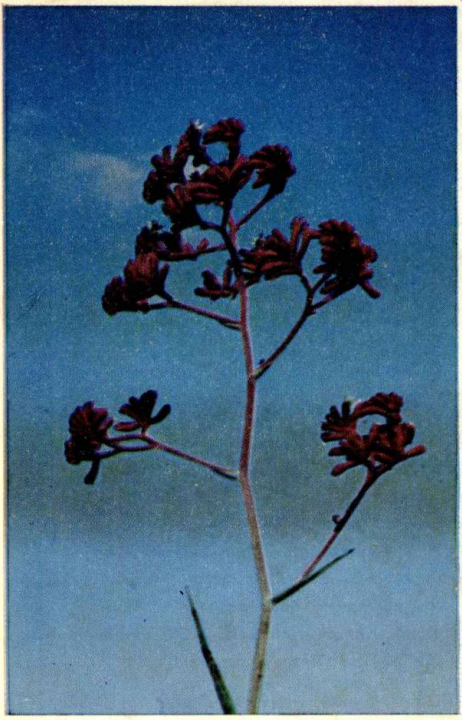
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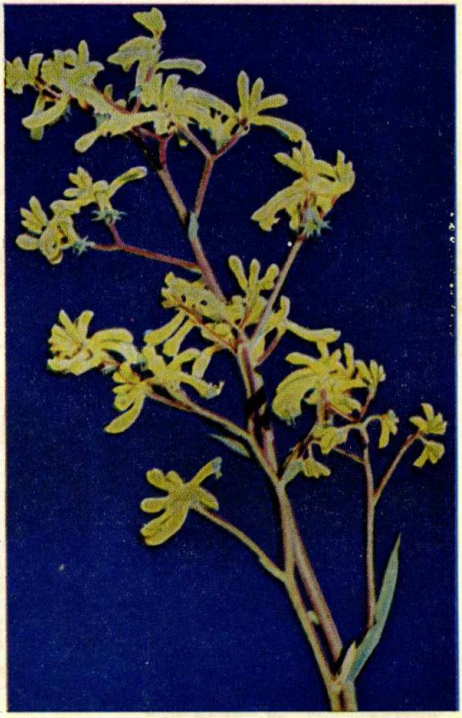
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Anigozanthos preissii (top) — *A. rufa*

Anigozanthos bicolor (top) — *A. pulcherrima*

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