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DARWINIA OLDFIELDII

HOW TO GROW WESTERN AUSTRALIA'S WILDFLOWERS

HOW TO GROW TERRESTRIAL ORCHIDS—ALSO PROPAGATION FROM SEED

WESTERN AUSTRALIAN WILDFLOWERS

This issue has been compiled principally by West Australian members and presents their flora and its application to horticulture. The introducing article opposite is followed by:

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PAST ISSUES OF "AUSTRALIAN PLANTS" AVAILABLE

Because of the vast wealth of our flora there is very little repetition of previous information. VOLUME No. 1, issues 1-12, no longer available bound but issues 1, 5, 6, 7, 8, 9 are available at 45c each, \$2.85 incl. postage.

VOLUME No. 2, issues 13-20, all available only fully bound at \$6.00 plus 20c postage. And in this volume is also "A Descriptive Catalogue of Western Australian Plants".

VOLUME No. 3, issues 21-28, all available only fully bound at \$6.00 plus 20c postage, including also "Catalogue of Cultivated Australian Native Plants" valued at \$3.00.

VOLUME No. 4, issues 29-36, all available only fully bound at \$6.00 plus 20c postage, including "Western Australian Plants for Horticulture—Part 1" valued at \$3.00—see below.

VOLUME No. 5, issues 37-44 all available only fully bound at \$6.00 plus 20c postage including "The Language of Botany", a valuable reference to words and terms.

Please excuse the delay in despatch of volume 5, it will be sent by end of April.

Other Books by the Society

WEST AUSTRALIAN PLANTS FOR HORTICULTURE is the latest book by this Society available from the editor for \$3.00 plus 20c postage. The format of the book generally is to have simple but adequate descriptions (using simple features that anyone can distinguish) of three species in one genus with a full colour plate of one of them on the opposite page. Directions as to cultivation are given for each species. Hundreds of West Australian wildflowers are also described. This is the style of book we recommend and is excellent value at this low price. It is proposed to produce more in this series on wildflowers from other states if readers will support us by buying the first one, providing the money to produce the next one.

"West Australian Plants"—A Descriptive Catalogue (2nd Edition)

This fine book was one of the first produced by the Society and has been so widely acclaimed and received that a reprint has been necessary. The number of colour plates has been doubled but the real value of the book even for those who have a copy of the first edition is that fully revised. It is the only reference ever produced to the entire flora of Western Australia. New additions include the grass and fern families but the many hundreds of species added and names revised make this book a must for anybody interested in growing the western wildflowers.

Available from the Editor, 860 Henry Lawson Drive, Picnic Point, 2213 for \$3.00 plus 20c postage.

THE LANGUAGE OF BOTANY by C. N. Debenham

Price \$1.50 plus 20c postage

The first edition of this book was so widely sought after that it sold out. It became a reference text to not only all Universities and Colleges studying botany and was especially valuable to horticultural classes at the layman level. It defines in clear terms every botanical term you are likely to meet. The second edition has been fully revised and expanded threefold to include such things as the meaning and origin of plant names and all facets of the biology of plant life.

WEST AUSTRALIAN WILDFLOWERS

AN INTRODUCTION by J. S. Beard

We are often asked, how many varieties of West Australian wildflowers are there? As there does not seem to be any satisfactory definition of a "wildflower", this question cannot be exactly answered. Many curious claims are made in tourist literature. We can only reply that our "Descriptive Catalogue of West Australian Plants" (second edition 1970) lists 5802 species. This is the sum total of known flowering plants and grasses but a great number are inconspicuous in themselves or have inconspicuous flowers and so are certainly not "wildflowers".

About 1445 species are thought to occur in the Northern Province, 1822 in the Eremaean and 3611 in the Southwestern Province (as many species occur in more than one province, the total of these figures exceeds 5802). Northern and Eremaean plants tend to range across the continent, but the flora of the Southwest is to a high degree endemic, that is to say, unique to that area. A recent check has revealed that 86% of the flowering plant species of the southwest occur nowhere else (Beard 1969), and it is this quality of uniqueness which is the special feature of the southwest. On a continent, such as Australia, such behaviour is abnormal. Local uniqueness is normally expected in oceanic islands such as Hawaii or Mauritius where species have undergone changes in isolation from continental populations. Southwestern Australia is in effect an island, isolated from the well-watered east by the desert. Unique plants are bound to be of special interest. When so many of them are of outstanding natural beauty, interest is redoubled. It is easy to understand, therefore, that Western Australia possesses in the southwest a floral heritage of a very special character whose preservation is of world-wide importance.

Commencing on page 50 the different climatic regions of the southwest have been described, with their principal plant communities. This is also a convenient way to deal with the distribution of species and wildflower areas for the visitor. The karri forests of the extreme southwest with their giant trees are a spectacle in themselves, for many of the finest stands are preserved from timber cutting in national parks. The weather there is apt to be cool and even rainy throughout the year, and spring is late with flowers at their best in October. At a certain stage after fire the undergrowth is dominated by great masses of white-flowering *Clematis pubescens*, purple *Hovea elliptica*, and *Kennedia coccinea*, or by the yellow pea *Bossiaea laidlawiana*, giving outstanding colour effects. In this region *Boronia megastigma* has its natural habitat in swamps, so too the pitcher plant *Cephalotus follicularis*, and *Beaufortia sparsa* which is summer flowering.

Understory plants in the karri forest are mostly soft leaved. On entering the jarrah and wandoo forests of the adjoining region however a sclerophyll flora makes it appearance, and leaves are harsh and prickly. Most of the jarrah forest is still intact, growing as it does on solid laterite, and roads crossing the Darling Range pass through the forest for about 30 miles, with displays of wayside flora. From here comes the state emblem, the Kangaroo Paw, *Anigozanthos manglesii*, and other species, *Grevillea wilsonii*, *Isopogon dubius*, *Lechenaultia biloba*, and *Conospermum amoenum*. On the sandy coastal plain around and north of Perth the forests are replaced



ACACIA CYANOPHYLLA

Any reference to a section of the Australian flora must first mention the usual dominance of the Eucalyptus trees (rear cover) followed by the Acacia (wattles). There are hundreds of species in Western Australia the plant above growing to a small tree in sand heath. Other prominent members of the scrub are plants of the "Grass Tree" family (*Dasypogon* and *Xanthorrhoea* shown opposite) and the often shaggy Banksia and close relative *Dryandra*.



Reprinted from "How to Know Western Australian Wildflowers" by W. E. Blackall—Available from the Editor

Dasypogon bromeliaefolius
(Pineapple-leaved Dasypogon)

Xanthorrhoea gracilis
(Graceful Grass Tree)

Dryandra sessilis* syn. *D. floribunda
(Parrot Bush)

Banksia sphaerocarpa
(Round Fruit Banksia)

WHERE THEY GROW

WESTERN AUSTRALIA—ITS PHYSICAL CONDITIONS, CLIMATES AND SOILS

by J. S. Beard

The state of Western Australia which comprises the western third of the whole Australian continent is an enormous and thinly populated territory, just under one million square miles in area, with a population that has now reached one million persons, and half of these live in the capital city, Perth. About 40% of the State is uninhabited desert, barely explored, until recently. 50% is put to pastoral use in large sheep and cattle stations, and only about 10% is suitable for permanent agriculture, in a relatively small sector crowded into the southwestern corner.

Geologically, Western Australia has been relatively stable and free from mountain-building activity for an enormously long period. Its surface therefore consists of a plateau generally about 1200 to 1500 feet above sea level and of great evenness. There are no great mountain chains and hence no great rivers take their rise. The slightly undulating landscape extends in endless monotony, broken only by small hills marking the outcrop of some hard and resistant rocks and by the salt lakes, normally dry, into which drainage is collected after heavy rain. Such a land surface has been subject to weathering processes for an immense period, but to relatively little removal by erosion of inert weathered material. Almost the whole country is covered with a thick mantle of debris, highly weathered and leached of its plant nutrients. Extensive plateau surfaces are clad with lateritic soils developed perhaps 15 to 30 million years ago under a quite different climate from the present one. Sometimes these soils retain their original sandy layer, sometimes this has been stripped down to the bare ironstone, or partly so. Western Australia is notorious for its expanses of sand and gravel upon which, in the drier parts of the Southwest, trees are unable to survive so that the scrub flora runs riot free from competition. Here the finest wildflower displays are to be seen. The better red loam soils are timbered, and the competition of the trees eliminates nearly all undergrowth except in the areas of highest rainfall where both trees and smaller plants can flourish together.

Climatically, Western Australia has three principal regions which coincide with three so-called "Botanical Provinces". The Northern Province which includes the Kimberley down to the Fitzroy River has a hot dry Tropical climate with a short wet season of 4 months only, during the summer, in which from 20 to 25 inches of rain may be received according to locality. The vegetation is mainly tropical savanna and savanna-woodland, that is to say it consists of tall grasses, usually with scattered trees. The Eremaean or desert Province which occupies most of the State has a typical desert climate in which rainfall is low and erratic and there is no assured growing season. Droughts of up to a year without effective rain are common and may often last longer. Average rainfall mostly exceeds 8½ inches a year but is as low as 6½ on the Nullarbor Plain. Averages in fact mean little. The vegetation is kept alive by sporadic heavy falls of rain copious enough to be effective which tend to occur about three times a year. Chance of rain is greater in summer in the north with a winter component increasing

southward so that on the Nullarbor rain can be hoped for equally in any month. The desert must not be thought of in terms of bare, barren country with waves of moving sand. There are frequently stretches of sandhills, it is true, but they are well vegetated. The northern portion of the desert and any sandy areas in the south are all spinifex country with shrubs and trees. In the southwest and centre, mulga is dominant, while the Nullarbor Plain as a limestone area features bluebush plains with scattered myall and myoporum.

The Southwestern Province is that little corner of 10% of the state which can be devoted to farming. Like the north it receives a reasonably favourable rainfall but in the opposite season—winter—and this is described as a Mediterranean climate. There are three subdivisions. Along the south coast a strip of country classed as "Moderate Mediterranean" normally experiences less than 4 dry months in the year and is characterised on the more favourable soils by wet sclerophyll forest with giant stands of the Karri (*Eucalyptus diversicolor*) 250 feet and more tall. Forestry is the main activity. Inland of this belt and extending up the north coast and along to the east is a region of "Warm Mediterranean" climate which experiences 5 to 6 dry months in the year. It was originally mainly clothed with dry sclerophyll forest of jarrah (*E. marginata*) and wandoo (*E. wandoo*) with heaths in sandy coastal areas. The main activities of this region are forestry, intensive farming, dairying and beef on artificial pastures, and fruit growing. Further inland still lies a drier region with a "Dry Warm Mediterranean" climate where 7 to 8 months in the year are dry. This is essentially the West Australian wheatbelt and its natural vegetation consists of sclerophyll woodlands and mallee on the heavier soils, with heath and thicket on the sandy and gravelly lateritic soils.

Intermediate zones mark the transition from both the Northern and Southwestern Provinces to the Eremean, the Southern transition being the most noteworthy. This is the "southwestern interzone" of Burbidge (1960), and is vegetated with sclerophyll woodlands and thickets. There is little land use apart from mining.

Those who set out to cultivate Western Australian plants will do well to take note of the conditions of their natural habitats for while some plants are so tolerant that they will grow readily in a quite different environment, most are benefited by some attempt to replicate nature and some demand this treatment. Growers outside our state should first note the strongly mediterranean character of the southwestern climate with its dry summer and wet winter, the corresponding range of humidity, from low to high, and the general absence of severe frost. Secondly it is important to note that most of the best floriferous plants come from the poor sandy soils which are well-drained, neutral to slightly acid in reaction, and acutely impoverished in nutrients. The soil surface is normally dry, but there is moisture below, so that plants develop large deep root systems. There is much sunshine and very bright light, so that our plants are not indicated for indoors or for gloomy climates.

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Photography by E. Humphreys
DRYANDRA QUERCIFOLIA

"I photographed this plant in the garden of Ken Stuckey, Furrer, S.A. It was one of the finest *Dryandra* I have seen"—E. J. Humphreys. This is quite a recommendation from someone who has seen most of the *Dryandra* species.





Photography by F. W. Humphreys

ISOPOGON FORMOSUS R.Br.

This plant is *Isopogon formosus* R.Br. It has terete divided leaves. *Isopogon roseus* is a synonym of *I. dubius* and the name should not be used. *I. dubius* has flat leaves and is illustrated in "West Australian Plants for Horticulture" by K. Newby—R. D. Royce.

PLANNING AN AUSTRALIAN GARDEN

by Marion I. Blackwell

Have you ever thought seriously about why you want a garden and what you want of that garden?

When choosing a house, most of us spend a great deal of time, thought and energy determining what our needs are, and how they can best be satisfied by the allocation of available space; whether in the planning of a new house or the buying of an established one. How many of us really think in this way about the planning of the garden? When we consider that the whole customary $\frac{1}{4}$ acre is really "our home", and that the weather in this sunny land is ideally suited to outdoor activities; a much broader concept of "living space" evolves, and the designing of the garden for maximum and optimal use at a very early stage is important.

Perhaps you are one of the lucky ones with a virgin block of bush upon which you propose to build. Do not let an enthusiastic bulldozer driver flatten your scrub and denude your property. During the time it takes to draw up your plans and get the building under way, get to know your block. Ideally, watch the plants over a whole year. See what is already growing there, mark the plants and keep notes upon identity, time of flowering, foliage features and general appearance. As the season progresses you will find a lot of treasures worth saving for the future joy they will bring. Also look at the bush nearby. You may find other plants indigenous to the area which you'd like to grow, knowing full well that they would fit in with what you already have, that they'd "like the place", be in their right habitat, and be fully adapted to soil and climate so that they would take very little looking after when once established.

Get the co-operation of your builder to save as much as possible of the existing vegetation. Even as a ground cover this will prevent erosion and give your house an established look as soon as it is erected. Rope or fence areas off, if necessary, and especially guard any particular shrubs or trees which you wish to feature in the garden plan. It is easy to remove the few unwanted plants at a later stage when you are ready to replace them with others. In the meantime they will hold the soil and give a continuity to the cover. Remember that it takes from 5 to 7 years to achieve that established look if you once allow the denudation of an area, and one never really achieves the ecological entity which was previously established by nature. Good contemporary architecture lends itself ideally to a bushland setting, and the two combined spell Australian individuality and an Australian way of life.

More and more thinking Australians are demanding low maintenance gardens. With the modern motor age, much of their free recreational time is spent away from home, travelling, surfing, playing or attending organised sports. Entertaining, still chiefly done at home, is becoming more informal. For example, outdoor barbecues in hot weather have gained favour over the formal dinner party. Slowly, as we loosen the bonds with colder climate origins, and lose our preconceived ideas, a concept of an Australian way of life is emerging; more suited to our climatic conditions, our temperament and our set of values. Just as this is reflected in the more advanced contemporary architecture, so too it should be illuminated in our garden planning. Good design and forward thinking are the keys to an integrated and extended living space with multiple uses, adaptable to family needs.

Plan your garden so that it looks after itself with only occasional attention. Native plants in their own or similar habitats, once established, require little or no supplementary watering. Their growth is improved by the application of a fertiliser such as blood and bone at the commencement of their growing season (usually August in Perth), and perhaps any that need shaping may need a light pruning once a year, this is all.

Use your garden as an extension of your various family activity areas. A play area for young children with sand and water, and shade in summer, overlooked from the kitchen window saves hours of walking time "to check up" and sets a mother's mind at rest. This area could possibly be converted later into a pool to give a new vista of interest from the kitchen window. Perhaps a secluded court off the bathroom would be appreciated, if you have a sunbathing teenager. Plan a shady nook for summer respite, where, with an outside sitting area you can relax and enjoy the breeze on a hot afternoon or early evening. A sunny protected corner for winter warmth is ideal for family breakfasts, for stringing the beans or taking up that hem. Just as the right angling of the house and the correct overhang of the eave achieves both these aims, so the use of deciduous and evergreen trees in the appropriate location may bring the solution in the garden.

Should you be less fortunate than to have bush to begin with, it is still possible—admittedly with comparatively greater expenditure of time, effort and money—to achieve a low maintenance native garden. This added initial expense would be almost equivalent to that needed to establish a traditional exotic type garden, the chief difference being firstly that once established the former would require little maintenance whereas the latter would claim much more of your time and need regular attention for watering, weeding and feeding; and secondly that the former helps our housing to fit into its landscape whereas the latter at its best creates diversity rather than harmony and copies from exotic landscapes.

To get back to the original questions—the why and the what of a garden; perhaps a few criteria might help you to determine this for your particular needs.

Firstly and foremost, perhaps the greatest need which a garden fulfils for many people whether they be active gardeners or passive garden users, is that of relaxation. In this age of increasingly populated and industrialised communities, work pressures build up in the individual, and man needs a means of "unwinding", of "letting off steam" and relaxing. Those who garden achieve this in the "doing"; sort themselves out and recharge their sense of equilibrium during the actions of planting, digging and weeding. Others can achieve this peace within themselves by merely being in a place of restful composition and beauty, away from the daily pressures, whether alone in contemplation, or in the relaxed company of friends.

A garden sets off a house and may add considerable beauty to it, by integrating it into the landscape and highlighting its particular features. It should provide shade where necessary, protection from strong winds, privacy from neighbours and any eye-sores, recreational areas for various members of the family, unobtrusive utilities such as a clothes drying area, an incinerator and perhaps wood and tool storage; and finally and of greatest import. pleasure, in the natural beauty of design in plants, of form, colour and shape. It should be a rest for the mind and the eye; a place of peaceful contemplation for those in need of it.

(See now "A Landscape Plan for a New Garden" on page 68, and "Gardening in Perth" on page 91).

SMALL PLANT FOR GROUND COVER



Photography by J. Glass

LOBELIA

The *Lobelia* illustrated could be any one of four species. Two of these have elongated capsules, the others have globular capsules. Of the two in the first group *Lobelia rhytidosperma* has wrinkled seeds while the seeds of *L. tenuior* are smooth and shining. The species with short, globular capsules are *L. rhombifolia*, with ovate deeply toothed leaves and *L. rarifolia* (syn. *L. parvifolia*) with small narrow leaves.

For other ground cover plants see page 67.

SMALL PLANT FOR GROUND COVER



Photography by F. Humphreys

HEMIANDRA GARDNERI Sargent.

Hemiandra gardneri is a comparatively rare plant and has been recorded only from a number of localities in the Watheroo-Wubin area in the Midlands district. It is closely related to the common *Hemiandra pungens* and like this plant is a low mat forming species with pungent leaves. It can be readily distinguished by its red flowers and included stamens—R. D. Royce.

WILDFLOWER GARDENS

Native Gardens in Heavy Soil by J. Hamersley

Contrary to the firmly held beliefs of most Australians, Western Australia is not entirely composed of sand, bauxite and iron. Considerable areas of alluvial clays and loams occur even in the metropolitan region, and these present their own particular problems to wildflower growers. We do not make any wild claims to have solved these problems; perhaps after twelve years the most we can say is that, for reasons we can only guess at, some plants are more broad-minded than others!

Even within a restricted area these alluvial soils vary considerably. Perhaps the conditions, practices, and results of three growers in the Swan Valley may be of interest. All three gardens are within half a mile of the river and about 25-30 feet above sea level. Rainfall is about 34 inches and 30 inches of this falls between May 1st and October 31st under normal seasonal conditions. Hot days and reasonably cool nights occur in the four summer months with a good deal of hot dry wind. It is the very wet winter coupled with the tremendous evaporation in summer which seems to put pressure on plants from gentler climates.

Garden No. 1

Mrs. Baker's garden at Middle Swan is in an area of brickmaking clay (probably 50 ft. deep). The soil had never been cultivated and would have carried in its native state *Eucalyptus calophylla* and *E. wandoo* and a rich variety of Darling Range plants as an under storey. Years of burning off had reduced the species still persisting, and destroyed the loose surface mulch so necessary in this context. (It is noticeable that *E. calophylla*, a rather messy tree of the blood wood series, builds up, due to its mulching effect, a top soil favoured by small plants, but *E. wandoo* drops material so full of tannic acid as to inhibit plant growth under the canopy). The topography is rather flat and any depressions become waterlogged or puggy if cultivated. Uncultivated, the water sits on the surface for weeks in winter, and is more likely to evaporate than penetrate. If drainage off the surface is possible a remarkable range of native plants can be re-established.

Mrs. Baker uses a woodburning stove, and has spread charcoal and ash on her garden for many years. This has had a very beneficial effect on the soil surface, replacing in some degree the protection originally given by the natural mulch. Exotic weeds were pulled out, and small local plants introduced with the least possible soil disturbance. These were watered with a dribbling hose or through a jam tin sunk beside the plant. Later a wide range of species from many areas and soil types was introduced. Many sand-loving plants, including the biggest *Grevillea leucopteris* in captivity, are flourishing in this unlikely situation. This must be considered an extremely successful handling of a problem soil.

Plants in this garden include: *Grevillea pinaster*, *G. leucopteris*, *G. robusta*, *G. bipinnatifida*, *G. wilsonii*, *Eremaea beaufortioides*, *Melaleuca radula*, *M. scabra*, *M. steedmanii*, *M. lateritia*, *M. megacephala*, *Hakea myrtoides*, *H. multilineata*, *H. petiolaris*, *H. laurina* (11 years old), *H. victoriae*, *Callistemon* species, *Hardenbergia comptoniana*, *Sollya*, *Marianthus pictus*, *Kunzea baxteri* and *K. sericea*.

Garden No. 2

My own garden is only just above flood level, on a tongue of clay over-laying loam, which appears at the surface in the lowest areas. This is part of one of the earliest farms in the State, and has been under crop or pasture continuously since 1830. Nonetheless it is still recalcitrant. The alluvium is so fine that in spite of sawdust, animal manure, and vegetable matter incorporated over the years the surface still packs tightly under rain or sprinklers. Mulching is essential and even under mulch a hard patch develops under every footmark. The soil responds to regular cultivation at a critical stage of dampness. This of course is simple when dealing with ordinary garden plants, but very difficult in a "woodland" setting of native trees and small shrubs. At present we are trying a new technique. Where once we turned in the exotic weeds in early winter with the previous summer's mulch, now the winter growth is pulled up and laid on the surface to reduce the packing effect of the rain, and is not turned in till the wet season is nearly finished. The effect on the soil structure seems better, but an added complication is making comparison difficult as the bore water has become increasingly alkaline. Many plants are beginning to look unhappy by the end of summer, and it is feared the range of plant species will be restricted.

Fortunately most Myrtaceae seem tolerant, but many Proteaceae are a poor colour and not making much growth. The Dryandras seem particularly unhappy with the conditions here. Trees do very well as they quickly get through to the loam and sandy silts under the clay. Some 20 species of Eucalypts, 6 of Casuarina, as well as 3 Agonis, many Melaleucas and Callistemons, and a dozen Acacias have done amazingly well. Some of these are native to desert (6 inch rainfall) country. Others belong to 50 inch rainfall or are only found near swamps or streams.

Plants growing in this Guildford garden at present are:

Eucalyptus: Eastern States, *E. citriodora*, *E. maculata*, *E. melliodora*, *E. leucoxylon rosea*. W.A. Species: (from areas under 20" rainfall, more or less) *E. brachyphylla*, *E. angulosa*, *E. grossa*, *E. macrandra*, *E. camaldulensis*, *E. spathulata*, *E. salubris*, *E. tetraptera*, *E. tetragona*, *E. sargentii*, *E. platypus*, *E. stoatei*, *E. rhodantha*, *E. forrestiana*. From areas of under 12" rainfall, *E. caesia*, *E. torquata*, *E. orbifolia*, *E. kruseana*. (These are mainly found in catchment areas, and may have good underground supplies available).

Acacias. The Eastern States species, *A. cardiophylla*, *A. decurrens*, *A. dealbata*, *A. podalyrifolia* and *A. spectabilis* grow strongly and naturalise freely. *A. decora*, *A. conferta*, *A. vestita* have flowered well but have not established themselves completely. Of the W.A. species *A. acuminata*, *A. cyanophylla*, *A. alaucoptera* and *A. merrallii* do well; *A. drummondii* and *A. multispicata* need humouring.

Casuarina are *C. torulosa*, *C. equisetifolia*, *C. glauca*, and *C. decussata*. **Callitris** *preissii* and *C. cupressiformis* have done well, especially the latter which is 25 ft. at least and has not begun to develop an open crown. *C. arenosa* seedlings are also flourishing.

Agonis *flexuosa*, *A. marginata*, and *A. juniperiana* do surprisingly well. **Hakea** *victoriae*, *H. laurina* and *H. petiolaris* are the only ones to do well. These grow too fast and become wind tender.

Perhaps the most unlikely successes are *Diplolaena grandiflora* and *Marianthus ringens* (both from the light country at Geraldton). They all flower freely and set seed in this most unlikely environment. Apart from Acacia the only natives to regenerate by seed to date are *Darwinia citriodora*, *Sollya heterophylla*, and a Berry Saltbush thought to be *Enchylaena tomentosa*.

(Another garden is described on page 72)

New Kangaroo Paws

by K. R. Oliver

The kangaroo paws of the south western corner of Australia beautify the bushland scene each year from June to February with the strange unique beauty of form and colour combinations of their flowers. These plants have a widespread appeal to the public and it is indeed a pity that of the



Photography by K. R. Oliver

Hybrids from *A. manglesii* x *A. flavida*

eight species of *Anigozanthos* and the one species of *Macropidia* only one of the less interesting species *A. flavida* has been widely successful in cultivation both in Western Australia and outside of the State.

The success of *A. flavida* in cultivation is due to its true perennial habit, general adaptability and vigour, immunity to ink disease, ease of vegetative propagation and its freedom from attack by snails. It is also the easiest species to raise from seed. Considering the qualities of *A. flavida* as a plant for cultivation and the beauty of the flowers of some of the other species, it immediately suggests itself that if these qualities could be combined in hybrid plants then kangaroo paws would be obtained which would be at once both highly desirable and highly successful as horticultural plants. The author has attempted to breed such plants and will relate his experiences in the hope that this may interest and help others.

THE AIM OF BREEDING

It would be desirable to produce a range of hybrids of various colours, forms, heights etc., all of which should have the following characteristics. Good colour and pleasing appearance, reliability and vigour in cultivation, resistance to ink disease, free flowering habits and preferably also be unpalatable to snails. If sterile or if not true breeding the plants should be perennial and easy to propagate vegetatively; or if true breeding, then a non perennial hybrid would be acceptable.

BREEDING TECHNIQUES

As far as is known all species are pollinated by birds only (the honeyeater and possibly the western silver eye too) in the wild and for controlled hybridisation the flowers must be protected from the natural pollinating vectors. *A. flavida* is readily self fertilized and recent work by L. Bousfield at King's Park has shown that *A. manglesii* is also self compatible to some extent. Much doubt remains about what can and cannot be achieved but the following method is known to work well. *A. flavida* is used as the male parent and the female parent is protected from birds. Emasculation of the female parent may be carried out if desired but has been found to be unnecessary by experience. A large number of pollinations should be carried out as seed set may not always be good, individual plants appear to vary in this respect. Pollination can be satisfactorily carried out by means of a small piece of a tissue around the end of a match, using a new piece of tissue for each pair of plants pollinated.

Protection from birds is best achieved by a wire cage around the plant, or alternatively by cutting away the upper half of the flower just before it opens, pollinating and then ensheathing the entire style with a length of drinking straw.

The seed ripens in the summer and must be collected just before it is shed. In the case of *A. pulcherrimus* and *A. rufus* the entire flower drops off when the seed is ripe, the seed being retained in the ovary which must be cracked to liberate it. With all other species of *Anigozanthos* the ovaries split and the seed is liberated as soon as it is ripe. The seed will apparently not germinate unless the weather is cool. Around Perth either autumn or spring sowing appears to be best.

POLYPOIDS

The plants resulting from crossing *A. flavida* with other species are highly sterile. However fertile plants can be produced by doubling the chromosome number of these hybrids (i.e. by producing tetraploid plants).

Further breeding can then be carried out. Colchicine solution is effective for doubling the chromosome number. (Colchicine is an extremely poisonous drug and even skin contact should be avoided). For very young seedlings a 0.2% solution should be suitable. For advanced seedlings or mature plants a 0.3-0.5% solution is suitable. The soil is dug away until the rhizome is completely bared and cotton wool is wrapped around it and is kept wet with the solution for 3 to 5 days. It is important that the plants be actively growing at the time of treatment and particular attention should be paid to areas on the rhizome where new growth is just beginning.

Tetraploid flowers from the sterile hybrids are recognised by their production of fertile pollen and by their larger size (approx. 30% increase in length).

Autotetraploids of *A. manglesii* and *A. flavida* produced at King's Park were found to be fertile but in this case no obvious increase in flower size was observed.

Tetraploids produced from sterile diploids are self compatible and are true breeding if selfed. Thus a tetraploid of particular merit can be duplicated from seed many times. This point is important as the hybrids are highly variable and favourable variations can be readily retained. Crossing two of these original tetraploids produces a uniform first generation, but these are of course not true breeding.

The tetraploids may be crossed among themselves or may be used as the male parent for crossing with diploids (all attempts to use them as female parents in tetraploid diploid crosses have failed). The triploids so produced if they contain two chromosome sets of the same species or of two closely related species such as *A. manglesii* and *A. viridis* will set some seed if pollinated from a tetraploid. This may be important as the plants so produced could have an irregular number of chromosomes and thus new forms may emerge from such crosses.

REVIEW OF MAIN SPECIES USED IN HYBRIDISATION SO FAR

A. flavida—much branched inflorescence (3' to 8' tall) having a large number of flowering heads of small flowers. Flower colour is an unattractive pale green over most of its range but it is also found in red, burgundy, orange, pink, yellow and a great many intermediate colourings. These colours are generally not as bright as in most other species and the stems are devoid of the coloured branched hairs that beautify the stems as well as the flowers in most other species.

A. manglesii—the best known and well loved kangaroo paw. Intermediate in height with an unbranched inflorescence. The colour is nearly always red and green but rarely plants are found that are all red, all yellow or orange and pale green. The rare colours appear to be due to the presence of a single pair of recessive genes and should be easy to breed true to colour. The plants are highly susceptible to ink disease and snail attack and the leaves often die off in the summer time. The plants are not long lived.

A. viridis—closely related to *A. manglesii* but the inflorescence is all green in colour. It can be pale yellow green to deep green or very rarely a reddish shade. Although probably the least attractive of the genus it may be important in breeding because it has resistance to ink disease and appears to be longer lived than many of the other species.

A. pulcherrimus and *A. rufus*—for the purposes of plant breeding these can probably be considered varieties of a single species. *A. pulcherrimus* being gold or yellow and *A. rufus* burgundy or red. Similar in appearance

to *A. flavida* but probably not too closely related to it (consider the different mechanism of shedding the ripened seed). Although troubled by ink disease and apparently short lived their colouring is brilliant and they rival *A. manglesii* as the outstanding kangaroo paw in appearance.

HYBRIDS

The *A. manglesii* x *A. flavida* Hybrid—Plants are variable in height and other characteristics having from two to eight flowering heads on their branched stems. The diploid appears to be completely sterile. Individual plants are variable in their susceptibility to ink disease but are generally susceptible except for a few plants. The tetraploid is quite fertile and some of these have now been growing for years. The tetraploid seed germinates readily and the plants are quite vigorous with a branched inflorescence up to 5 feet or more tall, the individual flowers being only slightly smaller than those of *A. manglesii* in some cases. Red shades are the easiest to obtain but by choosing suitably coloured parents a variety of colours including yellow can be obtained. To obtain yellow progeny both of the parents should themselves be yellow, or less desirably one could be pale green.

***A. viridis* x *A. flavida* Hybrids**—This cross gives a hardy plant similar to the *A. manglesii* x *A. flavida* cross but it is very much more resistant to ink disease. Plants have been obtained in many colours but it is doubtful if any of these would be bright enough to interest gardeners generally. The tetraploid crosses readily with the *A. manglesii* x *A. flavida* tetraploid and the progeny are quite fertile. By self pollinating these plants a recombination of genes from *A. viridis* and *A. manglesii* should occur that will give in some cases good colour and good ink disease resistance in the one plant. These plants would of course not be true breeding and vegetative propagation would have to be used on any plants of merit obtained. True breeding plants can be obtained by crossing *A. manglesii* and *A. viridis* at the diploid level and then crossing these hybrids with *A. flavida*. Any outstanding plants obtained could be treated with colchicine and the true breeding tetraploid obtained. The same technique could be applied to *A. humilis* or *A. bicolor* crossed with *A. viridis*. (Of the known non *Flavida* hybrids the *A. humilis* x *A. viridis* hybrid is the most interesting, as it comes in a good variety of colours).

***A. pulcherrimus* x *A. flavida* hybrid** appears to have much to offer as they can probably be obtained in a wide variety of colours by using different coloured *A. flavidas*. Tetraploids are not available as yet although a tetraploid flower or two has been obtained. Resistance to ink disease is variable but a good percentage of satisfactory plants should be obtained. When using *A. rufus* for the cross it is probably only possible to obtain red colours. The plants are highly sterile but this year a few seeds have been obtained from an *A. pulcherrimus* x *A. flavida* cross (male parent unknown) and two years ago a plant that is thought to be an *A. rufa* x *A. flavida* cross yielded some seed when pollinated from an *A. manglesii* x *A. flavida* tetraploid and one plant was raised from this seed. This single plant obtained is a very good one, is sterile, but a hexaploid obtained from this should be fertile. Seed obtained from these *A. pulcherrimus* x *A. flavida* diploids is of course very valuable as recombinations of genes from the two species would be obtained. Experimentation with the use of different male parents and different pollinating techniques may result in seed being obtained in quantity.

***A. flavida*, *A. manglesii* and *A. viridis* triploids** having one chromosome some set from each can be produced by pollinating the diploid from

the tetraploid. One batch of plants was raised from a single pair of parents and all were badly susceptible to ink disease. However this is probably not the general case and was probably due to an unfortunate choice of the parents involved. The triploid will set seed when pollinated from a tetraploid. One fully fertile hexaploid existed briefly before it died.

A. manglesii pollinated with the *A. manglesii* x *A. flavida* tetraploid obtained by pollinating produced interesting and very variable triploids, one plant having an unbranched stem and others having stems that branched up to as many as sixteen times. Colours obtained were all red or red and green. The plants are eighteen months old and so far none have got ink disease but this is probably only a matter of time, however they were an exceptionally vigorous and fast growing batch of plants. A hexaploid has not yet been obtained so it is not known if this would be fertile or not.

Well that's the story of hybrid kangaroo paws so far as is known to the author. This report summarises work carried out so far but it is by no means the end of the story, indeed it is only the beginning and many beautiful new kangaroo paws lie in the future. If this information helps anyone to produce some of these its purpose will be fulfilled. Improvement within a species is also possible and anyone interested in this can obtain seeds, plants and ideas from the author through the editor.

Anigozanthos Bicolor Minor

by H. C. Venning

My first introduction to this interesting little plant was some four years ago when it was found growing in a swampy depression on the property of Society members, Mr. & Mrs. W. T. Grocock in the South Stirling area of W.A. The flower is a miniature replica of *Anigozanthos bicolor*, red and green in colour with a total height of 6 to 8 inches. It would seem the seed retains its viability over quite a lengthy period. Although not prolific seed bearers, the bulbs multiply very readily.

The plants in the wild die down completely in the summer and reappear again after the first good rains. A number of these plants were found growing in an open area amongst short grass while others were nestled under shrubs.

The soil is of a gravelly clay composition and during very wet winters the plants are standing in water.

I was privileged to be given one of these bulbs and it has responded very well in cultivation. By its third season it had multiplied enormously and carried thirty two flower spikes. I have kept it in a plastic pot standing in a saucer of water and placed in deep shade in summer. During winter I place the pot (still standing in the saucer) in an open sunny position in the garden where in the main it is looked after by nature. In this way the plant has remained alive and growing all the year round.

From observations over four years the length of flowering in cultivation has been longer than in the wild. The first blooms appear in mid July with the flowering extending through to the end of November or early December, the peak month being September. A new bulb that develops during winter will bloom in ten to twelve weeks.

To date there has been no sign of ink disease.

(Continued on page 76)

WESTERN WILDFLOWERS

WITH HORTICULTURAL POTENTIAL by E. Wittwer, King's Park, Perth

In order to assess the horticultural potential of a plant we must examine many aspects critically. Too often species are recommended because they provide a brilliant show that lasts a few weeks, but no consideration is given to the fact that they are unsightly for the rest of the year. Others are difficult to propagate and grow, or prove unsatisfactory in cultivation (no flowering, poor flowering, unbalanced growth). The wildflower enthusiast can and will, of course, grow many plants which will never become popular to the average gardener. Landscape and house gardeners however will need plants which perform well in cultivation.

To evaluate the horticultural potential of a plant we have to consider the following points.

- a. The ornamental quality (flowers, fruit, foliage, growth form).
- b. The plant must be decorative preferably the whole and certainly most of the year.
- c. Usefulness for special purpose (windbreak, ground cover, resistance to salt spray, droughts, etc.).
- d. Plant must be reasonably easy to propagate and propagation material must be readily available.
- e. Adaptability of the plant, that is its tolerance to a variety of soil types and climatic conditions.
- f. The expected life span (short or long lived, the time required to produce a mature flowering plant).
- g. Resistance to fungal diseases and pests.

The following plants have considerable potential as horticultural subjects and the extent to which they meet the above requirements is indicated using the letters a, b, etc.

- Banksia ashbyi* (abdeg). Compact shrub to 12'; best orange-flowering *Banksia* for the garden. Colour plate on page 321 of our No. 43 issue.
- Banksia media* (abdeg). Compact shrub 6-12'; flowers deep yellow, turning rusty brown; free flowering, good dark green foliage.
- Callitris preissii* (bcdeg). "Native Pine". Shrub or small tree to 20'; particularly good for coastal areas; stands lime and salt spray—a "windbreak" plant.
- Calothamnus blepharospermus*, *C. homalophyllus*, *C. quadrifidus* (abcdeg). One-sided bottlebrush; compact shrubs 4-6', flowers red—good "windbreak" shrub.
- Darwinia oldfieldii* (abdeg). Compact spreading shrub, 1-2'; flowers crimson; flowers freely from late winter to early summer. Colour plate on cover.
- Dampiera diversifolia* (abcdeg). Prostrate trailing plant; flowers deep blue. Good rockery and ground cover plant.
- Dryandra calophylla*, *D. pteridifolia* (abde). Both species are very good foliage plants, 1-2' high; dark green fern-like foliage; flowers hidden inside the bush. Ornamental undershrub.
- Eucalyptus caesia*, large form (abdefg). "Weeping" tree or large shrub, glaucous branches and foliage; flowers pink-crimson, 2-2½ inches in diameter.
- Eucalyptus sepulcralis* (abdeg). Slender "weeping" tree to 20', very graceful. Glaucous branches and foliage.
- Eucalyptus formanii* (abdeg). This species has only recently come into cultivation; the fine linear, lanceolate, bluish-grey foliage is very decorative and stays on the plant for the first 6-7 feet. The tree grows to 25' but retains the juvenile foliage on its lower branches.
- Eucalyptus crucis*, "Silver Mallee" (abdeg). Tree or shrub to 25'. Silvery foliage yellow flowers.

- Eucalyptus rhodantha* (abde). Shrub 4-8'. The silvery-glaucous foliage is stem-clasping. The showy red flowers are up to 3 inches in diameter. This is the most outstanding of all West Australian silvery foliage plants.
- Grevillea candelabroides* (abde). Compact shrub 8-15', the upright white flower spikes resemble candelabras. Main flowering season is spring to early summer but it is rarely without flowers when grown in the garden.
- Grevillea leucopterys* (abde). Shrub or small tree to 15'. The creamy flowers are carried on long stalks above the foliage. Ornamental shrubs for large gardens and parks. Do not plant close to the house to avoid the unpleasant odour of the flowers.
- Grevillea hookeriana*, "Toothbrush Grevillea" (abde). Shrub to 10'. Dark green foliage. The red flowers form a "toothbrush-like" inflorescence.
- Grevillea thelemanniana* (abcdeg). Semi-prostrate spreading shrub to 3' high. The flowers are pink to crimson. In cultivation this species flowers nearly all the year round. The plant grows naturally on limestone but does quite well on slightly acid soil.
- Hakea multilineata* (abdeg). Tall shrub 10-20' high; flowers from light pink to deep crimson in spikes up to 6 inches long. This species is variable both in colour and form.
- Hakea bucculenta* (abdeg). Shrub to 6-10'. The bright scarlet flowers are in 4-6 inch long spikes and contrast with the green linear foliage. Probably the most showy Hakea.
- Hakea petiolaris* (abdeg). Shrub to 15'. The ornamental value is in the bluish-green foliage but the pink "pincushion" flowers are also attractive.
- Hakea suaveolens* (abdeg). Shrub to 8', dark green foliage and white, sweetly scented flowers. Attractive shrub for full sun or semi-shade positions.
- Kunzea pulchella* (abdeg). Compact shrub to 6'. Silvery foliage and red flowers. An outstanding shrub both for foliage and flowers.
- Kunzea baxteri* (abcdeg). Compact shrub to 8'. Dark green foliage and scarlet flowers. A very good garden plant. Will grow in the most exposed position.
- Kennedia heckxiana* (abde). Vigorous climber; the large orange flowers make this species one of the most attractive native climbing plants.
- Leptospermum sericeum* (abcde). Shrub to 6'. Silvery-grey to pinkish foliage, pink flowers ($\frac{1}{2}$ inch diameter). This shrub performs well in garden conditions but will withstand the most exposed positions.
- Melaleuca coccinea* (abde). Shrub 6-8', good green foliage, red bottle-brush flowers. This species has been in cultivation for a few years only but has flowered well and the shrubs remain decorative for the whole of the year.
- Melaleuca diosmifolia* (abcdeg). Shrub 5-6' high, flowers greenish. This is probably the best Melaleuca for foliage. The compact dark green shrub is an ideal hedge plant standing up to high wind and tolerating salt spray.
- Melaleuca quinquinervia*, *M. parviflora* (abdef). Paperbark tree. 30-60', 25-30'. Both species are typical "Paperbarks"—the white trunks are the main attraction.
- Pimelea ferruginea* (abde). Compact shrub to 3'. The profusion of pink flower heads and attractive shiny green foliage makes this the best species for the garden.
- Regelia velutina* (abd). Shrub to 10', flowers scarlet. This shrub should only be planted for its silvery grey foliage as it does not flower in our (Perth) local conditions.
- Regelia megacephala* (abcde). Compact shrub to 10'; flowers purple. A very attractive shrub both for foliage and flowers. Wind-resistant.
- Scholtzia parviflora* (abde). 6-8'. Rather erect. Shrub similar to *Thryptomene* and often sold as such. In early spring is covered with tiny pink flowers which last for about 2 months.
- Thryptomene denticulata* (abde). Shrub to 2' with tiny pale purple flowers from June to October.
- Thryptomene maisonneuvei* (abde). Spreading shrub to 3'. Flowers pinkish. Flowering time same as above.
- Thryptomene saxicola* (abde). Spreading shrub 2-3'. Flowers pale pink from July to October.

GROUND COVER PLANTS

FOR THE COASTAL SANDPLAIN by E. Wittwer, King's Park, Perth

In recent years the value of ground cover plants has been more fully recognised. These plants play an important role especially in the sands of the coastal plains surrounding the Perth area. Bare sand exposed to the full sun heats up very quickly, the soil temperature in the top layer is extremely high and heat reflection is near the maximum. Water retention in the sandy soil is low—in fact, practically non-existent—but on the other hand water loss through evaporation is high. This creates very harsh conditions for most plants unless frequent watering is carried out.

Some of these problems can be overcome by using a suitable mulch which eliminates much heat absorption and reduces evaporation. Many mulches have the disadvantage of looking unnatural while others need frequent replacing.

Ground cover plants provide the most effective, natural and pleasing form of soil insulation. At the same time they eliminate soil erosion and provide a good climate for the micro-organisms in the soil.

To sum up the value of ground cover plants we can list the following points.

- a. Keeping soil temperatures at the right level.
- b. Reducing evaporation.
- c. Eliminating erosion.
- d. Reducing weed growth.
- e. Giving the garden a more natural look.
- f. Making mulching unnecessary.
- g. Increasing the variety of species for the garden and making it more interesting.

For the small garden only prostrate, semi-prostrate and "mat-forming" shrubs or herbaceous plants can be used. Where larger areas have to be covered vigorous growing species should be selected and some of the more dwarf spreading shrubs can be used.

SOME WEST AUSTRALIAN SPECIES SUITABLE FOR GROUND COVER ARE:

- Adenanthos cuneatus* (prostrate form) 2-3 sq. yards.
Adenanthos cuneatus (prostrate form) 2-3 sq. yards.
Banksia petiolaris (quickest growing prostrate species).
Banksia prostrata, *B. repens* (slow growers).
Banksia candolleana (for the larger gardens only).
Brachysenia praemorsum (semi-prostrate) (vigorous 3-4 sq. yards).
Baeckea camphorosmae (semi-prostrate).
Bartlingia squarrosa (for small gardens only).
Conostylis aculeata, *C. brevicauda*, *C. candicans*, *C. setigera*, *C. setosa* (sunny or semi-shade).
Calocephalus brownii (fine branched dwarf form) stands salt spray, sunny position.
Dryandra nivea, *D. bipinnatifida*, both slow growers.
Dryandra fraseri, *D. calophylla*, *D. pteridifolia*, are all good under shrubs for larger areas.
Disphyma australe, sunny position.
Dichondra repens (semi-shade in sand, in better soil it can stand sunny position).
Dampiera cuneata, *D. diversifolia*, *D. linearis*, all best in semi-shade.
Frankenia pauciflora, semi-shade.
Galenia secunda, vigorous grower, only for large areas, ideal plants to stop soil erosion on slopes.
Grevillea bipinnatifida.
Grevillea obtusifolia (prostrate form), shady moist position.
Grevillea brownii (prostrate form), *G. synapheae*, *G. thelemanniana* (prostrate form), *G. quercifolia*, *G. flexuosa*, all these species are small plants.

Grevillea paniculata (prostrate form), non flowering branches, shade or semi-shade.
Hakea myrtoides (for small gardens only).
Hydrocotyle asiatica (vigorous grower for shady position, some summer watering).
Hemiantra pungens (prostrate form), sunny, semi-shade.
Hibbertia crenata (shady position).
Hibbertia amplexicaulis (shady position).
Isotropis cuneifolia (small gardens only).
Jacksonia sericea, vigorous quick grower, 3-4 sq. yards.
Kennedia glabrata, *K. microphylla*, *K. prostrata*, *K. eximia*, all best in semi-shade.
Lobelia quadrangularis (moist, semi-shaded position, needs good soil).
Leschenaultia linarioides (this specimen likes alkaline soil, limestone).
Leschenaultia formosa, *L. floribunda*, *L. expansa*, all for small gardens only.
Melaleuca trichophylla (sunny position).
Melaleuca cardiophylla, *M. violacea* (both for large gardens).
Rhagodia nutans, sunny position.
Stirlingia tenuifolia.
Tremandra stelligera (for shady position).

A LANDSCAPE PLAN

FOR A NEW GARDEN by Marion I. Blackwell

This is a design for a domestic garden in an outer Perth suburb. The owners only request, apart from a low maintenance garden of W.A. natives, was for a track around the house for their young sons to ride tricycles on. They had bought a block of sand less than half mile from the sea, elevated and sloping, with a wide sweeping vista seawards over about 130°; and herein lay some of the particular problems to be dealt with.

Firstly that the view should not be occluded, yet that some of the prevailing sea breezes (and often much more than breezes), should be modified and shelter gained both for plants and garden users—so the shrubbery on the windward side had to be dense and varied but not too tall. The house is of two stories, with entertainment areas on the upper level, reached because of the slope of the land by a short flight of steps from the front pathway. Views from all windows needed to be considered in the placement of the taller trees, to frame vistas, soften adjacent buildings and hide eyesores.

Secondly some screening was also needed from street traffic on two sides and on the North Eastern aspect, from the school, situated opposite.

The block had originally been a stabilised dune, but unfortunately at the time of purchase, the whole area had already been denuded of its natural vegetational cover, so that the garden, not only had to be started from scratch (and seeds!), but the young plants upon emerging had to cope with high ground temperatures, constant sand blast and glare with its resultant scorch from the bare sand areas, together with strong onshore salt winds.

The wife is a wild flower enthusiast, keen to have an all "West Australian Native Garden" for low maintenance—as she has a job outside the home—and because she particularly likes them and is willing to try to grow most of them herself. This she started to do while the house was being built, continually adding compost in any form available to the sand, raising her own seedlings, planting them out while quite small in the cool part of the year and giving them adequate shelter until well established. She is continuing to develop the garden as time permits, planting the "backbone" trees first, as they are the most permanent things in a garden and take the longest time to grow; and now adding shrubs and ground covers to develop the areas in between.

SIMPLE PROPAGATION

Propagation by a Home Gardener—Hazel Cole

I have been growing native plants for about eight years. Prior to that time I had no experience of any kind of propagation. I was starting a new garden on sand and felt that native plants would stand a better chance of survival in such a medium because this is where many grow naturally. I started by buying *Hakea petiolaris*, *Melaleuca nesophila*, *Melaleuca armillaris*, *Darwinia citriodora*, *Eucalyptus caesia*, and a *Calothamnus* species. Soon I began to like the look of the native plants in my garden and as the selection from nurseries was limited, I decided to grow my own seedlings.

For a propagation house I picked a corner of the garden with a northerly aspect and sheltered from prevailing winds. It was made up of a frame with superimposed wooden slats and eventually became covered by a creeper. This served for the first season, but drips from the rafters damaged seed beds and young seedlings during heavy rain. I realised also that in winter a warm spot was needed to keep the seedlings growing. At this stage of my venture I seemed always to be moving pots around, hence I strongly recommend that in summer with our hot climate a frame structure should be covered with sarlon cloth to give shade, and for this purpose I have extended the bush house. Up till now I have had no proper protection from rain other than odd pieces of glass, and I attribute some of my failures to this cause. I now have a sheet of P.V.C. to cover seeds and seedlings. This can be easily removed during fine days, and it should also give added warmth during this coming winter. A location on a northerly facing wall is excellent for providing the added warmth necessary to continuing growth in the winter months.

The main sowing periods in W.A. are autumn and spring. Most northern species (e.g. *Cassia*), *Eucalyptus* and *Acacia* are best sown in spring. Seeds for autumn sowing should include *Anigozanthos*, *Prostanthera magnifica*, *Thysanotus multifloris*, *Beaufortia*, *Boronia*, *Eremaea*, *Pileanthus*, *Isopogon*, *Guichenotia macrantha*, *Chorizema*, *Hakea*, *Regelia*, *Marianthus*, *Dodoneae*, *Kennedia*, *Callistemon*, *Kunzea* and *Melaleuca*. The last three can be grown at almost any time of the year. Should I wish for any reason to grow a particular species in summer, I put a few seeds per pot and don't prick out, leaving the strongest seedling, but even so losses can be high during a heat wave. Though my bush house is the coolest place in the garden, it becomes necessary to move small seedlings into the house during extremely high temperatures. Germination of seed generally takes place after 1-6 weeks, but interesting enough I have found that after a year's dormancy there has been a good germination of *Verticordia monodelpha*, *Anigozanthos bicolor*, and *Guichenotia macrantha*. In the case of *Verticordia* and *Pileanthus* good seed is difficult to come by from plants growing wild, probably due to insect damage, and seed from cultivated plants should be used whenever available. The seed of some genera of course needs pre-treatment with hot water, e.g. *Acacia*, *Chorizema* and *Kennedia*. I also pretreat seed of *Anigozanthos viridis* and *Anigozanthos pulcherrima*.

For the sowing of small seeds I prepare 5" or 6" plastic pots filled with a 50-50 bush sand garden compost mixture with a little blood and bone added. This I sterilise by pouring boiling water into the filled pots. After cooling the seed is sown thinly, pressed in, and covered lightly with sand and a fine road metal mulch which prevents seed disturbance during

subsequent watering. For *Melaleuca* and *Eucalypt* I use bog method. Larger seeds are planted 2 or 3 to a 4" pot. Seed boxes are useful for medium seed such as *Kennedia*, *Chorizema* and *Anigozanthos*.

Seedlings should be thinned as they grow, and a pair of tweezers is useful for this. As soon as young seedlings are big enough to handle and there is a cool day, I prick them out into 4" plastic pots using a patting mixture of 1 part cladium peat (pH 3.7) to 6 parts black bush sand and 6 parts sieved garden compost with some blood and bone added. My compost is made from chopped soft prunings, leaves, a little poultry manure and sand. When pricking out I use a large penknife cutting round the seedling on four sides, lifting on the blade of the knife, and placing in a hole of similar size. In this way the roots are not disturbed. Even a long tap root lifts out without breaking. Both the pot containing the seedlings and the soil mixture in the 4" pots must be thoroughly wet and the tiny plants must be given shelter and shade for a few days until they are put under the sarlan shade cloth (if in spring or autumn) or into the sun if in winter.

Most *Melaleucas* germinate easily and are also easy to grow on, but *Melaleuca scabra* has proved difficult. *Verticordia lindleyi*, *V. densiflora* and *V. plumosa* seem quite easy to grow, but *V. chrysantha* is difficult. It germinates well but the seedlings die off soon after pricking out, so this year I intend to try sowing a few seeds per pot, leaving the strongest seedling and planting out in the ground while quite small. *Banksias* and *Dryandras* are difficult to grow on in pots except for *B. occidentalis* and *D. fraseri*, because they readily become chlorotic and do not transplant easily, but recent experience with cladium peat mixture is encouraging. It is best to sow seeds of these species in situ in the autumn. This also applies to *Hakea multileneata* and *H. bucculenta*. I have had no success to date with *Isopogon* and *Petrophila* (all species of the family Proteaceae you will notice) and here too it may be better to sow in situ. *Eremaea* species germinate well, but the young seedlings are prone to die, especially *E. violaceae*. Spraying with a fungicide may help here. However each year a few plants survive, and these I put in the ground in early summer when still quite small, put a rock by them for root stability and shade with leafy prunings which also help to support the plant against wind. Most of these survive the first summer, and then they are well away. *Grevilleas* are difficult to germinate (the exceptions being *G. thelemanniana*, *G. pinaster*, *G. bipinnatifida*, and *G. pritzellii*) but I have had seed from cultivated plants for these. *G. leucopertis* will germinate readily if the testa is removed. *Beaufortia* germinate well but the only two I have been able to grow on are *B. squarrosa* and *B. sparsa*. I shall try *B. elegans*, *B. eriocephala*, *B. heterophylla* and *B. macrostemon* again this autumn by putting a few seeds per pot and not pricking out. Root disturbance seems to be something they will not tolerate.

After the seedling stage I pot on into plastic planter bogs (9 inch by 5' inch) using the same soil mixture as before, with a sprinkling of blood and bone as the plant is inserted into the planting hole. These plants are hardened off in summer (from spring sown seed) by giving increasing amounts of morning sun until they get full morning sun but afternoon shade.

Care must be taken in watering seedlings. Garden sprinklers should not be used as they tend to flatten down small seedlings. I use a watering can with a fine rose, stand pots in a tray of water, or for bigger seedlings water gently with a hand held hose. The best method is that of sub-irrigation.

This not only cuts down weed growth, but also fungal attack on the foliage. By adopting this method on a bigger scale I hope to have more success with difficult genera like *Beaufortias* and *Eremaeas*.

When trying out new species it is a good idea to keep records showing date of sowing seed, date of germination, and approximate percentage of germination. Also I always leave the old label in a pot or seed box in case seeds germinate the following year as happens with some of our native species which have dormancy periods.

Certain plants grow better from cuttings, and my procedure is to use small plastic bags sitting in a large plastic pot half full of sand, the whole covered by a large plastic bag (to maintain humidity), and the pots standing in a tray of water. 6" or larger pots filled with the cutting medium can also be used. I take semi-matured wood for the cuttings, stripping off all the leaves except for the top few, and cutting these in half if large. This cuts down transpiration yet allows the growth auxins to operate. It is also worthwhile to dip the cuttings in a cutting powder such as Seradix 2. I find that April to June is the best time to put in cuttings. Coarse river sand has proved to be the best medium, sterilised with boiling water, and allowed to partly dry. I spray the cuttings with a fungicide. Plants that have been grown successfully by this means are *Calocephalus brownii*, *Pimelia ferruginea*, *Darwinia rhadinophylla*, *D. oldfieldii*, *Leschenaultia laricina*, *L. formosa* (*L. biloba* can be struck by putting tips in a pot of gravelly soil and leaving in the winter rain in a shady spot), *Chamaelaucium uncinatum* (Geraldton Wax) especially the deep red, *Hemiandra pungens*, *Hibbertia crenata*, *Eremophila glabra*, *Frankenia pauciflora*, and *Grevillea obtusifolia*.

Growing native plants can prove an engrossing hobby and quite a challenge. I put it to good use by selling my excess stock for a charitable cause, to me a far more enjoyable occupation than baking cakes for these stalls.

WILDFLOWER GARDENS—Continued from page 59

Garden No. 3

The garden of Mr. C. Hyne has had a most desirable sloping site in another area under cultivation since the earliest days of the settlement. Here the clay is overlaid with sandy loam at varying depths. The impermeable layer has prevented leaching of soil nutriments and the free open texture encourages root growth. Most of the garden is well protected, and the plants have been placed with discretion. The depth of the friable top soil over the clay varies from 4 feet on one side of the 100 ft. wide block to one foot on the other. Plants listed below are well established, and it should be noted that some of them, including *Verticordia grandis*, *Macropidia fuliginosa*, *Banksia coccinea*, and *Nuytsia floribunda* rarely persist in the metropolitan gardens to this stage of development. This is an outstandingly successful garden situation for natives.

Plants in this garden are: Myrtaceae: *Eucalyptus torquata*, *E. macrocarpa*, *E. rhodantha*, *E. farrestiana*, *E. stoatei*, *E. pyriformis*, *E. tetraptera*, *E. erythocorys*, *E. preissiana*, *Melaleuca nesophila*, *M. elliptica*, *M. huegelii*, *M. nematophylla*, *Kunzea baxteri*, *K. pulchella*, *Eremaea violaceae*, *Callistemons phoeniceus* and *speciosus*, *Verticordia grandis*, *Darwinia citriodora*. Proteaceae: *Hakea laurina*, *H. bucculenta*, *H. multilineata*, *Banksia coccinea*, *Grevillea leucopteryx*, *G. bipinnatifida*. Small plants: *Correa* species, *Macropidia fuliginosa*, *Anigozanthos flavidus*, *A. rufus*, *A. humilis*, and *A. manglietii*. Other Trees: *Nuytsia floribunda* and *Pittosporum phylliraeoides* with *Hibiscus huegelii*.

DRYANDRA AND BANKSIA

Dryandras and Banksias I am Growing in My Garden by G. A. Oxnam

Dryandras and *Banksias* are genera which do not as yet find very wide representation in wildflower gardens in this State. There is widespread hearsay that they will not withstand artificial watering or heavy applications of artificial fertilisers such as they will receive in close proximity to lawns, and that they will fall prey to attacks by white ants at an early age. Also it seems a strongly held belief that they are a long time coming to maturity, and so will contribute little in the way of floral display for many years.

Having established a wildflower garden at Nedlands, W.A., comprising such genera as *Eucalyptus*, *Acacia*, *Hakea*, *Grevillea*, *Melaleuca*, *Kunzea*, *Callistemon*, *Boronia*, *Leschenaultia*, *Kennedia*, *Hardenbergia*, and *Anigozanthos*, I determined to explore for myself the possibility of growing *Dryandras* and *Banksias*. These genera are endemic to Australia, and for this reason alone no native garden should be complete without some. But apart from this, they have decided merit as horticultural subjects on account of their form and foliage, and their striking floral displays in a wide range of colour. Leaf shapes range from needle-like forms to large triangular cut-outs. The cut flowers are particularly prized for use in large floral decorations. They can be used fresh (in which state they keep for weeks) or dried. Many are borne on long sturdy stems which make them ideal for arranging. The mature inflorescences bearing the fruit, the "Big Bad Banksia Men" of May Gibbs fame, are also decorative, and come in a wide variety of shapes and sizes from the nine inch giant of *Banksia grandis* to the dainty rose cone of *Banksia laricina*. These stay to enhance the appearance of the plant long after the colour has faded. Both genera include a wide range of size and habit of growth amongst their species, so that various members can be useful as ground cover, shrubs, or as specimen trees. Some trees grow upright to 60 ft. whilst others are informal and straggling. They offer great possibilities in landscaping. A strong point too for including them in the home garden is that they flower in late summer and autumn when little else is in bloom. In many cases the young leaf growth is of a bronze tinging and conspicuously attractive in itself. In fact this stage can be just as eye-catching as a bush in full flower.

DRYANDRA

Dryandra fraseri, my earliest success from seed, is an excellent ground cover plant, which after eight years covers an area of 4 ft. by 4 ft. The foliage form is very attractive. It blooms freely each year, and the yellow rosette-type inflorescences are each about two inches in diameter. Unfortunately it has not set seed in my garden, and it is only the difficulty of securing seed that prevents my using it a lot more in my garden.

Dryandra nana has also proved useful as a ground cover and border plant. It is valuable for its leaf form though its flowers are somewhat inconspicuous. My plants in this case were obtained by transplanting root suckers from the bush. These established quite readily with care in the early stages. One plant has by now spread itself along the driveway for 5 ft. by 3 ft.

Dryandra polycephala is of course the florist's delight, and any gardener would be pleased to own one. I have found that this species germinates very easily from seed. It is however extraordinarily difficult to grow the seedlings on in pots as they damp off so easily. Success has come for me by planting straight into the ground in autumn and covering the tiny plant with a 10 inch plastic bag over a frame to provide winter protection. If yellowing occurs at any stage, treatment with iron chelate and trace element fertiliser seems to be the cure. Four plants have now been established to flowering and seem likely to survive. They flower in the 3rd or 4th year when the shrub is about three feet high. It eventually grows to 5 ft. by 4 ft. It is as well to remember that it is prickly when you are considering location. It is one of the first flowers to bloom in the spring and continues for several months.

Dryandra formosa is a species from the Stirling Range, but adapts fairly well to sand. My specimen, again grown from seed in situ is 5 ft. high and flowered in its fifth year. The foliage is soft and most attractive. The two inch bronze inflorescence is borne on a long slender stem, and it also dries perfectly, which makes it a good subject for floral art. The plant is very prone to yellowing but responds to iron chelate treatment.

Dryandra praemorsa. Two of these plants were raised from seed sown in situ. One bloomed for the first time in its fifth year. The other died in its fourth year after a fine display of new leaf growth. I feel these plants need to be assured of deep watering during summer in our hot dry Perth climate. The deeply cut foliage forms a rosette around the large yellow flower heads.

Dryandra speciosa. A plant is flowering in its fourth year from seed in situ. Growth has been slow but steady.

BANKSIA

With this genera I have had several unaccountable losses. The plant dies suddenly, as did *D. praemorsa*, often just after it made a lot of new growth prior to flowering or just after flowering. It is as if the plant has perished in the effort of reproduction. Flowering time coincides with the end of the dry summer season so that lack of water may also be involved. I have been working on the assumption that *Dryandra* and *Banksia* roots should be encouraged to go down for water. To this end I give them a thorough night watering once a week. Shallow watering encourages the plant to rely on surface roots and in century heat the ground temperature is so high that the plant is easily threatened. (One test on a hottish afternoon revealed as follows:- Shade temperature 95°; 1 inch deep in dry grey sand 135°; 1 inch deep in heavy loam unmulched, watered 5 hours before, 126°; 1 inch deep in heavy mulched soil watered 5 hours before, 95°). I always pack around the plant well with stones and leaf mulch to guard against movement in the ground and to keep the roots cool.

When I started my garden in 1960, *Banksias* were hard to obtain from the nurseries. I was fortunate to obtain small seedlings of *B. grandis* and *B. littoralis* at the two-leafed stage. These *Banksias* are now 12 feet tall, but none has yet flowered. By 1967 I was able to obtain six species from a nursery. These were *B. ashbyi*, *B. verticillata*, *B. praemorsa*, *B. occidentalis*, *B. media* and *B. repens*. All have become strongly established, and two plants of *B. media* have already flowered prolifically this year. It is indeed a worthwhile plant. It is a compact shrub, the young leaf growth is eye-

catching, and the 6 inch yellow cones are spectacular and borne in great numbers. *B. dryandroides* I obtained from a friend. At four years it is barely two feet tall but makes steady progress. Its leaf is again most attractive.

All my other *Banksias* have been grown from seed planted in situ as soon as the ground is thoroughly wet in late autumn (which is the break of the dry season here). I sow three seeds about 3 inches apart and retain the strongest seedling if more than one germinates. During the cold months they are covered with a plastic bag over a frame, and care is taken to see that this is not left on once the warm days come in spring or they will cook. Any sign of yellowing in the seedlings is treated with applications of iron chelate and the trace element mixture, Minorels. As the plant becomes established I give light dressings of bone dust at intervals. I have in my garden the following *Banksias* grown in this way:-

Banksia attenuata, dwarf form. At 5 years old this is 4 ft. by 3 ft. but has not yet flowered.

Banksia hookerana. My first plant flowered in its third year—and died. Another plant, apparently thriving, died at two years. Several younger ones are still looking healthy. The plant I collected the seed from is in a public garden where it receives a minimum of attention and watering, and it flowers prolifically every year, so I feel I will eventually succeed with this species. A rounded 5' x 5' bush which covers itself with greyish orange flowers.

Banksia baueri. This has been a slow grower, but has never yellowed or seemed to suffer a set-back. At five years old it is 4 ft. by 5 ft. but has not yet flowered. The fact that it is in rather a shady position could account for the delay in flowering.

Banksia baxteri. This has flowered in its fifth year. (Another which was given me is now eight years old, and also flowered first in its fifth year). This species is rather straggling in form, but can be firmly recommended for its flowers. These are globular and silvery green. They are carried on long slender stems, which make them ideal for picking. I was able to give away about 40 blooms this Christmas. The dentate leaf is in the form of triangular cut-outs to the mid-rib, and adds attraction to the flower. I would like to point out here that with all *Banksias*, unless you need seed (in which case a few cones will suffice) or are collecting the dried fruit for floral art, you should regard picking as an important part of the cultivation programme. In this way the plant is saved from expending itself on producing mature fruit and is less likely to perish when growing away from its normal environment or when the dry season is particularly severe.

Banksia speciosa. From seed to flowering took only two years in this species, and by this time it was 10 ft. tall. Its long hanging saw-toothed leaves are an attractive feature as is the whole shape of the bush, an ideal garden subject. Silvery grey to yellow flowers.

Banksia victoriae. Again flowers came in the second year from seed. Three plants are strongly established, already 4 ft. high, and the bright orange flower heads attract humans and honey-eaters! Ultimately a 6' 6" shrub with serrated foliage, woolly young leaves and bright orange cones 4" across.

Banksia burdettii. This species also obliged with flowers in the second year. These are rather like the flowers of *victoriae* but not as robust. A compact bush with slightly greyish leaves, it flowered at 4 ft. in height. Grows to a

6' x 4' shrub with finely serrated grey-green leaves and the flower heads being grey at first and opening to orange. Colour plate Vol. 5, pp. 336.

Banksia caleyi. Several plants have become established to the fourth year, but another (the strongest looking) shrivelled and died after a luxurious display of new bronze leaf in its third summer. None has yet flowered. Colour plate Vol. 5, pp. 201.

Banksia prionotes. Plants of this at one, two and three years of age are growing strongly. All have had to be nursed through periods of yellowing with iron chelate. None has yet flowered. This grows to a spectacular tree to 15 feet high with showy grey and orange flower heads.

Banksia menziesii. My five year old plant has been broken twice by children and dogs, but fortunately the only result has been extra branching. It has been a slow grower because of the treatment meted out to it, and possibly because it is in a shady position.

Banksia nutans. I find this a difficult species. It germinates easily enough, but yellows, and does not respond very readily to iron chelate treatment. To date only one has survived, 6 inches high, 3 years old.

Banksia coccinea. I must report a total failure to date with this the most showy of all the *Banksias*. Germination has been easy enough but all plants have been lost at the two leaf stage. However I understand that other growers have had more success, but I have only heard of one plant producing flowers in the metropolitan area—a flower twelve feet up!

Banksia prostrata. A five year old plant of this species has made steady progress, but has not yet flowered.

In the winter of 1969, I extended my sowing to include *B. goodii*, *B. pilostylis*, *B. violaceae*, *B. petiolaris*, more *B. media*, *B. repens*, *B. sphaerocarpa*. These have survived their first summer. I failed to get *B. laricina*, and *B. tricuspidata* to germinate, and failed to carry on *B. solandri*, *B. laevigata*, *B. audax*, but will try all these again in my 1970 planting along with *B. meisneri*, *B. luffitzi*, *B. sceptrum*, *B. quercifolia*, *B. brownii*, *B. candolleana*, and *Dryandra proteoides*, *D. carlinoides*, and *D. shuttleworthiana*.

I feel confident that any gardener can, with a minimum of expense and care, have a selection of *Dryandras* and *Banksias* growing and flowering within three years if the programme of care outlined above is followed. My recommendations to the beginner would be to try *B. media*, *B. victoriae*, *B. burdettii*, *B. prionotes*, *B. speciosa*, *B. hookerana*, and *Dryandra praemorsa* and *D. formosa* and *D. polycephala*. Sow the seed in fairly open sunny positions where there is room for growth. Some sideways spreading could be controlled eventually by pruning. The only fertiliser I have used on these plants apart from Iron Chelate and the trace element mixture Minorels is Bone Dust. I avoid planting too close to areas that are likely to be treated with artificial fertilisers.

ANIGOZANTHOS BICOLOR—continued from page 64

This year I have divided up a section of the bulbs, planting some in the ground (the soil being grey sand), to test their adaptability. So far the results are successful.

I have found this plant very rewarding and consider its potential as a pot or rockery plant is unquestioned.

Over a period of time with the division of bulbs I hope this rather rare and almost unknown variety of *Anigozanthos* will be preserved by cultivation.

THE ORCHIDS ACIANTHUS

Cultivation of the Genus Acianthus by David L. Jones

Acianthus is a small genus of about twenty species confined to Australia, N.Z. and New Caledonia. In Australia there are about eight species, some of which are very widespread.



Photography by A. Logan

ACIANTHUS EXSERTUS

"Mosquito Orchid" very common from Queensland to Victoria to 8" high.

All the species have been fully described in No. 28 issue followed by fuller details of the species in Tasmania and South Australian and their cultivation. The general growth habit of the plant is a flat rounded leaf generally held above the soil surface with the flowers borne on a long raceme. The underground system consists of small rounded tubers $\frac{1}{8}$ – $\frac{1}{4}$ " across and long white fleshy roots which form new tubers at the tips.

I have tried six species in cultivation, including one from N.Z., and found all to be relatively easy and rewarding. Most species grow in colonies and this is a good sign for cultivation. Provided the basic rules of drainage are observed and they are given some protection then cultivation of the species is relatively simple. Before potting ensure that the drainage hole is covered and running free. Use an open soil mixture that will also drain free, and ensure that some leaf-mould is present. I use a compost of 1/3 bush loam, 1/3 coarse sand and 1/3 partially rotted leaf-mould of the Coastal Tea-tree, *Leptospermum laevigatum*. The bush loam is either a coastal sandy-loam or else mountain soil—a well textured soil from some Victorian highlands. Often a good loam can be obtained from Granite areas.

As the various species increase vegetatively I repot annually into a new soil mix. About 15-20 tubers in a 5" pot makes a good display. I have noticed that some species only flower well every second year. I find they respond well to liquid fertilizer; the leaves freshening up and the general vigour of the plants increasing. The only pest problem I have encountered is aphid on the flowering stems. These are readily controlled by a contact pyrethrum spray. Slugs and snails can be a problem and should be kept away with baits.

Acianthus amplexicaulis (F. M. Bail.) Rolfe. I have only had one season's experience with this species, however it seems to grow well but needs the protection of a glasshouse in Melbourne. It has a very attractively lobed leaf.

Acianthus caudatus R.Br. This species is rather slow to increase in cultivation and prefers a heavy soil such as mountain soil or a granite loam. The flower buds appear early in the season but are slow to develop and susceptible to damping-off. The species definitely only flowers well every second year. I think that it does best in a large pot where it can be left for a few seasons between repotting.

Acianthus exsertus R.Br. This is a very easy and rewarding species to grow. It increases freely by three times or so, and flowers very well. A potful makes a very nice show. It prefers a sandy loam but I have had good results recently using mountain soil. There is no doubt that it responds well to early watering—begin in earnest about mid-February. There is a very attractive all green form from some of the islands in Corner Inlet and on the coast in South Gippsland.

Acianthus fornicatus R.Br. This is possibly the most rewarding species in cultivation. It grows vigorously, reproduces rapidly (three to four times), and flowers freely. A potful makes an impressive display. It can be grown in any well-drained mix however it definitely prefers a heavy soil such as the mountain or granite soil. There is a very superior form collected by Brian Whitehead in N.S.W. This is very vigorous and flowers freely. The flowers themselves are large with an attractive green labellum.

Acianthus fornicatus* var. *sinclairii (Hook. f.) E. D. Hatch. This is a dainty form from N.Z. It is much less robust than our mainland variety but seems to grow easily. It prefers a mountain soil mix and flowers quite freely, but increases slowly.

Acianthus reniformis (R.Br.) Schlechter. A very common and variable species that often occurs in dense colonies. It varies in leaf size and colour, flower colour and time of flowering. In all it is an ideal orchid for horticulture since it provides such a field to select from. Overall it is a very easy species to grow reproducing well and preferring a heavier soil mix. However I have found that it is an erratic flowerer, some seasons making a beautiful display but usually producing few spikes. I have noted a few forms that I have had experience with, but undoubtedly there are others.

You Yangs form", this form has large glistening green leaves and bears a tall spike of large rosy flowers. It is vigorous in cultivation. There is another form similar with bluish-green leaves.

"Coastal form", this is a rather diminutive form that often grows in exposed coastal dunes. It has small bluish green leaves about 1" across and is a very shy flowerer.

"Yellow flowered form", this lovely form comes from the eastern region of S.A. around Naracoorte, and was introduced by Marion Beek. It has a sparkling green leaf and a lovely yellow-green flower borne on a tall spike. Two other very interesting forms from the same area may be worth considering. One flowers early in the season the other late and both appear to have potential.

ORCHIDS FROM SEED

SOWING ORCHID SEED IN BOTTLES—PART 3

by B. C. Kowald, Katanning, W.A.*

Terrestrial orchids are fascinating little plants. It is such a pity they have been so hard to grow from seed. I am always trying to find a better or easier way and can now offer some improvements on my previous methods.

The bottles are still prepared in the same way although with some bottles I did not bother with the holes in the lid. I just screwed the plastic tops loosely. I find it much easier to do the planting over a hot stove. The bottles are stood on a wire stand on top of the stove, while the lids, etc., are in a saucepan of captan solution also kept warm. The seed is sewn in the bottles with a copper wire, or just poured in. This seems to take hours off the work.

* Part 1—"How to Flask Terrestrial Orchid Seed in Bottles", No. 42 Issue, Vol. 5. There were a few errors in this part—the small things are boiled only 10 mins. not 1 hour—you dip only the small seed bottles in Captan, not the flasks.

Part 2—"Orchids from Flasks to Pots", No. 44 issue, Vol. 5. Should be 11 gm. of agar as given in Part 1, not 17 gm. Wash the seedlings from the flask in two lots of boiled cold distilled water and then in a very weak fungicide solution before planting. Store tubers in sawdust away from rodents and dust with insecticide.

AUSTRALIAN INDIGENOUS ORCHIDS by A. W. Dockrill

This is a large 870 page book that describes all Australian epiphytic orchids and those terrestrial orchids found in the northern areas of Australia. Each species is described. The book has been accepted throughout the world as the reference to Australian orchids.

Those who find the technical descriptions heavy going are referred to the last two paragraphs on each page where the descriptions are again given in a form more readily understood. This has been one secret to the book's success as anyone keen to know more of our orchids may readily use the book. Available from the Editor, 860 Henry Lawson Drive, Picnic Point, 2213 for \$18.00 plus \$1.00 postage.

SUPPLEMENTARY SHEETS No. 2: It is proposed to maintain this book up to date through the pages of "Australian Plants" as we have done here. For those who have bought the book, the new discoveries are available free of charge from the Editor in the form of "Supplementary Sheets No. 2" especially reprinted for easy insertion in your book.

THE NORTH OF WESTERN AUSTRALIA

by Fred Lullfitz

Under the auspices of the Department of the North West, Fred Lullfitz is now promoting interest in the growing of more trees by both private individuals and shires in the endeavour to improve the appearance and the living conditions of the Northern townships. The territory over which he operates is all that country north of the 26th parallel, roughly from Shark Bay to Wyndham.

The first project was to make plants available to all interested prospective growers. This was done by producing young trees in any location possible. Initially volunteer nurseries were assisted and encouraged to produce plants sufficient for local needs. However with most of the population being on a temporary basis—school teachers, police, and other Government officers—the scheme proved a little unreliable, and finally a central nursery was developed at Broome. Here plants are now produced hygienically and disease free in as wide a variety as possible.

PROPAGATION OF WILDFLOWERS AT BROOME

Primarily they are grown in a mixture of river sand and peat-moss with some added chemical fertiliser. They are pricked out into polythene tubes about 1½" in diameter, and when large enough are packed into a standard size box and mailed to other centres. This is assisted by courtesy of commercial transport, and business enterprises who do this as a service to the community. The young seedlings are then supposed to be repotted at their destination and when large enough are made available to people wishing to take advantage of the service. The scheme does not operate in competition with commercial nurseries and every encouragement is given to local enterprises.

The range of plants produced is dependent upon seed supplies available. Seed is collected mainly in the north, and consists of both native and other species which appear to thrive in a particular area. A most welcome addition is seed supplied from interested admirers of the scheme, and quite a variety has come from Queensland. Some has come from overseas.

It is necessary to channel plants to the areas where they will grow readily, for the total area can be divided into zones of differing climatic influence. There is no point in persevering with "hard to grow" types at this stage. Plants for many areas must of necessity be able to tolerate water and soil which carries a lot of soluble salts. Shark Bay of course heads the list here with very heavy salinity. Another feature to contend with is the extremely arid conditions plus strong winds—particularly in the Pilbara, Port Hedland, and the new mining areas. The mining companies have quickly recognised the need for trees and have initiated their own nurseries and gardening staff. Their new towns are quickly showing the results of this. One of the major problems is to try and break down the attitude of "I will only be here two years so I won't see the results of any gardening I do, so why bother?" Little thought is given to the concept that if the previous occupier had grown some plants then the benefit would be theirs. With the supply of free plants and free advice, a basic planting is being achieved.

Transport has in the past limited the choice of available species, and the poinciana, golden shower (*Cassia fistula*), River gum, oleander and tamarisk have been the faithful standbys. It is considered that a lot of the coastal towns would improve with the addition of palm trees, and to this end about 3000 coconuts have been distributed. They are quite popular and the demand far exceeds supply. The first essential in the whole of the North is provision of shelter and windbreak. To this end the River gum (*Eucalyptus camaldulensis*) is by far the finest tree. It thrives with the minimum of care and growth is rapid. With little attention it will rise 8 feet in the first year from seed, and it is tolerant of almost any soil. Another fast grower is

Sesbania grandiflora, a native legume from the watercourses. I have some in the nursery at Broome, and at 10 months they are over 12 feet high after being lopped at 5 feet to induce branching.

Some other native plants from the area which are thriving are *Erythrina vespertilio*, Chintabel or Yeelba, and *Eucalyptus bigalerita*. The latter is a handsome gum from the flood flats of the Kimberley with enormous round shiny green leaves the size of a dinner plate and a smooth white bark turning salmon as the season progresses. It is deciduous!

A genus of local tropical trees which shows no resistance to domestication is *Terminalia*. Though the flowers are inconspicuous they are all very nice trees with a variety of leaf form, and fruits which are quite attractive.

Ficus species. There are about six of these available, and they are easy to grow.

Native to northern watercourses are the "Cape Lilac" and "Sirus" or *Albizzia lebbek*. Both are very valuable and versatile trees.

All *Brachychiton* are worthwhile. In particular the mountain Kurrajong with its large red bell flowers is most desirable.

There is a very interesting range of native cassias for shrub work and all are good. A garden in Exmouth, where soil is only a few inches deep on solid rock and water is scarce, has about six varieties of native cassias. The seed was simply broadcast sown. With the added attention of some watering, the result has been phenomenal.

A genus relatively untouched and here regarded with some contempt is *Acacia*. Unlimited variety ranges from flat topped shrubs with large shiny green foliage to creeping trees and that oddity of the north *Acacia dunnii* (Elephant Ear Wattle) with phyllodes sometimes as large as a sheet of newspaper.

One *Verticordia* in the far north, *Verticordia cunninghamii*, is a small tree up to 12 feet, but unfortunately it smells like a rodent's cage!

Numerous *Calytrix* abound, and *Grevilleas* are plentiful. *G. dryandri*, *G. heliosperma*, *G. pteridifolia*, and *G. wickhamii* are prominent. From Broome almost to Port Hedland on the red sandy loam *Cyanostegia cyanocalyx* is a marvellous sight from July to Christmas. This is not an easy one to cultivate.

In the Pilbara—in the iron mining centres—the Sturt Pea and Ashburton Pea come into their own after a good season. *Ptilotus* species are also a joy to behold. *Eremophila* species by the score are outstanding. Some very fine *Ipomoea* species are available, and these cultivate readily. The new found *Ipomoea yardiensis*, whilst most rare, is a gem.

This list is but a sample of the native flora in the area. I hope the picture I have presented does not give rise to a vision of a lush paradise of wildflowers. The climate for the most part is extremely harsh and the soil extensively leached free of plant nutriment, and it is only in occasional lush seasons that nature shows to advantage.

Trees like Desert Walnut—*Owenia species*—whilst presenting a fine picture on spinifex plains where no comparison exists, are too hard to germinate freely, and their habit of shedding huge quantities of leaves and hard round nuts makes them an unattractive subject for cultivation.

It is very pleasing to observe that there is an increasing demand also by the aboriginal population for shade trees and fruit trees in camp areas and in housing tenements. Opportunity is taken to assist and advise where possible in the establishment of vegetable gardens and general planting. All schools are assisted with nursery establishments. Garden clubs are formed for children and Arbor Day is observed by a programme.

Anigozanthos and its Orthographic Variants

by Hansjoerg Eichler (Adelaide)

The scientific name of the Kangaroo Paw has been spelt in various forms in the botanical and horticultural literature, and there is still no unanimity reached on the correct spelling of the name in Australia. The existing confusion is perpetuated by the fact that in two important modern dictionaries of generic names of flowering plants the name is spelt differently: H. K. Airy Shaw in the seventh edition of J. C. Willis, *A Dictionary of the Flowering Plants and Ferns* (1966) on page 64 lists *Anigozanthos* as correct, whereas N. T. Burbidge, *Dictionary of Australian Plant Genera* (1963) on page 17 accepts *Anigosanthos* as correct and mentions several other spellings as variants.

In this journal (*Australian Plants*, vol. 2, Sept. 1963, on pages 107-115) J. Grieve and N. Marchant dealt with the species of Kangaroo Paws and stated about the scientific name: "For a considerable time this was spelt *Anigozanthos*, but the correct usage to conform with the Article of the International Code as pointed out by J. Green (M.Sc. Thesis, 1958) is to use the s instead of z." In the thesis cited Green writes on p. 221 under the heading "Spelling of *Anigosanthos*" the following paragraph: "It will be noted that the spelling of this genus departs from that commonly used in the literature. This is to conform with the Article of the International Code requiring adherence to the original spelling of a genus or species." Grieve and Marchant obviously took the correctness of this statement in the thesis for granted and did not attempt to check the original spelling. Green has nowhere in his thesis given a reference to the original publication of the generic name but has consistently (at least on 8 pages) spelt it *Anigosanthos*. The possibility of a typing error in the crucial paragraph of the unpublished thesis can, therefore, be excluded. Burbidge (1963) quoted the original publication and marked the reference with "(A)" thus indicating that it had been personally checked by the author (see Introduction p. XI). Such an indication was not given by Airy Shaw (1966), but his care in revising Willis' Dictionary is well known.

I have been asked recently to give information on the correct spelling of the name in question in connection with the legend to a card of the Australian Wildflower Series issued by the South Australian Museum and I thereby noticed these current discrepancies. As the original publication is rare and not easily available I felt it desirable that my findings be made available in some detail.

The name was originally published by Jaques Julien Houttou de Labillardière in his work entitled "Relation du voyage à la recherche de la Pérouse . . .". This work consists of three volumes, two with text, and one atlas. The latter is in folio size; the two text volumes were issued in two sizes, octavo and quarto. The accepted publication dates are (according to Stafleu, *Regn. Veg.* 52:252.1967) as follows: Vol. 1: 22 Feb-4 Mar 1800; vol. 2 incl. atlas: early Apr 1800. I was unable to ascertain which of the two text editions, octavo or quarto, came out first. [Burbidge quotes both editions, but gives the date 1799 which appears to be incorrect]. Fortunately in both editions and in all places in which the name is mentioned in the original work the name is uniformly spelt, and there is no doubt that *Anigozanthos* is correct.

As this name is an excellent example for orthographic variants of a generic name, all variants I was able to trace are listed and the references to the examined literature are given. Except for the original publication by Labillardière, the first references cited need not be the earliest places in which the relevant variants were published; as all variants which differ from the original spelling are incorrect their priorities are of no nomenclatural significance.

The correct generic name of the Kangaroo Paw is *Anigozanthos*.
Anigozanthos Labillardière, *Relation du voyage à la recherche de la Pérouse* (Paris) 1(22.II-4.III.1800) 410, 411 [quarto ed.], 409, 410 [octavo ed.]; 2 (IV.1800) App. 104 [quarto ed.], App. 100 [octavo ed.]; atlas (IV.1800) t. 22; Labillardière, *Voyage in search of La Pérouse* (London) 1 (1800, after 6.V.1800), 465, t. 22, XXIX (= list of plates); Labillardière, *Nov. Holl. Pl. Sp.* 2 (1807) 119; R. Brown, *Prod. Fl. Nov. Holl.* 1 (1810) 301; Massey, [Cuvier] *Dict. Sc. Nat.* 2 (1816) 157; Link, *Enum. Pl.* 1 (1821)

313; Schultes in Roemer & Schultes, Syst. Veg. 7/1 (1829) XXII, 283; R. Brown, Prod. [ed. Nees] (1827) 157; Bartling, Ord. (1830) 43; Sweet, Hort. Brit. ed. 2 (1830) 504; Steudel, Nomencl. Bot. ed. 2, 1 (1840) 98; Hooker, Bot. Mag. 73 (1847) t.4291; 76 (1850) t.4507; Pfeiffer, Syn. Bot. (1870) 97; Bentham, Fl. Austral. 6 (1873) 441; F. v. Mueller, Fragm. 8 (1873) 20-23; Pfeiffer, Nomencl. Bot. 1 (1873) 193; F. v. Mueller, Cens. Aust. Pl. 1 (1882) 144; Durand, Ind. Gen. Phan. (1888) 411; F. v. Mueller, Sec. Cens. Aust. Pl. 1 (1889) 195; Baillon, Hist. Pl. 13 (1894) 28, 29 fig. 57-60; F. v. Mueller & Tate, Trans. Roy. Soc. S. Aust. 16 (1896) 378; Diels & Pritzel, Bot. Jb. 35 (1904) 112; Peiloe, Wildfl. W. Aust. (1921) 41, 48, t.1; Bailey, Stand. Cyclop. Hort. 1 (1922) 290; Domin, Bibl. Bot. 85 (1915) 528; 89 (1929) 696 [1250]; Gardner, Enum. Pl. Aust. Occ. 1 (1930) 21; Kelsey & Dayton (ed.), Standardized Plant Names ed. 2 (1942) 17; Barrett, Aust. Wildfl. Book (1942) 25; Audas, Aust. Bushland (1950) 129; Blackall & Grieve, W. Aust. Wildfl. 1 (1954) 74, 79, 335, t.2; id. 1 (reprint ed. 1959) 74, 79; Hutchinson, Fam. Fl. Pl. ed. 2, 2 (1959) 677; Serventy, W. Aust. Naturalist 7(7.VI.1961) 206; Burbidge, Dict. Aust. Pl. Gen. (1963) 18 (pro. syn.; wrong reference), 17 (pro syn. sub *Anigosanthos*); Shaw, Willis Dict. Fl. Pl. ed. 7 (1966) 64; Harris, Wild. Fl. Aust. ed. 6 (1966) 177, t.35; Ayrey, Aust. Wildfl. (no date) 19.

The following orthographic variants of the name *Anigozanthos*, which are nomenclaturally wrong, were traced in the literature cited:

Agonizanthos F. v. Mueller, Cens. Aust. Pl. 1 (1882) 116.

Anigozanthos Steudel, Nomencl. Bot. 2(1824) 747 (pro syn. sub *Schwaegrichenia*).

Anigosanthos Lemée, Dict. Genr. Pl. Phan. 8a (1941) 122; Green, J. W., Cytotaxonomic studies in the Haemodoraceae. [M.Sc. Thesis; Univ. of W. Aust. (1958) 221, 37, 48, 56, 57, 59, 229, 231; typescript]; Blackall & Grieve, W. Aust. Wildfl. 1 (repr. ed. 1959) VII (errata), Lv (index), t.2; Gardner, Wildfl. W. Aust. (ed. Parkinson) (1959) 6-10, 160; Grieve & Marchant, Aust. Pl. 2 (IX.1963) 107-115; Burbidge, Dict. Aust. Pl. Gen. (1963) 17 (wrong reference), 316, 328; Lother & Holliday, Growing Austral. Pl. (1964) 73; Beard, W. Aust. Pl. (1965) VIII, IX, t.2; Anonym., Aust. Pl. 3 (VI.1965) 132; Blombery, Guide Native Aust. Pl. (1967) 8, 91, 118, 120, 206, 206, 287, 340, 348, 386, t.1; Morcombe, Aust. Western Wildfl. (1968) 7, 70, 86; Baglin & Mullins, Aust. Wildfl. Coul. (1969) 106; Anonym., Aust. Pl. 5 (IX.1969) 192; Wheller, Aust. Pl. 5 (XII.1969) 199; Wrigley, Aust. Pl. 5 (III.1970) 244.

Anigosanthus Endlicher, Gen. Pl. (1837) 172; Endlicher, Enchiridion (1841) 100; Meisner, Pl. Vasc. Gen. (1842) 396, Comment. 299; Endlicher in Lehmann, Pl. Preiss. 2 (1846) 25-27; Spach, Hist. Veg. Phan. 13 (1846) 113; Lehmann, Pl. Preiss. 2 (1848) 274; Lindley, Veg. Kingd. ed. 3 (1853) 153; Pfeiffer, Nomencl. Bot. 1 (1873) 193; Pax in Engler & Prantl, Nat. Pflfam. II, 5 (1888) 99 fig. 67, 123 fig. 86, 124; Dalla Torre & Harms, Gen. Siphonog. (1900-1907) 78; Pax & Hoffmann in Engler & Prantl, Nat. Pflfam. ed. 2, 15a (1930) 428; Melchior in Engler's Syllabus ed. 12, 2 (1964) 527.

Anigozanthus Salisbury, Parad. Lond. (1807) t.97; Sweet, Hort. Brit. ed. 2 (1830) 602; Herbert, Amaryll. (1837) 65, 86; Lindley, Bot. Reg. 23 (1837) t.2012; Lindley, Swan Riv. App. (1839) XLII, t.6 fig. B; Drummond, Hook. J. Bot. 2 (1840) 348; Hooker, Bot. Mag. 71 (1845) t.4180; Pfeiffer, Nomencl. Bot. 1 (1873) 193; Ogden & Richardson, Flow. W. Aust. (1929) t.1, (1935) [2 unnumbered plates]; Robinson, W. Aust. Naturalist 1 (15.XII.1947) 67; Souster, W. Aust. Naturalist 1 (13.IX.1948) 114, 118; Audas, Aust. Bushland (1950) 126; Gorge, W. Aust. Naturalist 4 (24.XII.1954) 169; Chadeaud & Emberger, Traité Bot. Syst. 2 (1960) 1139; Anonym., W. Aust. Naturalist 7 (7.VI.1961) 219 (index); Burbidge, Dict. Aust. Pl. Gen. (1963) 17 (pro syn. sub *Anigosanthos*), 18 (pro syn.).

Anigozantos Massey, [Cuvier] Dict. Sc. Nat. 2 1816) 157; Pfeiffer, Nomencl. Bot. 1 (1873) 193.

Anoegosanthos Burbidge, Dict. Aust. Pl. Gen. (1963) 17 (pro. syn. sub *Anigosanthos*), 19 (pro. syn., wrong reference).

Anoegosanthus Reichenbach, Consp. Reg. Veg. (1828) 60; Endlicher, Enchiridion (1841) 100 (pro syn. sub *Anigosanthos*); Pfeiffer, Nomencl. Bot. 1 (1873) 200.

Anygosanthos Burbidge, Dict. Aust. Pl. Gen. (1963) 21 (pro syn.; wrong reference).

Anygozanthes Schlechtendal, Willd. En. Pl. Hort. Berol. Suppl. (1814) 17; Pfeiffer, Nomencl. Bot. 1 (1873) 225.

Anygozanthos Burbidge, Dict. Aust. Pl. Gen. (1963) 17 (pro syn. sub *Anigosanthos*).

The following names which are mentioned as synonyms of *Anigozanthes* cannot be accepted as orthographic variants but are obviously derived from the name *Anigozanthes*:

Anigosia Salisbury, Trans. Hort. Soc. 1 (1812) 327 [n.v.; fide Pfeiffer, Nomencl. Bot. 1 (1873) 193]; Burbidge, Dict. Aust. Pl. Gen. (1963) 17 (pro syn. et pro syn. sub *Anigosanthos*).

Anigoza Salisb. ex Endlicher, Gen. Pl. (1837) 172 (pro syn. sub *Anigosanthos*); Pfeiffer, Nomencl. Bot. 1 (1873) 194.

It appears almost certain that the wrong spelling *Anigosanthos*, which has been commonly used for the last decade in Australia as the scientific name of the genus containing the State Emblem Flower of Western Australia, was introduced in the Australian literature only in 1958. Strict adherence to the original spelling, *Anigozanthes*, is necessary and will, it is hoped, quickly eliminate this error.

Other examples for correct names of Australian plant genera of which later orthographic variants have been widely, but wrongly, used are the following names: *Brachyscome* (not *Brachycome*); *Calytrix* (not *Calythrix*); *Lagenifera* (not *Lagenophora*); *Lechenaultia* (not *Leschenaultia*); *Newcastelia* (not *Newcastlia*); *Omalanthus* (not *Homalanthus*).

BOOK REVIEWS

All books reviewed, in fact any book on wildflowers or the Australian scene are available by mail only from the Editor, 860 Henry Lawson Drive, Picnic Point, N.S.W. 2213. WEST AUSTRALIAN NATIVE PLANTS IN CULTIVATION by A. R. Fairall—New price \$8.95 plus 25c postage.

This is the book all wildflower growers have been waiting for. Arthur Fairall was superintendent of King's Park, Perth, for a number of years. A mature competent gardener who received his experience in botanical gardens in other parts of the world, it must have been obvious to him when he took up his post in Perth that, as so little experience in the cultivation of Western Australia's wildflowers had been recorded, he must rely on his own skill and record his own experiences. What a challenge it must have seemed to him and to John Beard who gave him every support. The thousands of beautiful wildflowers of Western Australia represents the largest horticultural potential in the world, as yet little known to the gardening world.

This book represents his careful observations of results at King's Park. It commences with an introduction to the natural environment followed by a chapter on the various aspects of cultivation and propagation, and then proceeds for the next 200 pages to describe hundreds of wildflowers he has actually grown with simple clear descriptions and a report on where and how it grew. The book is illustrated with 105 full colour plates and is really good value. Who could place a value on the recorded experiences of such a competent horticulturalist? It was a great loss to Australia when Arthur Fairall died before his book was published.

THE COMPLETE BOOK OF AUSTRALIAN GARDENING by Jessie Boyd Price.

A 257 page book of large page size, the text indicates the practical nature of a successful gardener. As with most modern books the presentation is most colourful but the real value of the book is to the home gardener in that the advice given in the preparation and maintenance of a garden is so easy to follow.

AUSTRALIA'S WILDFLOWERS by Michael Morcombe — Price \$4.95 plus 55 cents postage

The perfection of the colour photography of Michael Morcombe is widely known. In this beautiful book fewer colour plates are close-up photographic studies and most of the 180 colour plates show the flower and plant in striking realism. The author has displayed a remarkable gift in sketching both in presentation and detail in the 30 line drawings. This is the best attempt I have seen to portray the huge diversity of the Australian flora in one book. The continent is divided into six regions with a chapter and collections of colour plates on each. The publishers have succeeded in their desire to make this not just another "pretty" book by the choice of writers. The descriptive material for each region is very well done by the following writers who are not only competent in their field but show an awareness of the type of information the reader will want to know. They are: The South, J. H. Willis; The East, D. F. Blaxell; The Centre, C. M. Chippendale; The North, C. S. Robinson; The North-East, A. W. Dockrill; The South-West, A. S. George. Maps are provided and the National Parks listed. With 128 pages (12" x 9") this book is good value and would make a beautiful gift.

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AUSTRALIAN BUSH FLOWERS by Jan Langley — Price \$9.95 plus 35 cents postage

This large 93 page (13½" x 9") book contains paintings of 84 species of wildflowers in its 43 large colour plates. An artist acutely sensitive of the beauty of our wildflowers. A brief description of the plants accompanies the paintings.

ISOPOGON

by KEN STUCKEY, Furner, South Australia*

Isopogon adenanthoides—an outstanding small shrub of 3 feet, the compact upright branches are densely clothed in short adenanthos like leaves, light green in colour, not stiff but rough to handle. The rose pink flowers are terminal on the rounded crown of the plant, and flowers in early spring.

I. asper—a low spreading shrub which has only grown to 18" here but should grow to 3 ft. in a better soil type. The arching branches are fairly densely covered with 1" divided leaves and rough to feel. The small pink flowers are densely packed on the upper ends of the branches.

I. attenuatus—a spreading shrub to 3 ft. with 6" smooth flat leaves. The large ovoid flower heads are yellow and terminal, the flowers opening slowly, opening first at the apex of the head and it may be two or three weeks before the flowers at the base are out.

I. axillaris—this species likes a damp situation and does not mind being in a few inches of water during the winter. The upright branches are not numerous and have 3" flat leaves but much shorter on the ends of the branches where the small pink flowers are densely clustered. An interesting and useful plant that can be improved by pruning after flowering.

I. buxifolius—an upright shrub of 3-4 feet with a compact growth habit. The fairly crowded short, flat, dark green leaves add to the density of the shrub. The small flowers are both terminal and in the upper axils and can vary from almost white to rose pink. It is thriving in semi shade to an open situation and flowers in mid spring.

I. cuneatus—has been in cultivation for many years and has proved hardy and apparently not adverse to various soil types. It grows to 6 feet and is improved by pruning after flowering. The mauve/pink flowers are terminal and very good for picking.

I. divergens—there are various forms of this specie, the more robust and compact form has short terete leaves and grows to 6 feet. The numerous purple/pink flowers are terminal but slightly smaller than the other forms. Another form with slender 6" terete leaves grows to 3-4 ft. with a more open growth habit and larger flowers. Another variation can be a similar shaped shrub to the last but with light green leaves and pinkish flowers.

I. dubius (roseus)—another specie that has been in cultivation for a long time and noted for its bright rose-pink flowers. A bushy but upright shrub to 3 feet with stiff, flat, deeply segmented leaves to 2 inches. The flowers are terminal and very showy. It appears to do well in sand and even better in heavier well drained soil types.

I. formosus—this shrub can vary in form from being bushy to a slender upright shrub to 7 feet. The short 2 inch leaves are nearly terete but grooved above and divided several times, crowded on the bushy forms but more sparse on the slender upright forms. The bright rose pink flowers are terminal and on the bushy form many are carried on short laterals on the main branches.

I. latifolius—somewhat similar in appearance to *I. cuneatus* but *I. latifolius* grows to eight feet with larger leaves and flowers. The purple-pink flowers are terminal on the previous year's growth and very showy. Pruning will encourage new growth which will enhance the following year's flowering.

* This is one of a series of articles on Proteaceae by Ken Stuckey. The very closely allied *Petrophile* are described in our no. 44 issue and *Banksia* in our no. 41 issue.

I. linearis—a spreading shrub of 2 ft., branching from the base and arching outwards. The flat 3" leaves are greyish-green and curved upwards, often to one side as well, giving the branch a spiralling effect. The flowers are terminal, either single or several in a cluster, bright pink to almost red, making a bright show in mid-spring.

I. longifolia—a robust shrub, spreading but upright to 8 ft. with 4-6 inch long linear leaves, entire or two to three linear lobes. The yellow, ovoid flowers are terminal and flower in Oct.-Nov.

I. polycephalus—a spreading but upright shrub to 4 ft. with pale green 3" oblanceolate leaves. The whole shrub has a soft slightly succulent appearance, it flowers in August. The small pink flowers have a straggly appearance and not striking.

I. scabriusculus—the form growing here is upright to 4 ft. with 3" terete leaves, the rather small pink flowers are terminal or in the upper axils. It flowers in Oct. but is not as showy as many other species.

I. sphaerocephalus—a spreading shrub of 3 ft. with flat 3" leaves, the new growth in summer is a lovely soft red. The large ovoid heads of yellow flowers are terminal.

I. teretifolius—a stiff, upright, small shrub of 2-3 ft. with rigid terete leaves mostly divided two or three times. The pink flowers have a shy appearance as they turn sideways to the direction of growth and sometimes decumbent. A worthwhile small shrub for cultivation.

I. tridens—a dense upright shrub to 3 ft., the dark green 2" leaves are lobed on the widened end of the leaf and thickly clothe the bush. The yellow ovoid flowers are terminal.

I. trilobus—somewhat similar to the previous species but the leaves are irregularly lobed and more blunt appearance. Flowers are yellow and terminal, flowering in Oct.-November.

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WEST AUSTRALIAN WILDFLOWERS—continued from page 47

by a *Banksia* woodland with *B. menziesii*, *B. attenuata*, and *B. ilicifolia* dominant. The *Banksias* flower in summer and autumn, but flower display is at its best in December when the golden *Verticordia nitens* covers huge patches setting off the occasional Christmas trees (*Nuytsia floribunda*).

At the extremities of this climatic region, on the north coast from the Hill River to Dongara and on the south coast from the Stirling Range to Israelite Bay are huge expanses of heath country which are some of the finest wildflower country in the state. The soil is a white bleached sand over a pea ironstone and trees (*E. wandoo* and *E. calophylla* in the north, *E. occidentalis* in the south) become confined to creeks and depressions. The northern and southern heaths have many similarities and many differences. On deep sand, in the north, *Banksia hookerana* and *Xylomelum angustifolium* are dominant, while outcropping laterite carries a community of low heath

with *Xanthorrhoea reflexa* the most conspicuous species. In the south, *Banksia speciosa* and *Lambertia inermis* are dominant on deep sand but shallow soils are more common with the straggly mallee *Eucalyptus tetragona*. The flora of these heaths is a very rich one and they give splendid displays of colour with a climax in September-October.

The black, red and golden Kangaroo paws come from here, as well as innumerable striking Proteaceae, Epacridaceae and others.

This climatic region also embraces the Stirling Range near Albany, a scenic National Park area with abrupt isolated mountain peaks up to 3500 feet high, covered with dense thickets of prickly scrub. The Range contains many interesting local endemics which are at their best in October, most notably *Ispogon latifolius* and the mountain bells, *Darwinia leiostyla*, *D. meeboldii* and *D. squarrosa*. The same applies to the less prominent Barren Ranges further east where one finds *Eucalyptus burdettiana*, *E. coronata* and *E. sepulcralis*, *Regelia velutina* and *Hakea victoriae*.

In the wheatbelt of the interior vegetation patterns are best understood in terms of catenary sequences of soils and vegetation. The landscape undulates and soil types are determined by their position on the slope. The bottomland soils are calcareous red loams and carry woodland of salmon gum (*E. salmonophloia*) and gimlet (*E. salubris*). Up slope, still on red loam, comes woodland of York gum (*E. loxophleba*), or wandoo (*E. wandoo*), and further east *E. oleosa*. Crests and ridges normally carry a laterite cap, either solid or decayed to yellow sand: vegetation is respectively *Acacia-Casuarina* thicket ("wodjil") or heath, the latter very rich and floriferous as with the coastal heaths. The woodlands are not wildflower country but the heaths definitely are. It will be seen that they occupy plateau sites. The Great Eastern Highway between Coolgardie and Southern Cross traverses long stretches of these heaths which are very colourful in spring. *Grevillea excelsior* is the most conspicuous species, growing as it does to 20 feet tall, but it is a pioneer species that follows fire. Most colour is seen in October when the *Verticordias* are in flower, *V. roei*, *V. picta*, *V. chrysantha*, etc.

There is a well-defined mallee belt parallel to the south coast inland of the coastal heaths but there is little wildflower interest apart from the *Melaleucas* which form the understory.

Outside the southwestern province the heath flora is continued on sand into the desert and there are many interesting species but no longer mass displays of their colour. From the Murchison River to the Northwest Cape there is a heath flora in local patches with *Banksia ashbyi*, *Grevillea gordoniana*, *Verticordia etheliana*, *Pileanthus peduncularis*. On sand dunes in the eastern districts *Grevillea stenobotrya*, *G. juncifolia*, *Thryptomene maisonneuvii* and *Micromyrtus flaviflora* are noteworthy. However, for massed colour one must depend upon the annuals and provided it is a good season with winter rain vast carpets of pink, white and yellow everlastings will extend everywhere in the mulga in August. Such colour carpets can be continuous for hundreds of miles.

Even right up in the north, provided always it is a good season, in August again visitors to the mining developments in the Pilbara can see much the same thing. *Ptilotus exaltatus* replaces the everlastings; Sturt's Desert Pea (*Clianthus*) appears among the softfex; wattles, *Grevillea wickhamii* and the *Eremophila* spp. are colourful. *Swainsona occidentalis* swathes the salty flats and its relation the giant annual *S. macculloughiana* which may grow to 9 feet tall will give quite a shock to the visitor!

REFERENCE

- Beard, J. S., 1969.—Endemism in the Western Australian flora at the species level. *J. Roy. Soc. W. Aust.* 52: 18-20.

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GARDENING IN PERTH

by Marion I. Blackwell

Perth coastal sand has problems associated with it, which need serious consideration if one wishes to establish a successful garden upon it. As a basis this sand has almost no *nutrient content* or *water-holding capacity* so it needs the addition of plenty of compost and of nutrients.

The pH is often very high, i.e. up to 9.4; the sand in some areas being combined with broken limestone. Many plants will not tolerate this degree of alkalinity, others will grow minimally, but show a marked chlorosis which is difficult to counteract.

Sand blast is a continual problem—most particularly near the sea and in areas still being established. This can cause damage to the extent that trees and shrubs become completely denuded of leaves and bark. If this continues over a period, it can easily result in deaths. A certain degree of protection can be obtained by spraying acropol on the young leaves and shoots before planting out and repeating this at the commencement of windy seasons while the plants are still small.

High ground temperatures, even in September-October may reach 140°F. Many mallees and shrubby natives develop a large suberised swelling at ground level which protects their stems and roots from the effects of burning from ground contact.

Glare-scorch from the white bare sand especially in areas that have been cleared of ground cover. This is a killer, especially of soft-leaved plants, and in particular those originating from climates with high humidities.

The application of a mulch to the surface of the sand, such as pine-bark chips, pine needles, sawdust (though in very windy areas this just blows away), seaweed, compost or any like material, and the growing of ground covers will help cope with these last three problems.

Salt-bearing winds can cause a physiological drought for plants and even scorch the new leaves right off a plant within half an hour.

The Water-shedding property of Perth Sand. Until thoroughly wet, the sand particles shed any water applied to the surface of the soil so that it tends to run down holes at intervals and not wet the areas in between. In this way, thinking that you have "watered a plant", you may find the soil completely dry beneath the surface and that the plant has received none or little of the water you applied. Adding compost to the soil helps overcome this as does mulching, but special watering procedures are necessary if plants are to get the water you apply. In Perth the average rainfall is 34" a year, but almost all of this falls in the cool months. Measures therefore should be taken to conserve soil moisture by mulching, to add to the water retaining properties of the sand by incorporating compost, and to carry out a programme of watering in the hot months which will prevent water-deficits and resultant growth setbacks. This does not mean that you have to water a lot. The first summer after planting out is the most crucial in the life of young trees and shrubs; tissues are still soft and relatively unprotected roots and shoots are close to the hot ground surface, and this is when most damage is suffered. If ground preparation prior to planting has been thorough, one good soaking a week should be sufficient except during heat wave conditions. (Thorough watering at longer intervals encourages deep rooting and a cool root run away from the soil surface). Once established, native plants should not need to be watered. They benefit from an application of fertiliser at the commencement of their growing season (August-September),



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EUCALYPTUS STUDY SECTION

The aims of this section are to encourage the wider growth of *Eucalypts* in home gardens, streets and parks and to evaluate the suitability of various species under different conditions by interchange of information and seed by mail. Those wishing to join should contact Mr. E. Daniels, 23 Dorking Road, Cabarita, N.S.W. 2137.