

KINGS PARK NATIVE PLANT ANNUAL



\$4.00

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Cover photo

Fringed Lily (*Thysanotus triandrus*) is a widespread and common plant of Kings Park Bushland. It grows as a tufted grass-like herb producing a large number of flowers from September to November. Details of the natural history and cultivation of *Thysanotus* will be in a future issue of the Native Plant Annual. (Photo P. R. Wycherley).

Forward

Readers will join me in welcoming this new publication featuring Western Australia's best known natural resource, its striking variety of wildflowers. Residents and visitors alike have long been enthralled by the manner in which our native flora each spring transforms the bushlands of our State from monotonous of brown and green to carpets of natural colour comprising more than eight thousand species.

Kings Park Board has produced a series of wildflower notes, which form the basis of the information contained in this book.

These notes are unique as are the flowers they describe. They provide the home gardener with clear instructions on how native plants can be successfully cultivated as well as describing their natural history and peculiarities.

By purchasing this publication you will assist the Board in its research and conservation work, which in turn will help preserve the several hundred species threatened with extinction, especially in the closely settled South West of our State.

It gives me great pleasure to commend the Kings Park Board and the Sunday Times on the production of this book and I look forward to further issues.



HON K. F. McIVER M.L.A.
Minister for Lands and Surveys.

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Horticultural Advances in Kings Park



THE principal reservations of Kings Park were made in 1872 and 1890, however there was no park development until the Parks and Reserves Act was proclaimed in 1895. Sir John (later Lord) Forrest the first Premier of Western

Australia and the first President of the Perth Park Board, subsequently Kings Park Board, set a Norfolk Island Pine in the first official tree planting on 9 August 1895. Most of the early plantings were of trees introduced from Europe, South Africa or from other parts of Australia. It soon became evident that many originating from cool temperate regions could not be grown without summer irrigation.

In 1898 an avenue was planted along the drive from the main entrance with about two hundred Western Red Flowering Gums. This species *Eucalyptus ficifolia*, an endemic of the Warren District about Walpole in the South West, was to give Kings Park its first major horticultural problem with a native plant. The avenue flourished for 30 years and was so much one of the glories of Perth, that it was decided to plant further rows of these trees alongside the originals to commemorate the Centenary of Western Australia in 1929. Yet within another ten years only a handful remained, the rest had perished due to the epidemic spread of Patch Canker disease.

The only practical means of propagating vegetatively, selections of Red Flowering Gum resistant or tolerant to Patch Canker, namely grafting onto stocks of Marri, *Eucalyptus calophylla*, was initiated and improved on at Kings Park over the last 20 years. Tissue culture of this species has been attempted by many researchers, including some at Kings Park, but has been successful so far only on a limited experimental scale.

The planting of Australian and in particular Western Australian native plants in Kings Park was stimulated in 1936 when the Kessell Arboretum was established and again when trial plantings were made during the 1950's of various species, including shrubs and herbs. In 1959 the State Government decided to establish the Western Australian Botanic Garden in Kings Park and actual operations began in 1962. Now, nearly a quarter of a century later, the results can be

seen. More than 1200 species of west Australian plants are cultivated in the open ground of the Botanic Garden. Another 300 or more species are grown under cover or in containers. Much of this material is exhibited during the Annual Native Plant Display and Wildflower Exhibition.

The well known *Callistemon* cultivar 'Kings Park Special' was selected and propagated by the Kings Park nursery during the development of the Botanic Garden from material originally planted in the earlier trials. 'Kings Park Special' is of unknown hybrid origin and has proven hardy, tolerant of frost and drought, in many parts of Australia. *Pimelea ferruginea* 'Magenta Mist' is another cultivar selected by the Kings Park nursery.

When the Botanic Garden was begun relatively little of Western Australia's rich native flora had already been taken into cultivation. Therefore in most cases an experimental approach was necessary to propagation (whether from seed or vegetatively) subsequent establishment and growth. Some plants such as the genus *Verticordia*, (Morrison's or Feather-flowers) set very little seed and the initial stocks were built up by striking cuttings. Some other genera such as *Newcastelia* and *Pityrodia* were studied for many years before means of striking cuttings from them was discovered. In other plants whose cuttings strike easily, this method has been used to multiply individual flower colour variants, for example the wide range now available in *Lechenaultia*; white, pale green, yellow, orange, red, mauve, candy-striped, light and dark blue.

Sometimes the growth of a plant can be varied or it may be enabled to grow under adverse conditions by grafting onto a stock of another species. Such techniques have been developed in Kings Park especially for some species of *Eremophila* and *Hibiscus*. Work in progress concerns *Banksia* and *Grevillea*. *In vitro* culture of plants has been advanced by researchers all over the world in recent years. At Kings Park these methods have been applied in particular to rare and endangered species. Stem tissue of *Darwinia wittwerorum* and *Drummondia ericoides* have been successfully grown in sterile culture, roots induced and the resultant plantlets consequently grown on in conventional nursery potting media. Both these shrubs are restricted in their natural distribution, they are on the rare and endangered list and collection of material is strictly controlled.

Therefore such methods as these are very valuable when there is only a small amount of material to begin with, because of its rarity and the need to protect what little there is.

Carnivorous plants, which gain nutrients by trapping and digesting insects and other small animals, are in great demand by hobbyists in many countries. More than sixty carnivorous species are endemic in Western Australia, that is they occur naturally nowhere else in the world. Moreover there are more endemics in the South West than in any other comparable area in the world. The genus *Cephalotus* is said to be monotypic, that is it has only one species in it. The genus *Byblis* has only two species. This makes them very interesting and valuable scientifically. Sterile culture is used at Kings Park to multiply *Cephalotus follicularis* and *Byblis gigantea*, the particular technique for the latter was developed here. These are examples of how legitimate commercial, avocational and scientific demands for these plants can be satisfied without further pressure on a limited wild resource.

Another form of *in vitro* culture is used to raise terrestrial orchids from seed. Sterile culture has been for over half a century the major means for raising seedlings of epiphytic orchids, especially tropical species. This method, so successful with the epiphytes, that is the orchids which grow perched on the branches of trees, proved unsatisfactory for those which grow from underground tubers. It has been found that cultures of these tuberous terrestrial orchids, which include all those found in the South West, must be inoculated with a mycorrhiza, that is, a fungal partner, which enables the plant to take up nutrients. Now more than 100 of these orchids, including the famous Underground Orchid, have been taken into this kind of culture in Kings Park. So producing seedlings in quantity is no longer a problem, although methods of growing them on and planting out have yet to be perfected in some cases. Thus each step in the research program leads to another.

The orchids, like the carnivorous plants, are understandably in demand. It is sometimes thought that the object of growing rarities in botanic gardens is to preserve endangered species in protected cultivation or for attempts at re-establishing them in wild habitats. While this may be the only way to save some species which have become extinct in the wild, or may become so due to habitat destruction as a result of agriculture, mining or other developments, the main object is to help conserve them before such a critical stage is reached. The foregoing examples show how cultivation can assist the overall conservation project. Also the general public are

more strongly motivated to support conservation if some living specimens of the species under threat can be shown to them, but without the difficulty of travel to isolated places or the risk of interfering with nature reserves.

In vitro culture techniques have been applied to the Kangaroo Paws, which are so characteristic of Western Australia. In some cases seed production is relatively low and multiplication by tissue culture is a useful additional means of producing plants in quantity. Since tissue culture is a means of vegetative propagation, it can be used to perpetuate selected colour variants. It has also been used at Kings Park to increase stocks of the rarer species such as *Anigozanthos gabriellae*. The cultures can conveniently be exchanged with other botanic gardens, so that not all our eggs are in one basket. However, the official institutions need not be the only growers. There is scope for the amateur also. Therefore in these pages we seek to share the accumulated experience of Kings Park with you.



Paul Wycherley

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26 August, 1985.

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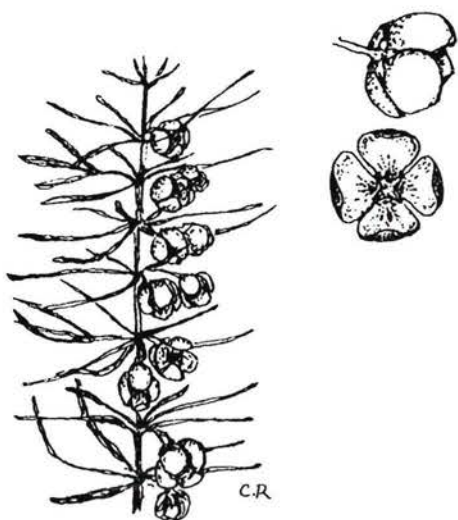
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The SCENTED BORONIA

Possibly Australia's best known native flower, *Boronia megastigma* is widely cultivated due to its popularity as a cut flower. Its enchanting perfume and clusters of attractively shaped flowers augment arrangements or are in demand as bunches by themselves.

Its name commemorates one Francesco Borone, a botanist who achieved posthumous notoriety by falling from a window in Athens while he was asleep. The specific epithet *megastigma* is derived from the Greek, 'mega' meaning large and 'stigma' meaning stigma. The large central stigma may be observed inside the cup-shaped flowers of all cultivars of Scented Boronia.

Boronia belongs to the family Rutaceae, and is thus related to the orange, grapefruit and lemon. Its scent is often likened to its citrus relatives.

Plants occur naturally in swampy land from Collicie to Cheynes Beach, where soils are usually a mixture of sand and peat which dry out on the surface in summer.

Although usually shorter in stature, plants may be up to 1.5m high. The small flowers hang from slender stems, and are coloured brown on the outside and yellow inside. The four-petaled flowers are produced from August to September. Their distinctive scent, produced from oil in the flowers, may be difficult to detect during dry weather, but fills the air on humid days. Plants are short-lived in their natural habitat but regenerate quickly after a bushfire. Germination occurs in the Spring after surface water has drained away.

Unfortunately, natural populations of this most attractive native are declining, due to the combined depredations of flower collectors, oil producers, seed pickers and the extension of farming land into their habitat. However, there appears little fear that *Boronia* faces extinction, thanks largely to its ready adaptability to commercial farming and the home garden.

During the 1940s and 1950s, there were large commercial plantings of *Boronia* in Victoria, and



Boronia megastigma flowers abundantly on the new growth. The brown stigma is prominent in the centre of each flower. (Photo K. W. Dixon).

many new varieties were raised during this period. However, many of these new cultivars fell victim to *Boronia* Rust disease, which swept the plantations as a destructive epidemic. Despite that setback, several cultivars are firmly established in the nursery industry, and will ensure that *Boronia* and its several variants will be around for a long time.

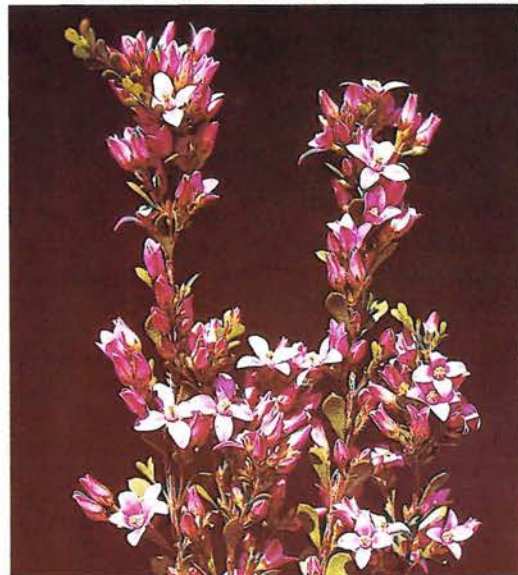
Boronia megastigma 'Chandleri' is a red-flowered form developed by the Chandler family.

Boronia megastigma 'Lutea' produces delicate yellow flowers, but may occasionally revert to the more familiar brown flowers on the same branch. This type of variant is known as a chimaera. It is readily available through the nursery industry.

Boronia megastigma 'Harlequin' is a recent but now widely available variant, whose blooms can be yellow and red with varying amounts of spotting and shading, with the blooms becoming darker in colour with age.

Boronia purdieana, or Yellow *Boronia*, is a

The showy *Boronia crenulata*. (Photo F. W. Humphreys).





Boronia megastigma 'Harlequin' a colourful new variety. (Photo K. W. Dixon).

bushy plant up to 50cm tall growing on free-draining sandy soils in woodlands north of Perth. The species is a popular cut flower, sufficiently hardy to withstand occasional drought conditions. It flowers slightly earlier than other *Boronia* species — between June and August.

Boronia crenulata is one of the best of the low-growing pink Boronias, with masses of light to dark pink blooms produced from March to December on a compact shrub. An unusual narrow-leaved form is available from nurseries, and although adaptable to a range of soils, it may require some watering in Summer.

Boronia heterophylla, the Kalgan Boronia, is a large, 2m tall bushy shrub common in moist situations from Busselton to Albany. Widely grown as a garden or container plant, the preferred nursery form is thought to be derived from plants grown commercially in Victoria. Its unusual deep pink, nodding flowers are produced in abundance from August to October. The plant prefers heavier soils

with some protection from strong winds and Summer sun.

PROPAGATION

CUTTINGS

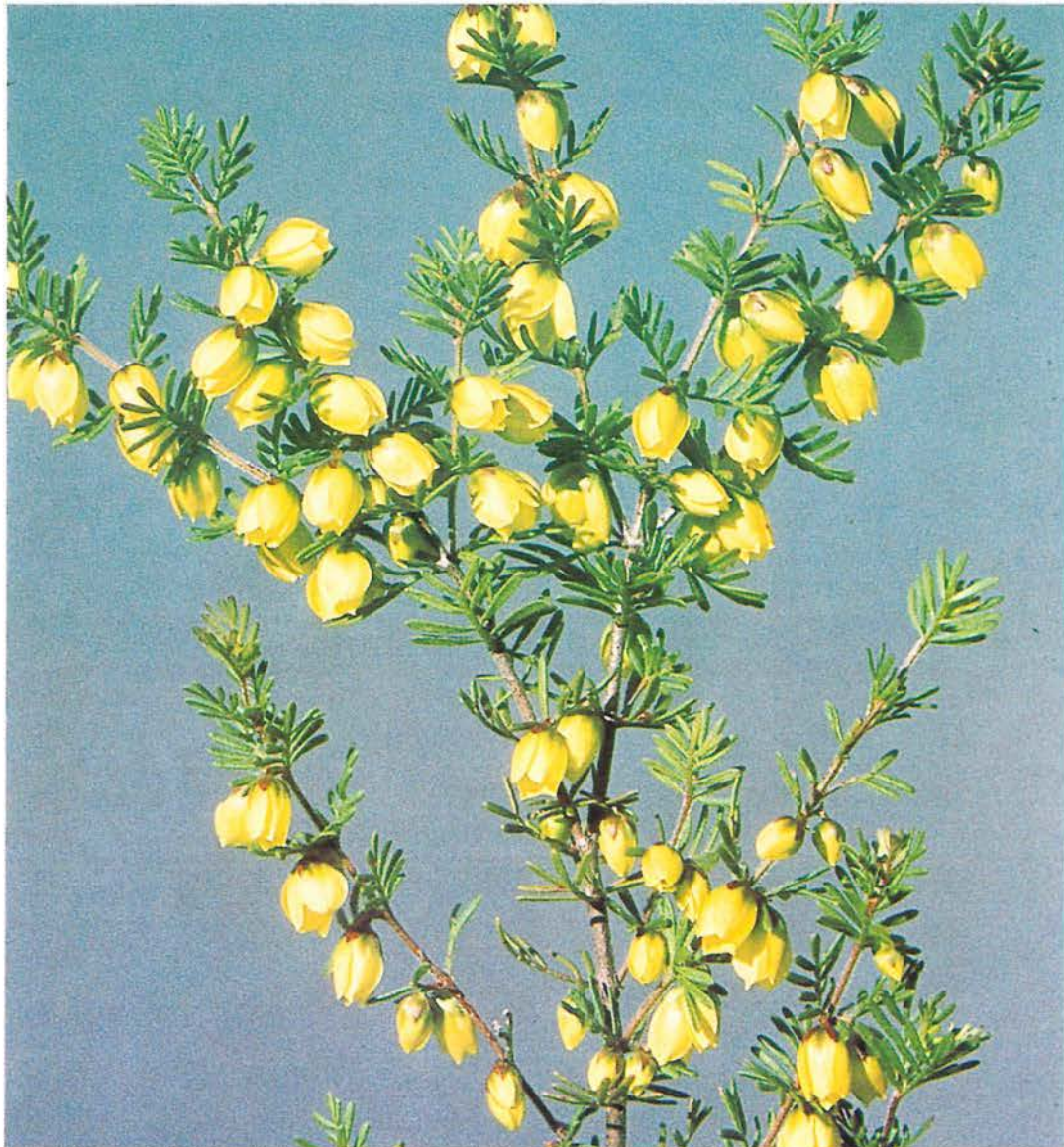
For the amateur gardener, the best way to raise new plants is by softwood or semi-hardwood cuttings, taken from Autumn to early Summer depending on when the right cutting material is available.

When using a hormone on the base of the cutting, roots will often form in 5 to 6 weeks.

NOTE that cultivars such as the yellow *B. megastigma* 'Lutea,' the red *B. megastigma* 'Chandleri' and the multi-coloured *B. megastigma* 'Harlequin' must be grown from cuttings if you wish to exactly reproduce the colour you require.

SEED

Since germination inhibitors have been iden-



Boronia purdieana, one of the early flowered Boronias. (Photo F. W. Humphreys).

tified in Boronia, it is highly advisable to use only fresh seed, despite the fact that they are known to remain viable for several years. The inhibiting agents are known to increase in potency as the seed ages and matures, thereby greatly reducing the ability to grow.

Improved germination rates have been recorded when sowing slightly immature seed, or sowing fresh seed late in the Spring. Sow in a free-draining slightly acid mix (e.g. 6 parts of local grey sand to 1 part cladium peat, parts by bulk). Seedlings should be pricked out (transplanted) when only a few days old into small pots using the same mix, or use a native plant mix supplied by a nursery.

When the seedlings are large enough to repot they are best kept under light shade, or placed in an area where they receive only morning and late afternoon sunshine.

CULTIVATION

All varieties require a slightly acid, free draining soil and are best located in a position sheltered from the noonday sun. They may also be grown as pot plants in a similar position, and thrive in shadehouses. As the plants generally live only 3 to 5 years, they should be repropagated. They respond well to slow release fertilisers, and to blood and bone. To make them bushy they should be lightly pruned straight after flowering, but beware as harsh pruning will often result in loss of the plant.

All require regular summer watering and benefit from a mulch such as pine bark or Sheoak branchlets to help keep the root system cool and to reduce evaporation from the soil.



Borgia megastigma 'Lutea' a well known colour variant. (Photo K. W. Dixon)





BLUE LESCHENAULTIA

Lechenaultia biloba with its profusion of brilliant blue flowers is one of Western Australia's best known wildflowers. The genus was first described by English botanist Robert Brown and its name commemorates a French naturalist on Baudin's expedition to southern Australia in 1800-1804. Jean-Baptiste Louis Claud Theodore Leschenault de la Tour who collected at Cape Naturaliste, the Swan River and Shark Bay in 1801 and 1803. Spelling was not one of Robert Brown's talents, since in naming this genus he omitted its 's,' a fault not carried over to its common appellation. The specific epithet '*biloba*' is derived from the Latin 'bi' meaning two, and 'lobus' lobe, referring to the 2-lobed stigma which is a feature of the flowers.

Plants occur naturally on sandy lateritic soils at Eneabba where they grow in heathland, and in Jarrah forest south to Manjimup; populations can be found as far East as Lake King, and stands are widely distributed along roadsides north of Perth. *Lechenaultia biloba* is a small shrub some 30 to

60 cm high. Although individual plants may be small, some suckering forms often produce large colonies. It is closely related to the Fanflowers, and belongs to the family Goodeniaceae.

Flowers are usually light or dark blue, but colours vary to deep purple, white and bicolor blue and white. They bloom from June to October.

PROPAGATION

CUTTINGS

The use of cuttings is by far the best method of propagation. They are easy to strike, and will reproduce the colour form of the parent plant. It is best to choose forms with a suckering habit, since they will be easier to keep growing in your garden.

Take semi-hardwood cuttings from Autumn to late Spring, and these will usually strike in about six weeks given favourable conditions. Softwood and hardwood cuttings of some forms may also be fairly easy to strike.



The rare white flowering form growing amongst the more common blue form. (Photo K. W. Dixon).

In heavy soils such as those found in the Hills area, semi-hardwood cuttings can be planted directly into the ground during June and July when the heavy Winter rains begin. Placed in a shallow trench 10 cm wide and filled with coarse sand, the plants will require regular Summer watering in their first season to aid their establishment.

SEED

Leschenaultia is difficult to raise from seed. The first plants successfully grown from seed were sent back to England and Europe by early botanical collectors, and probably the time delay between collection and propagation may have allowed the seed to mature or for its inhibitors to break down.

Seedlings have also been successfully raised in Western Australia.

Sow the seed in a free draining mix comprising 6 parts local grey sand and 1 part cladium peat

(parts by bulk) during the Autumn. Cover the seed with a thin layer of blue-metal dust of 2 to 3mm grit, then leave the pot out in the elements. Let the pot dry out and do not water during the Summer.

The following Autumn (April-May) water the seed pot. Germination usually occurs during this second Autumn after sowing. However, note that germination rates are usually low, and should be taken into account when planting your seed.

CULTIVATION

Grow the plants in a free-draining soil, in a sheltered position accessible to either full or broken sunlight. While plants are difficult to grow in Perth's deep sandy soils, they are easier to establish with a washed gravel (laterite pebbles) mulch 5 to 8 cm thick. Place the mulch right up to the stem of the plants. When they are established,



The dark blue form with white centre has the cultivar name "White Flash." (Photo P. R. Wycherley).



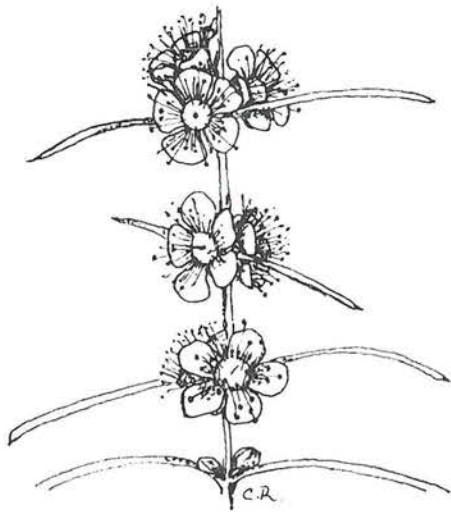
A large root sucker derived clone in bloom in gravel soils near Perth. (Photo P. R. Wycherley).

plants may still require occasional watering during Summer.

Note that the attractive pale-coloured flower forms are more difficult to establish in cultivation. Their leaves are normally lighter in colour, and often become chlorotic in sandy soils. To overcome this problem, the regular application of iron chelates may be necessary.

Leschenaultia plants respond well to a light dressing of a slow release fertiliser or blood and bone, and also benefit from light pruning after flowering. They can be successfully grown in pots, in broken sunlight or in a shadehouse. Beware that too much shade results in leggy plants which produce few flowers.





SWAN RIVER MYRTLE

Hypocalymma robustum was first described in 1837, although other species were earlier included under a section in the Teatree genus *Leptospermum*. The name derives from the Greek 'hypo' meaning underneath, and 'calymma' meaning a covering or head, and refers to the membranous covering over the flower bud. The specific epithet comes from the Latin 'robustus' meaning hard or strong.

Known as the Swan River Myrtle, it belongs to the family Myrtaceae and is closely related to *Eucalyptus* and *Agonis*. This small, many-stemmed shrub grows up to 1 m in height, and is common in Kings Park Bushland. It may also be found in sandy woodlands or in Jarrah forests between Perth and Albany, where it thrives on sandy or sandy lateritic soils.

Its masses of small pink flowers, produced from July to September, are carried in the leaf axils at the ends of the stems. They are seen to best advantage one or two years after a bushfire, when

new shoots stool up from the base of the plant, producing strong new growth and long flowering stems.

Myrtles are familiar in domestic gardens in Perth and beyond, and their popularity is assured by the varieties available in colour and form.

H. xanthopetalum produces brilliant yellow flowers from July to October when growing in its natural state, but will flower for most of the year when under cultivation.

A somewhat rounded shrub growing from 20cm to around 1m in height, it favours sandy to sandy lateritic soils. In cultivation, the plant responds well to light pruning, and can be propagated by taking softwood cuttings from Autumn to late Spring.

H. angustifolium is a highly variable open, shrubby species ranging in flower colour from white to pink, and in size from 40cm to 2m tall. The honey scented flowers are produced from Ju-



Hypocalymma angustifolium showing the pink buds and white flowers. (Photo F.W. Humphreys).

Hypocalymma puniceum one of the more spectacular large flowered Myrtles. (Photo F.W. Humphreys).

ly to November, and in some forms the new growth is an attractive pinkish red colour.

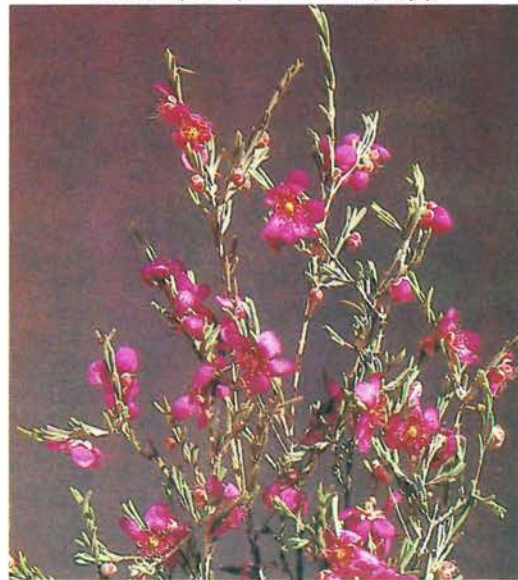
This variety is widespread and common in Winter-wet swamps of sand or loam throughout the State's south-west. It is readily propagated from semi-hardwood cuttings, and while easy to cultivate, it may require Summer watering in dry districts.

H. puniceum is an attractive compact shrub usually about 80cm high which covers itself in large, deep pink flowers from January until May.

Favouring gravelly soils in woodlands east of Perth, this species is rarely grown in cultivation yet adapts well to culture and is readily propagated from softwood cuttings.

H. cordifolium is a low, dense shrub up to 90cm tall. It is notable for its attractive heart-shaped deep green — sometimes green and cream variegated, leaves. Its rather insignificant white flowers are produced in Spring.

An ideal landscape 'filler,' this species never-





Hypocalymma robustum flowers profusely from the leaf axils. (Photo F.W. Humphreys).



Hypocalymma xanthopetalum can be distinguished by the flower colour and 4-angled stem. (Photo F.W. Humphreys).

theless requires regular light pruning if it is to maintain its shape. It adapts well to full sun or light shade, although the variegated form needs some protection from strong sun. It is easy to strike from semi-hardwood cuttings.

This species grows naturally in Winter wet areas in the deep south west of the State, while an attractive prostrate, small leaved form occurs from the Scott River.

A range of myrtles is available from nurseries, and will provide colour and texture to any garden.

PROPAGATION

CUTTINGS

Take softwood (soft tip) cuttings from Autumn to early Summer, noting that the period of strongest growth is immediately after flowering in the Spring. Cuttings are easy to strike, and in ideal conditions will form roots in 5 to 6 weeks. After roots form they should be hardened off gradually being given more light and air, and then

placed in small pots until they are ready for planting out.

SEED

The seed remains viable for at least 4 years and requires no treatment prior to sowing. Seed can be sown in Autumn or Spring, but Autumn is the better season in Western Australia. Sow in a free draining mix such as 6 parts local grey bush sand to 1 part cladium peat (parts by bulk). Germination will take from 3 to 4 weeks in ideal conditions.

The seedlings should be pricked out (transplanted) when only a few days old, into a similar soil mix. By adding a small quantity of slow release fertiliser, you will increase the growth rate of the plant.

CULTIVATION

Plants may be grown on until the Autumn, or planted out when 10 cm high. They will respond well to a sheltered full sun position, or broken



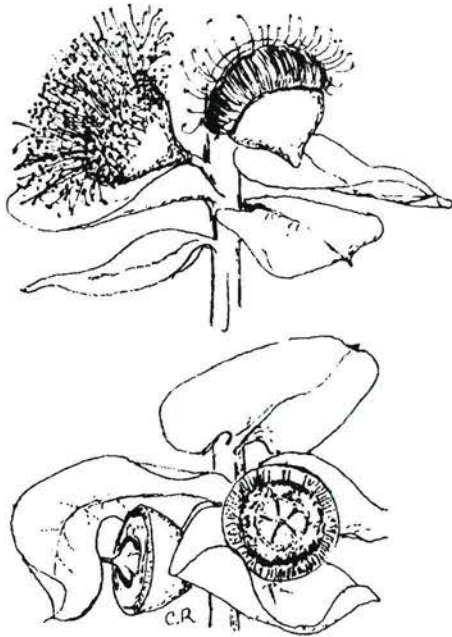
Hypocalymma cordatum with its distinctive heart-shaped leaf. (Photo K.W. Dixon).

sunlight, and they require a free draining soil — preferably slightly acid.

They require regular Spring, Summer and Autumn watering at least for the first year to establish them, after which they should then be drought tolerant. They respond well to light applications of slow release fertiliser or blood and bone. It is best to lightly prune the bush each year straight after flowering, otherwise they tend to become straggly and produce few flowers.

Plants grown from cuttings can flower when they are only a few months old, whereas those raised from seed may take 3 or 4 years to bloom. Plants grown from cuttings tend to be more difficult to establish in home gardens, although unfortunately the reason for this often-high mortality rate is not known.





MOTTLECAH

Eucalyptus macrocarpa was first described by Sir William Jackson Hooker, a Director of Kew Gardens in England, in 1842. Its specific name is derived from the Greek 'makros' meaning large or long and 'karpos' meaning fruit, referring to what is the broadest fruit of this genus. Previously *Eucalyptus rhodantha* was included with *E. macrocarpa*, but is now regarded as a separate species varying mainly in the length of the flower stalk and the habit of its growth. *E. rhodantha* is sometimes considered to be a partially stabilised hybrid between *E. macrocarpa* and *E. pyriformis* (the Pear-fruited Mallee).

Locally known as the Mottlecah or Rose of the West. *E. macrocarpa* belongs to the family Myrtaceae. Stands occur naturally in a belt from Geraldton to Kulin, with the northern and coastal populations favouring sandy lateritic soils while those in the wheatbelt grow in heavier, loamy soils.

The Mottlecah is a mallee or many stemmed shrub which produces new growth from a lignotuber (swollen base at ground level) following a bushfire. Plants may be fairly bushy and low in stature, or form a straggly shrub to 5m in height. The silvery grey leaves contrast well with the large scarlet or red flowers. Occasionally pure yellow flowers may be seen, but rarely do these produce yellow-flowered offspring.

Mottlecah is one of the largest-flowered *Eucalyptus* with blooms up to 8cm across. Its main flowering period is from August to November, although plants are able to flower in any month.

Flower heads and the timber from Mottlecah is commonly used in Ikebana arrangements. It has been successfully cultivated as far afield as California, Switzerland and Canberra.

PROPAGATION

At present the only known method of propagation is by seed. Cuttings are difficult to strike and



The less common yellow-flowered form of *Eucalyptus macrocarpa*. An intact, unopened flower is well protected by a large bud cap. (Photo P. R. Wycherley). All stages from bud to the developing fruit occur on the same branch. (Photo I. R. Dixon)

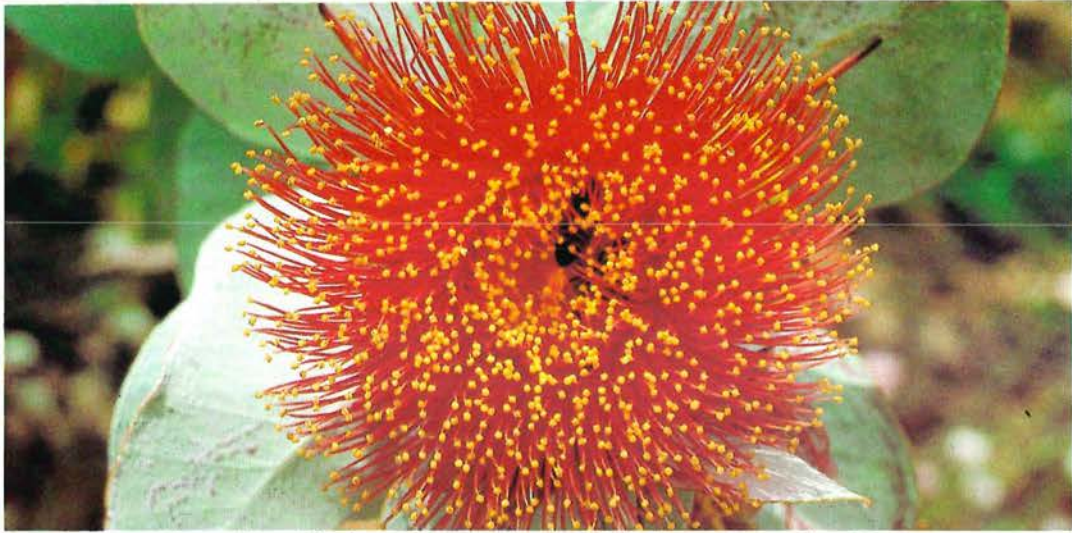
it is not known if plants have ever been successfully grafted.

Since few viable seed are produced, and since insect predation in the fruit is often extremely high, seed is difficult to collect. Most seed samples contain a high proportion of chaff. The seed is fairly large, grey to black in colour, and white inside. When good seed is available it should be sown in the early Autumn, Spring or Summer. Seed sown in wet and cold conditions will usually rot.

Use a free draining seed mix such as 6 parts local grey bush sand to 1 part cladium peat (parts by bulk).

Germination under ideal conditions will take about 2 weeks. Seedlings are best pricked out (transplanted) when only one or two days old. Alternatively 2 or 3 seeds can be sown in the same pot, thinning out later if necessary.





The spectacular red-flowered form of *Eucalyptus macrocarpa* contrasts with the blue-grey leaves. (Photo I. R. Dixon).



The Rose Mallee, *Eucalyptus rhodantha*, sometimes mistaken for the "Mottlecah." (Photo I. R. Dixon).

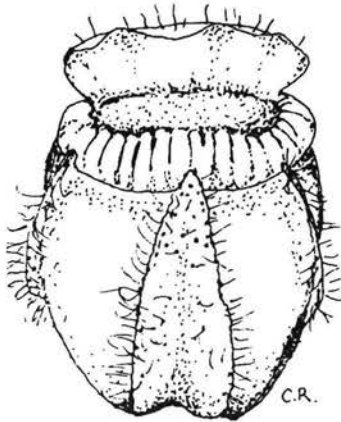
CULTIVATION

The seedlings may be planted out when they are about 10cm high, or else grown on for a few months in a free draining mix containing slow release fertiliser. Soils should be sandy and slightly acid, and the plants require full sun.

The plants themselves vary considerably in height and shape. Therefore unless you collected the seed yourself, and can recall the stature of the plant, it is best to allow the maximum amount of space for the plant to develop. Generally they do not require pruning, although their straggly nature can be tamed somewhat by hard pruning.

Plants grown on alkaline soils become chlorotic and seem not to recover regardless of treatment administered to them. Thus planting in soils which are remotely alkaline is not recommended.





ALBANY PITCHER PLANT

Cephalotus follicularis was first described in 1806 following collection of plants in wet marshes around King George Sound (later named Albany), where once the Pitcher Plant was quite common. 'Cephalotus' is a Greek word meaning head, referring to the stamens which were thought to have a head-like appearance; while 'follicularis' derives from the Latin meaning a small bag or sack, describing the pitcher-shaped leaves.

Its general distribution is from Mt Manypeaks west to the Donnelly River, and it is also found at Yallingup. It is the only member of the family Cephalotaceae, and is found only in south western Western Australia.

This insectivorous or carnivorous plant ensnares its prey in the pitchers which are in fact modified leaves. Attracted by secretions upon which they attempt to feed, insects climb over polished ribs which first curve over the pitcher mouth then end in downward pointing teeth. Below this ring of teeth is a smooth collar which is

Close-up of flowers of *Cephalotus*. (Photo I. R. Dixon).





Each trap of *Cephalotus* is a modified leaf and consists of elaborate spines and slippery surfaces to ensnare unsuspecting prey. (Photo K. W. Dixon).

pointed downwards and overhanging the cavity of the pitcher, and it is here where the secretion glands lie. Insects attempting to feed on the secretions slide on the smooth white surface of the collar, fall into the liquid at the base of the pitcher, and are unable to escape. They drown, decompose, and provide sustenance for the plant.

Contrary to commonly held belief, the lid of the pitcher is not used to trap insects; on hot days it may partially close in order to reduce evaporation.

This fascinating plant occurs in sandy peaty soils amongst dense shrubs and sedges, around swamps and along streams where water continually moves through the soil. However, the surface of the soil may dry out for a few months during Summer.

Sometimes up to 30cm across but usually much smaller, these plants produce two types of leaves; normal oval shaped leaves, and those modified in the shape of pitchers. The inconspicuous clusters of sweetly-scented flowers are carried on stems

up to 60cm long from December to March. Flowering appears to be more prolific after a bushfire.

The Pitcher Plant has been successfully cultivated in commercial quantities, and now extends its diet to insect life found from Melbourne to Darwin and other countries.

PROPAGATION

CUTTINGS – DIVISION

Vegetative propagation (using leaves) is by far the easiest and quickest method of propagation. Leaf cuttings are best taken in the Spring and Summer. Select normal leaves (not pitchers) which are almost fully mature, these will take about 8 weeks to strike. The pitchers will also strike if normal leaves are in short supply.

Plants produce a thick, branching rootstock which can be divided during Spring and Summer. The rootstock can also be cut into small segments about 3cm long, and then be treated as root cuttings. All cuttings are best struck in a mixture of 1



The Pitcher Plant adapts well to cultivation and was a popular European greenhouse plant in the late 1800's. (Photo P. R. Wycherley).

part sphagnum peat moss (German peat) and 1 part sand, on top of which is placed a thin layer of dead sphagnum moss.

Plants are also being produced commercially by tissue culture.

SEED

The seed is best sown in Spring (rising temperature) in the same mix as noted above; the seed is sown on top of the sphagnum moss and is then watered in. Germination is both slow and erratic, and plants are very slow-growing during the first year, reaching only 1cm to 2cm in diameter. Normally seedlings are not transplanted until they are about 1 year old.

CULTIVATION

Plants require sunlight to maintain the brightly coloured red or purple pitchers; when grown in shade the pitchers are entirely green. In cultivation it is difficult to grow plants with brightly coloured pitchers and, at the same time, maintain



Cephalotus follicularis growing naturally on peaty mounds among rushes in a swamp. (Photo I. R. Dixon).

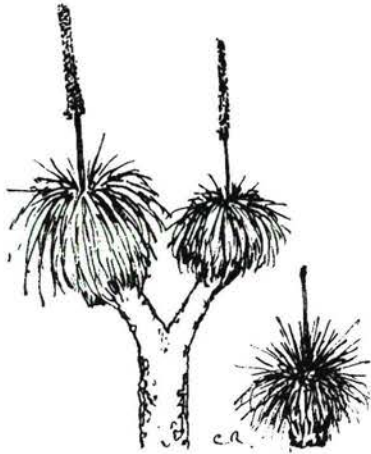


the high moisture level which the plant demands.

In Perth, examples are often grown in terrariums or old aquariums. However, too much sunlight can overheat such containers and kill the plants. They will thrive in a shade house, and have been known to survive when grown outside in sheltered positions.

In Kings Park plants have been grown in glasshouses with 50% shade during Summer. The pots of *Cephalotus* are plunged in sphagnum peat moss to keep them cool and reduce harmful evaporation. Plants thus cultivated have grown well but flower much better in evaporative cooled glasshouses, under which conditions they also produce seed.

The main cultural problems with *Cephalotus* appear to be waterlogging on one hand, dehydration on the other, and the control of mealy bug. Rogor, Basudin or Aphistox is used to drench plants grown in Kings Park when mealy bug is to be controlled.



BLACKBOYS

The Common Blackboy *Xanthorrhoea preissii* is a remarkable and ancient species.

First described in 1798 from a plant seen in eastern Australia, the Blackboy's genus name is derived from the Greek 'xanthos' meaning yellow, and 'rheo' meaning I flow, alluding to the gum which flows from the trunk. The specific epithet 'preissii' commemorates the German botanist August Ludwig Preiss, who collected more than 2500 native plants whilst in Western Australia between 1839 and 1841.

Blackboys grow in a wide range of soils, varying from deep free-draining sands to heavy lateritic soils.

Flowers comprise spikes more than 1m in length, with hundreds of small flowers which are pollinated both by birds and insects. The flowers are produced infrequently, usually following a bushfire. Both male and female flowers are produced on the same spike.

Blackboys have provided both Aboriginal and

European man with a range of services. Aboriginals were known to use the gum from its trunk as a glue, gum from the scape was eaten, nectar from the flowers was sucked, the dried flower scapes were used for fire-lighting by a drilling action, leaves were used to thatch huts and the young and somewhat blanched leaf bases were eaten for their nutty flavour.

European man first used the dried resinous leaf bases for kindling, and extracted picric acid. Today bowls and artifacts of great beauty are turned and carved by skilled craftsmen.

Blackboys are often confused with the Gin Tree or Black Gin, *Kingia australis*. The main differences between the two are that the Gin Tree produces not a single flower spike, but several short 20-40cm long stems with scale-like flowers in round heads (commonly called drum sticks), while the root system starts at the top of the trunk growing downwards beneath the old leaf bases, and thence to the soil.



A typical flowering specimen of the Common Blackboy growing in the bushland of Kings Park. (Photo I. R. Dixon).

Within a few months seed capsules protrude from the spike.
(Photo I. R. Dixon).

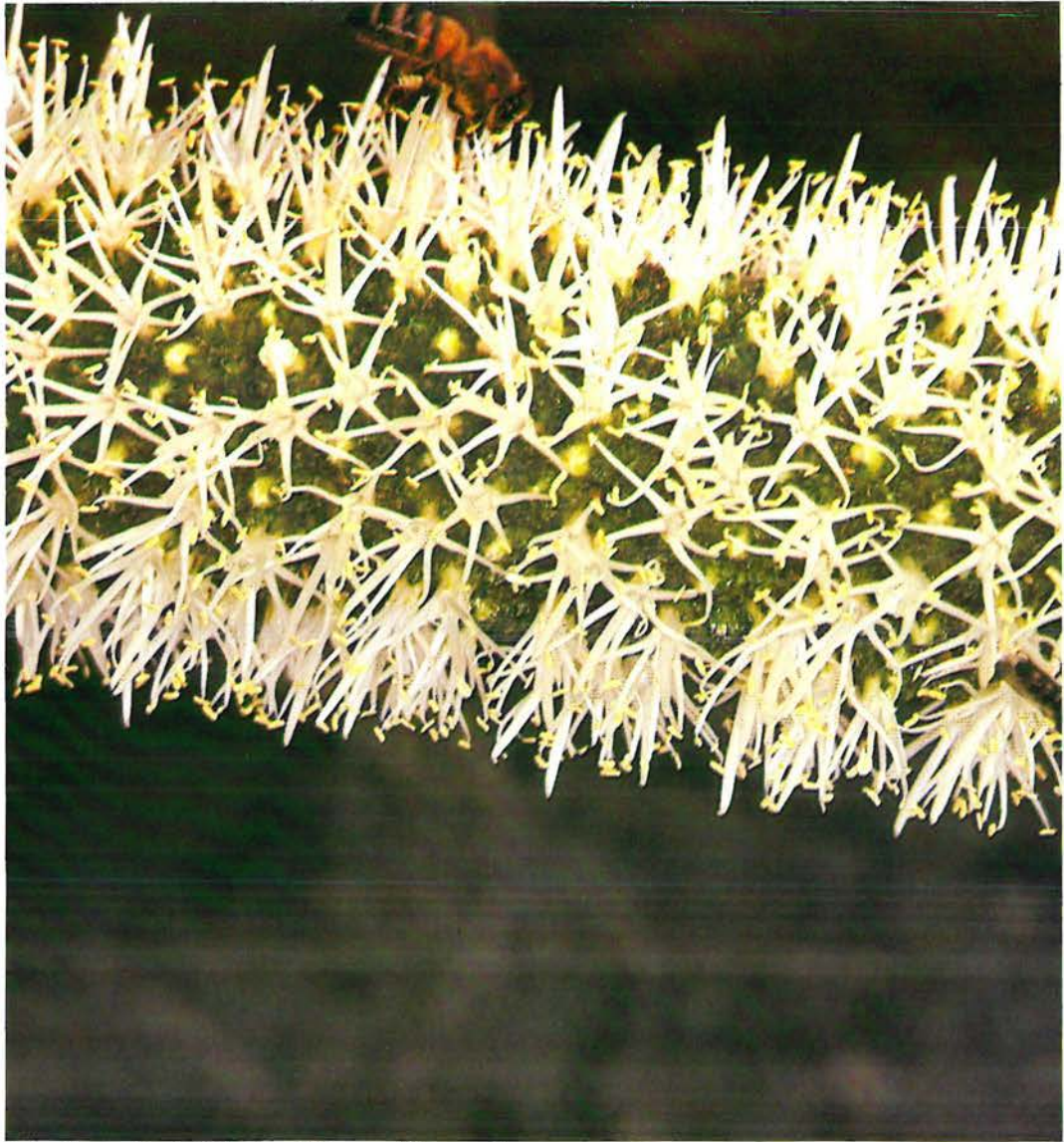
Growth rates are extremely slow at 1.7 to 2cm per annum, although it has been noted that this rate may be increased in cultivation. It is food for thought that, as Australians prepare to celebrate the bicentenary of European settlement of this country, specimens of Blackboy which are between 3 and 4 metres high are estimated to have been part of the Western Australian landscape for up to 600 years.

TRANSPLANTING

Like all our native plants, Blackboys are protected and can only be removed when on private property, and only then with the landowner's permission.

While there seems to be some controversy over exactly when is the best time of the year to transplant, there have been claims of success for almost any time. It is recommended that transplantation take place from April to June.





Each spike consists of 1000's of small flowers, which are a rich source of nectar for insects and birds. (Photo P. R. Wycherley).

The winged seeds are normally shed from the plant, however occasionally seed contained within the fallen spike may germinate in place. (Photo I. R. Dixon).

The Blackboy's Xanthorrhoeaceae family closely resembles the Lily family, its root system active from June to early Summer, following which time the root system gradually dies away. The old root system then only serves to anchor the plant in the ground.

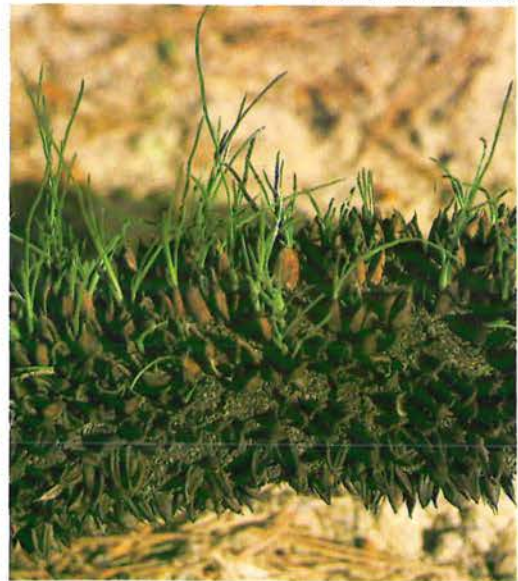
The recommended method of transplanting is as follows:

Tie up the leaves of the Blackboy with string to avoid damaging your eyes.

Dig around the base of the plant, severing the old roots. It is only necessary to dig a few centimetres away from the trunk to avoid damaging the bole of the plant. Do not push on the top of the trunk or it may snap off.

When transporting, wrap the root system in damp hessian such as an old sack, to avoid dehydration.

Replant the Blackboy as soon as possible at the same depth from which it was removed. While backfilling the hole around the root system, keep





Stem bases of the Blackboy adapt well to wood turning and come in a variety of shades. (Photo K. W. Dixon).

the hose running to moisten the surrounding soil and to fill any air pockets.

As soon as the planting is completed, make a depression in the soil around the plant for future hand watering, or else install trickle irrigation.

Release the string from around the leaves and set fire to them; most including the topmost green ones should be burned off. The top should then be hosed down to stop it from smouldering. This treatment reduces water loss through transpiration, but alternatively you may trim off the leaves with the shears. This could in fact be done before you remove the plant, but burning looks to be more natural.

Despite what may appear brutal treatment, new leaves will appear from the centre of the plant within a few weeks.

The plants should be watered regularly until the onset of heavy Winter rains. From then, weekly commencing in early Spring and continuing through Summer and Autumn until the onset of



Winter rains the next season. From then onwards, the plants should be drought tolerant.



SANDPLAIN WOODY PEAR

Xylomelum angustifolium was described in 1856 from a collection made by eminent botanist James Drummond. Its name comes from the Greek 'xylo' or wood, and 'melon' meaning apple, referring to its characteristic woody, pear-shaped fruits. Its specific epithet is derived from the Latin 'angustus' meaning an arrow, and 'folium' meaning leaf, descriptive of its narrow leaf structure compared to other species.

There are in fact, 5 species of *Xylomelum*, 2 occurring in Western Australia and 3 in New South Wales and Queensland. These two widely separated groups reflect an early link and then a biological separation between eastern and western Australia.

It belongs to the family Proteaceae and is thus closely related to the Banksias and Dryandras.

As its common name suggests, plants occur naturally on sandy soils. Between the Murchison River and Corrigin, and when travelling north of Perth between Badgingarra and Eneabba, stands

may be observed. The hard, woody fruit, which is not edible, contains two large winged seed which are kept on the plant for several years. After a bushfire or when a branch dies, the fruit split on their underside to release their seed.

Large open bushes or small trees, the Woody Pear can grow to 7m, but is usually much smaller. Its greyish green leaves are 10-15cm long and are broadly linear in shape. Cream flowers are produced from late December to February, and are arranged in dense racemes (finger shapes) toward the ends of the branches.

PROPAGATION

At present, the only successful method of propagation is by seed. Seed freshly extracted from the fruit should be sown in Autumn or Spring — Autumn being the best time in Western Australia.

Use a free-draining mix such as 4 parts local grey sand, 2 parts washed coarse river sand and 1 part cladium peat (parts by bulk). The following



The woody fruits which are covered in a white felt, mature approximately one year after flowering, but are held on the plant for many years. The small flowers occur densely in catkins. (Photo F. W. Humphreys). A Woody Pear plant in full bloom in its natural habitat north of Perth. (Photo I. R. Dixon).

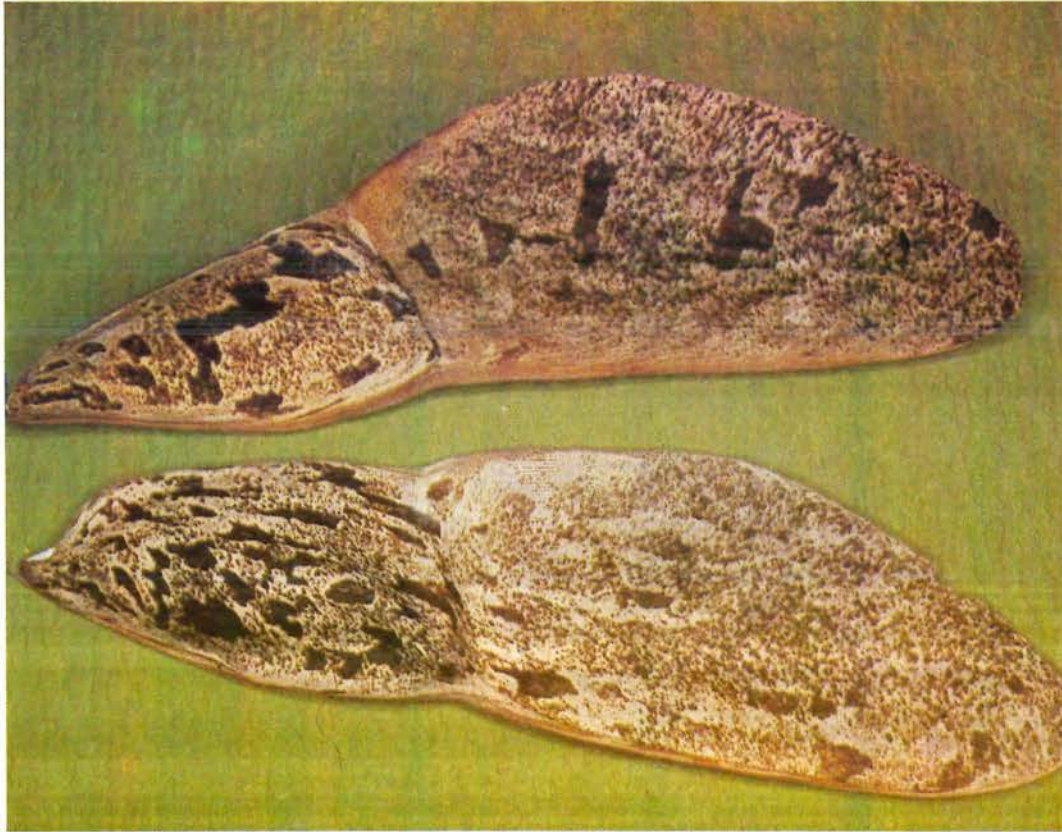
methods of sowing are recommended, since the seedlings have a vigorous root system and pricking out usually causes damage which can lead to their death.

- i) Sow 1 or 2 seed per pot, breaking off the wing of the seed before sowing; this will reduce the risk of fungal infection. After germination — 17 days under ideal conditions — thin to 1 seedling per pot.
- ii) Sow in situ, in the final growing position. Choose a well-drained position in full sun. Place 2 or 3 seed at each station around your label or marker peg. Thin out the seedlings after germination and keep them free of weeds.

CULTIVATION

Seedlings are best planted out when they are about 5cm high, in a free draining slightly acid and sandy soil, in full sun. Plants are fairly slow-growing, reaching about 3m in 6 years, at which time they produce their first flowers.





Front and rear view of the highly ornamented winged seeds of the Sandplain Woody Pear. (Photo K. W. Dixon).

Xylomelum occidentale or Forest Pear is the only other species which occurs naturally in Western Australia. It is extremely slow-growing and thus is not recommended for the home garden.

Plants produce shallow, fine feeder roots (proteoid roots) which extract phosphate from the litter layer. Cultivation around the plants is not recommended, since this may damage the proteoid roots and destroy the plant.

Weeding should be done by hand, although this can be reduced by the application of a mulch which will suppress the weed growth and reduce moisture loss through evaporation. Organic mulches such as Eucalyptus leaves or Sheoak branchlets are recommended, since they will gradually break down and add valuable nutrients to the soil.

A small quantity of slow release fertiliser containing nitrogen and potash is known to be beneficial. The direct application of phosphate should be avoided, other than in small quantities



such as blood and bone, which also contains essential nitrogen.

Normally 2 plants are required to produce a good seed set. Both the flowers and the fruit dry well, and are extensively used in dried floral arrangements.



Western Australian CHRISTMAS TREE

Nuytsia floribunda commemorates in its name the exploration of the south-west coast of Australia by Dutch navigator Pieter Nuyts in 1626-7. Its specific epithet comes from the Latin 'floris' or flower, and 'abundus' referring to the abundant flowers. The plant was described from a sample taken from the south coast of Western Australia.

Originally described in 1805 under the genus *Loranthus*, *Nuytsia* was renamed by English botanist Robert Brown in 1831.

Belonging to the Mistletoe family, the Christmas Tree occurs from Kalbarri in the north to Israelite Bay in the south. It favours sandy soils, and several populations are growing naturally in Kings Park. Some are typically suckering from underground stems, producing clumps of trees, while others stand alone.

The Christmas Tree is one of the few Mistletoe trees in the world, growing up to 15m in height but usually smaller. It is one of the most spec-

tacular flowering trees of the world, with masses of vivid orange flowers produced around Christmas time, its impact being all the more spectacular since at that time the Western Australian bush is otherwise depleted of flowers.

This plant is a hemiparasite, producing haustoria on its roots which penetrate the underground organs of its host. It is not known exactly what the tree thus extracts, be it nutrients, moisture or life itself. The haustoria — creamy white sucking pads through which the tree will draw its sustenance — often form a complete collar around the host. Plants from over a dozen different families are known to serve as hosts for the Christmas Tree, including introduced species such as Couch Grass (*Cynodon dactylon*), and *Pelargonium capitatum*.

The trunk of the Christmas Tree is very different from most trees. Instead of having a simple central cylinder of wood surrounded by bark, it has layers of wood and inner barks forming con-



This photograph was taken in the Kings Park container arboretum showing first flowering of a seed grown plant 15 years after sowing. (Photo I. R. Dixon).

centric cylinders. This peculiar design allows the tree to grow from the inner layers after receiving damage by fire or ringbarking to its trunk. When examining a broken branch after the wound has healed, the resulting new growth will generally be observed to shoot from the central area of the wound, whereas growth from other trees is from the outside of the wound.

The Christmas Tree provided wood for shields made by Aborigines, who also dug young shoots and, after peeling off the outer layer, ate the brittle centre. It is said to have tasted like sugar candy. There are conflicting records about whether or not the sticky gum which exudes from the stems was also eaten.

PROPAGATION

CUTTINGS – SUCKERS

Plants grown from semi-hardwood cuttings have been raised by a Perth nursery, and flowered when they were only 1 year old.

However, the nursery claims that it is not economic to raise plants by this method.

Although sometimes successfully grown from transplanted suckers, the method's unreliability means the best way to raise a Christmas Tree is from its seed.

SEED

Nuytsia is very easy to germinate providing only fresh seed is used. The 3-winged fruit which contains one seed may be sown in the Autumn or Spring. When sowing in pots, Autumn is the preferred sowing season in Western Australia.

Use a free-draining seed mix comprising 6 parts local grey bush sand to 1 part cladium peat (parts by bulk) and sow 2 seeds in each small pot or tube. Push the seed slightly down into the mix; the end where the stalk was attached to the fruit should be facing downwards, and the top half should be left uncovered. Alternatively, sow several seeds in a large pot and prick out the



The spectacular flowering heads are held well above the foliage. (Photo M. Seale).

A natural tree growing in the bushland of Kings Park. (Photo I. R. Dixon).

seedlings when they are a few days old.

Seed may also be grown in situ during June and July. Select a position giving protection from hot drying winds, preferably between existing shrubs, allowing the *Nuytsia* to use them as host plants. In early Spring, provide a mulch such as gravel or pine bark, and water the seedlings regularly during Spring, Summer and Autumn for the first 6 to 8 years. Seedlings produce 2, 3 or 4 cotyledons (seed leaves), while the first true leaves are light green, crowded on the new shoot and resembling a juvenile pine tree.

The seedlings in pots may be potted on into a free-draining mix when they are large enough to be transplanted. At this stage you can introduce a host such as a perennial grass or a slow growing shrub into the pot. However the seedlings can survive for over 1 year without a host, providing they are kept moist. In Kings Park nursery, a small Agriform tablet is placed in each pot, rapidly increasing the growth rate of the seedling.





Flowers are borne in clusters of 3 along the spike, opening from the base outwards. (Photo I. R. Dixon).

CULTIVATION

Plants require a sandy and free-draining soil, full sun position and protection from hot, drying winds. They prefer a mulch such as pine bark or gravel, which helps to reduce moisture loss and keeps the plant's root system cool. They should be planted within the root zone of their host plant, and should be given regular Spring, Summer and Autumn watering.

The *Nuytsia* seedling has an unusual growth pattern. For several years new shoots develop annually from the base, occasionally dying down again until a thick rootstock has developed. One shoot will then grow in height to form a trunk and gradually a tree. Flowering from seed may take 8 to 10 years or even more. One plant grown in Kings Park nursery from seed, then planted out, took 15 years to flower. But when you see a mature tree in full bloom, the wait seems worthwhile.





The RAINBOW PLANT

Byblis gigantea was named in 1839, 30 years after the annual, tropical species, *Byblis liniflora* was described. This lovely flower is named after a mythological princess, Byblis, who was turned into a fountain. The stem and leaves of the Rainbow Plant are covered with fine glandular hairs which glisten in the sun, resembling droplets of water from a fountain. The specific epithet comes from the Latin 'gigantea' meaning large, a comparison of this southern species to its tropical relative. The species was described from a sample collected in the wet sandy environs of the Swan River.

Its common name Rainbow Plant derives from the production of a spectrum of colours displayed when sunlight passes through the fine, moistened fringes on its stem and leaves. *B. gigantea* belongs to the family Byblidaceae, and is closely related to the *Drosera* or Sundew family. The plants grow naturally in low-lying sandy soils east

of Perth, and in sandy to sandy lateritic soils from the Moore River to Eneabba.

This carnivorous or insectivorous plant has the simplest kind of carnivorous mechanism, referred to as the 'flypaper trap.' It snares its victims on the numerous sticky glands which are on the ends of long hairs protruding from its stems and leaves. Although known as a 'passive' flypaper trap since the hairs do not move to enfold their prey, *Byblis* holds on to trapped insects with its sticky tentacles while digestive glands close to the leaf surface proceed to extract sustenance — chiefly in the form of nitrogen — from their victims.

By one of those peculiar partnerships often found in Nature, *Byblis* plays host to one variety of small insect which, oblivious to the hazards of the flypaper trap, lives on the plant and runs over its surface. Its audacity extends to feeding on the body juices of its hapless relatives while they await consumption.

The Rainbow Plant is an herbaceous perennial



Byblis liniflora, the short lived tropical species, grown from seed in the Kings Park nursery. It has a semi-climbing habit in pot culture. (Photo P. R. Wycherley).

which grows up to 30cm in height. It produces highly attractive pinkish mauve or occasionally white flowers 3 to 4cm across, from September to January. Seed is usually produced in January and February, the large seed capsules often containing more than 50 viable seeds.

PROPAGATION

CUTTINGS

Plants can be raised from cuttings taken in Winter or early Spring. Select fairly young shoots, and cut them off about 2cm below ground level. This type of cutting proves ready to strike, and roots may be expected to form within 5 or 6 weeks. However, this method of propagation is destructive, since the plants produce few shoots.

A method of successfully raising plants by tissue culture has been developed in Kings Park, and is described in the publication 'Micropropagation of *Byblis gigantea*,' details of which will be found in the Reference section at the start of this book.

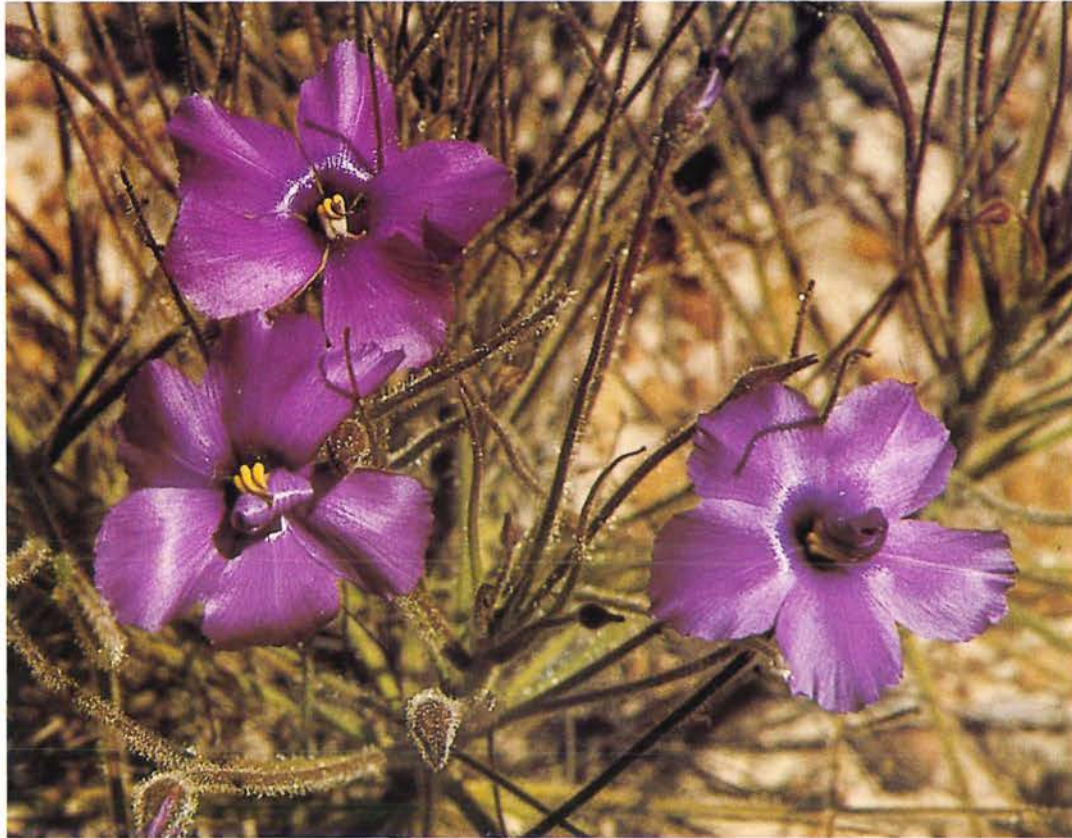
Plants raised by this method are used at present for research work in Kings park and are thus not available to the general public.

SEED

Plants can be raised from seed sown in the Autumn or Spring, Autumn being the preferred season in Western Australia. The small, black seeds have a hard, brittle seed coat. Improved germination of carnivorous plants by local growers uses the following method:

Pour boiling water over the seed, allow it to cool, then sow the seed immediately. It is recommended that the seed be sown on a mixture of sphagnum peat moss (German peat) and white silica sand.

A sowing mixture which has been found to work equally well in Perth is a mix of 6 parts local grey sand, 2 parts washed river sand and 1 part cladium peat. The pH of the mix should be slightly acid. Although plants grow naturally in Winter



Byblis gigantea with glistening sticky glands covering all the green parts of the plant. (Photo I. R. Dixon).

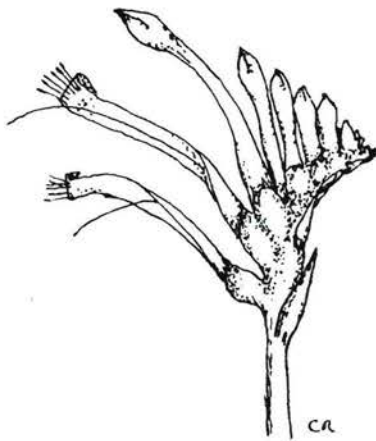
wet, but not boggy areas, they are subjected to very dry conditions during the Summer when the plants become dormant until the onset of heavy Autumn-Winter rains.

Plants grown in pots should not be dried off during their normal dormant season, since this generally leads to dehydration and their death. Watering by hand directly into the pot, or trickle irrigation, are the best methods as frequent overhead watering will wash off some of the sticky substance from the glands, the plant's mechanism for obtaining sustenance. Such over-watering may also wash off the insects which nourish the plants.

Byblis is best grown in full sun, otherwise its growth tends to become very soft, and prone to attack by insects and diseases. Occasionally, plants are attacked by caterpillars, which can be controlled by hand picking or by spraying with pyrethrum/pyrethrin. Fertilisers are not recommended when the plants are grown outside, providing there is a good supply of insect life. When



grown inside a glass house, plants may require the application of a small quantity of slow release fertiliser.



RED and GREEN KANGAROO PAW

Anigozanthos manglesii holds a special place amongst the 8000 different species of plants native to Western Australia. On 9th November 1960 it was declared the Floral Emblem for the State, and since that time has also been incorporated in the logo for Kings Park and the Botanic Gardens — the insignia worn by the Kings Park Guides and the Kings Park Rangers.

Anigozanthos was first described by French botanist Jacques-Julien Houton de Labillardiere in 1800, using a sample of the Red Kangaroo Paw (*A. rufus*) collected near Esperance in 1792. Its name possibly derives from the Greek 'anisos' meaning unequal, and 'anthos' meaning flower. Labillardiere himself stated "the corolla is in the form of a tube divided at its extremities into six unequal parts."

The specific epithet *manglesii* commemorates Robert Mangles, an English horticulturalist who successfully grew the type specimen from seed brought to England in 1833 by Western

Australia's first Governor, Sir James Stirling.

Although all colour variants other than the red-mauve forms are rare in natural bushland, Kangaroo Paws may be found naturally occurring on sandy, sandy lateritic or loamy free-draining soils from Kalbarri in the north, to Manjimup in the south.

The plants are short-lived, rhizomatous, herbaceous perennials with flower stems up to 1m long. Flowers are produced from August to October and vary considerably in colour, from the usual red and green through shades of reddish-mauve, orange, yellow, blueish-green and even a rare pure white. Plants from the northern extremities of their habitat often have branching flower stems.

Paradoxically, Kangaroo Paws thrive following bushfires and after the surrounding soil is disturbed during land clearing operations. After bushfires, competing species are cleared away and seeds are given the chance to germinate.



Typical red and green form of *Anigozanthos manglesii*. (Photo K. W. Dixon).

Anigozanthos manglesii often grows in dense colonies after fire. This is a scene in the Kings Park bushland with the yellow Prickly Moses (*Acacia pulchella*) in the background. (Photo I. R. Dixon).

Some years after a fire, other long-lived plants will again become dominant and will crowd out the Kangaroo Paws, which will not be seen until after the next fire or after clearing operations. In some of the more recently developed residential subdivisions north and south of Perth, it has been noted that cleared land produces a profusion of Kangaroo Paws until such time as other competing species re-establish themselves.

Thanks to its adoption as the State's Floral Emblem, the Red and Green form is the best known of numerous recognised variants, but others include

Yellow: greenish-yellow 'petals' or claw with a bright yellow base

Orange: greenish-yellow claw with a bright orange base

Blue: metallic blue claw with a red base

Red: overall flower coloured reddish mauve

Interestingly, dark flower colour forms appear to be more resistant to ink disease, a systemic





Green and yellow form of *Anigozanthos manglesii* makes a good contrast to other colour forms. (Photo K. W. Dixon).

fungal pathogen which quickly destroys susceptible plants. Unfortunately little is known of ways in which to chemically control this disease.

Stands of Kangaroo Paws may be seen in season both in Kings Park and at Yanchep National Park, north of Perth.

PROPAGATION

SEED

Plants are raised from seed sown in the Autumn or Spring. No seed treatment is required, although sowing should be in a free-draining mix such as 6 parts local grey sand and 1 part cladium peat (parts by bulk). Seed should be covered with a thin layer of blue-metal dust (2-3mm grit). Germination usually takes about 3 weeks, given ideal conditions.

Seedlings should be pricked out when only a few days old into tubes or small pots and are initially slow-growing.

Another method of propagation is to divide the rhizomes in Autumn, leaving 3 or 4 shoots on each division. At least one third of the leaves on each plant should be cut off, thereby reducing water loss through transpiration. They should then be potted up into a free draining mix as described above, and placed under light shade until the plants recover. Gradually introduce them to full sunlight and grow on until the pots are full of roots. At that stage they can be either potted on or planted in the garden.

Sometimes, however, heavy losses occur during division, and thus propagation by seed is recommended unless you wish to grow an unusual form. Under cultivation it has been found that all variants may be bred true to type, by careful crossing using similarly coloured plants.

CULTIVATION

Plants may be planted out when about 10cm high, or grown on in pots until the following



Pure red form of *Anigozanthos manglesii*. (Photo K. W. Dixon).

Autumn. Although plants will grow in broken sunlight, they prefer full sun.

In the home garden plants are generally short-lived and are best treated as an annual or biennial. New plants should thus be raised each year if you want to guarantee a display. They respond very well to light applications of slow release or liquid fertilisers, producing vigorous and lush growth.

Plants which germinate from seed sown in Autumn occasionally produce an inferior flower in late Spring or early Summer. However, do not despair; the first major flowering period is in the following late Winter or Spring, when plants will usually produce between 6 and 20 flowering stems. On particularly vigorous plants, more than 50 stems may be produced.

If you wish to keep your plants for more than one season, cut off the old flowers after the seed has ripened. Collect the seed if you wish, then in late March or early April cut off the remaining

dead flower stems almost to ground level, removing dead leaves on the way.

PESTS and DISEASES

Anigozanthos suffers from the attentions of slugs and snails, which are easy to control by use of snail pellets or by spraying the plants with Methylcarbamate. Other less troublesome pests include aphid which attack small plants, and brown hairy caterpillars, which feed on the stems.

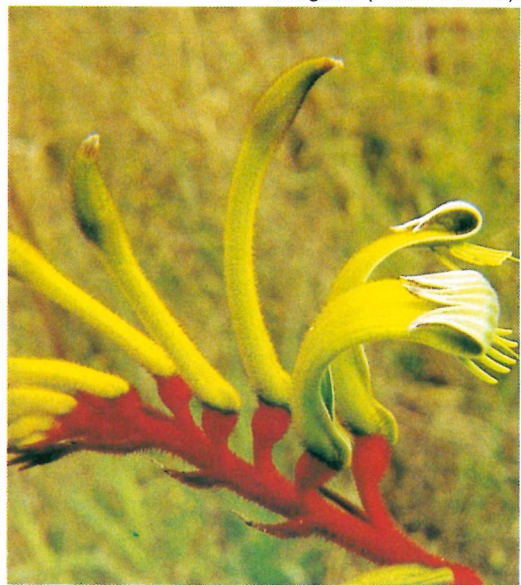
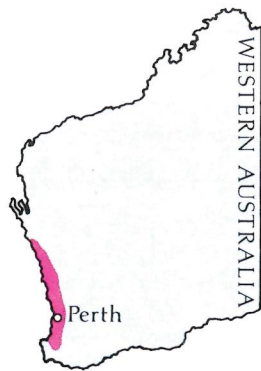
Major leaf diseases include ink disease, (black spots) and rust disease, (small orange-brown spots). The latter can kill the plant, but spraying with Baycor has been found to help in its control.

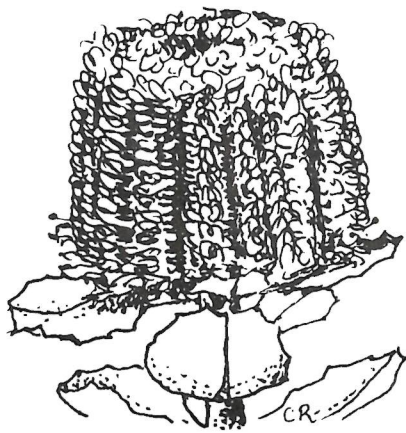
Prevention rather than cure of diseases seems to be the order of the day. Keep the plants' leaves dry by ensuring they receive full sunlight, and during the drier months either water using trickle irrigation, or else hand water at midday so that the leaves dry off quickly.



Blue and red form of *Anigozanthos manglesii*. (Photo K. W. Dixon).

An unusual yellow and red colour variant of *Anigozanthos manglesii*. (Photo I. R. Dixon).





SCARLET BANKSIA

Banksia coccinea is also known as the Albany Banksia, since it occurs naturally from Albany to the Stirling Range, as well as east as far as the Young River. It was described by Robert Brown, the botanist accompanying Matthew Flinders on his voyages of discovery to Australia. The plant was collected by him in December 1801 from King George Sound (now known as Albany) and, as with all of the *Banksia* genus, commemorates Joseph Banks, the botanist who accompanied Captain Cook. The specific epithet is from the Latin 'coccineus' meaning scarlet, referring to the colour of the styles or pollen-receptive organ.

Plants are generally found in open low woodland or tall shrubland on pure white or grey sandy soils. They have adapted well to the State's often impoverished soils by the use of a special fine root system. Called proteoid roots, they lie close to the soil surface where they extract phosphate from the litter layer.

Banksia coccinea may be a large shrub or small tree up to 8m high. The terminal flower heads contain hundreds of individual flowers which open from the base of the head towards the apex. Flowers are produced from June to January, and while they are usually scarlet in colour, an orange variant occurs in the Stirling Range.

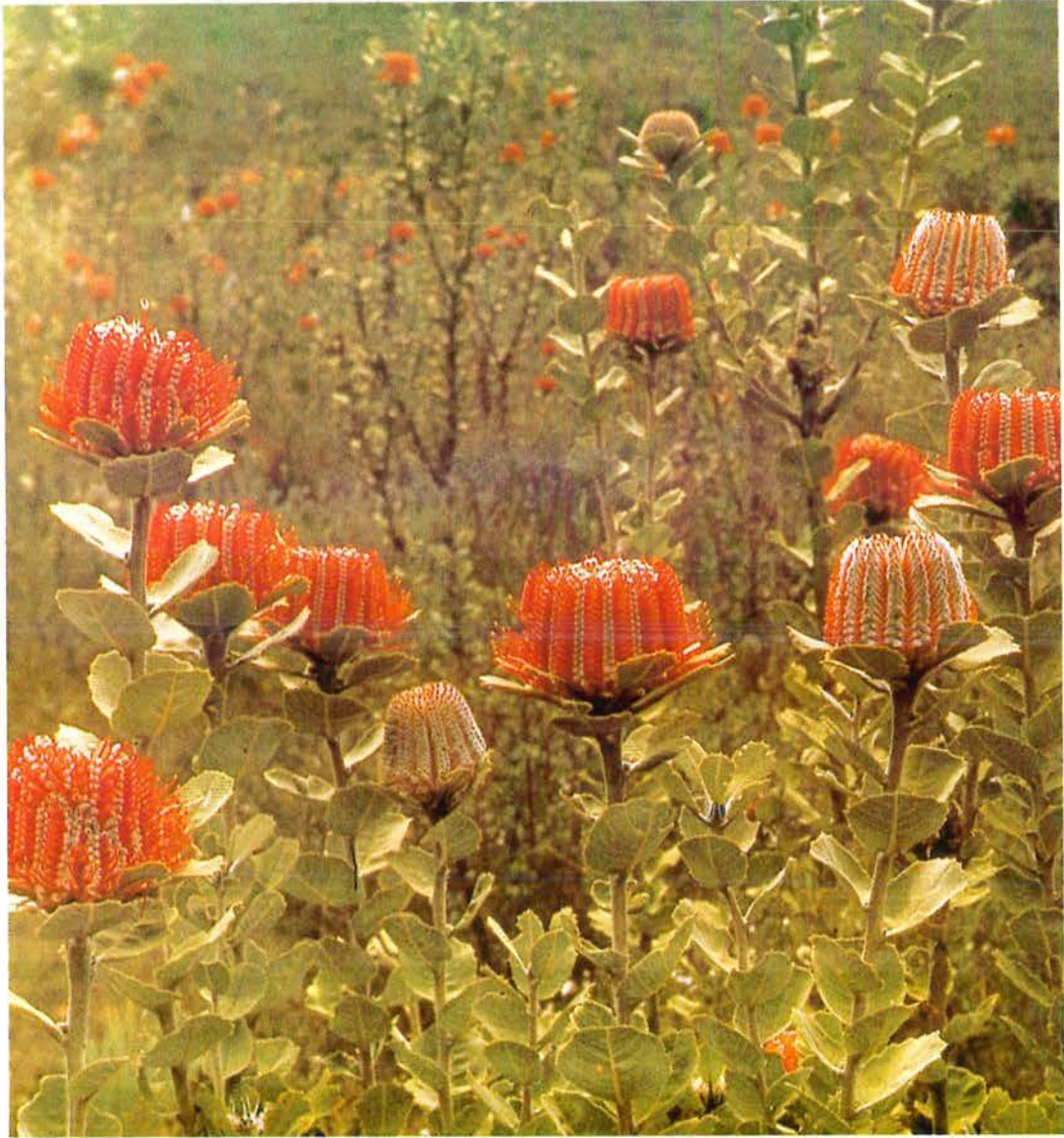
Although the plants are killed by fire, they regenerate freely from seed, which are released after maturing for over a year in the seed cones.

Sadly, natural populations of this plant are rapidly declining due to clearing operations, and through commercial exploitation of both its seed and flowers.

PROPAGATION

SEED

Although it is possible to raise plants from cuttings, the process is extremely difficult and the



In its natural habitat *Banksia coccinea* grows in dense thickets. (Photo M. Seale).

success rate low. The recommended method is thus by the use of fresh seed.

The test for freshness is to cut the seed in two. If the seed is fresh, its interior will be firm and white, whereas old seed is soft and creamy in colour.

Sowing can be in Autumn or Spring, but Autumn is recommended in Western Australia. An open free-draining mix of 4 parts local grey sand, 2 parts coarse washed river sand and 1 part cladium peat (parts by bulk) can be used in large pots. Seedlings can be pricked out when only a few days old, but since their roots are easily damaged, the following method is recommended.

Sow 2 seeds in each small pot or tube; they may be thinned to 1 seedling per pot as necessary. When a few weeks old, either plant out directly or place in larger pots for later planting out.

Seed may also be sown in the plant's final growing position, by sowing 2 or 3 seeds near a label or marker. If necessary thin out following germ-

ination; while by this method you will avoid any chance of damage to the delicate roots, you must ensure that weeds are controlled to avoid smothering the seedlings, and attacks by snails must also be controlled.

CULTIVATION

Banksia coccinea requires a free draining and sandy or sandy lateritic soil, and a full sun position. Plants which grow well on Perth's sandy soils usually do not flower, indicating that suitable nutrients or elements may be lacking. Mysteriously, the genus flowers well in the hills east of Perth, and at Yanchep National Park.

Plants prefer an organic mulch to manure or lawn clippings, thus avoiding the introduction of weed seeds and the chances of fungal attack. A mulch of Eucalyptus leaves or Sheoak branchlets will break down slowly, adding nutrients to the soil, suppressing weed growth and reducing moisture loss.



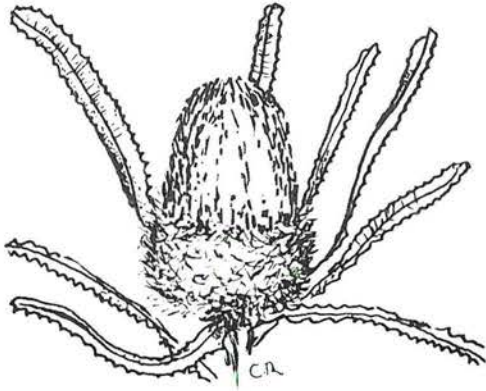
Close-up of spike of *Banksia coccinea*. (Photo P.R. Wycherley).

Avoid any cultivation of the soil near the roots, which may harm the plant. While fertilisers containing phosphate may kill Banksias, a small quantity of slow release fertiliser containing potash and nitrogen, or blood and bone, will not harm the plant.

Banksias respond well to light pruning after flowering, but hard pruning or lopping can prove deleterious.

Banksia coccinea is the most heavily exploited of the genus, since it makes a highly decorative cut flower and may also be dried.





FIREWOOD BANKSIA

Banksia menziesii commemorates Archibald Menzies, a surgeon-naturalist on Vancouver's voyage of 1790-1795. The company visited King George Sound in 1791, and Menzies collected many plants which were sent to Robert Brown, the English botanist who described *Banksia coccinea* etc. The species was named from a plant collected in 1827 from near the Swan River by Charles Fraser.

The Firewood or Menzies Banksia grows naturally in sandy soils from the Murchison River to Pinjarra, and occurs naturally in Kings Park. Like the Scarlet Banksia, it is closely related to the Dryandras or Parrot Bush, as well as the Proteas of South Africa. It belongs to the family Proteaceae.

Plants vary in size and shape, but often form a Banksia woodland of small trees from 3m to 10m in height. As with the Scarlet Banksia, the flowers are terminal and comprise hundreds of individual flowers which gradually cover the entire flower

cone. They are usually a shade of pink or red with a silvery indumentum (hairy covering), but are also known to produce pure yellow, chocolate or rusty-brown flowers between February and August.

After bushfires the plants sprout either from their trunks or from their lignotubers on the small shrub forms. Seeds are released upon maturity of the cones.

PROPAGATION

The method of propagation is as for the Scarlet Banksia *Banksia coccinea*, and the difficulties encountered in trying to grow this genus from cuttings makes propagation from seed the more desirable alternative.

CULTIVATION

Once again the recommended method of cultivation of the Firewood Banksia is as described for *Banksia coccinea*, repeating the warnings



Like many Banksias, *Banksia menziesii* opens from the base upwards. (Photo K.W. Dixon).

against cultivation of the soil near the plant, and against the use of fertilisers containing phosphate.

Banksia menziesii is used as a cut flower, which ages to an attractive grey. Interestingly the rust or chocolate coloured variants retain their colour for several years after being dried.

Evolution of BANKSIA and the Family PROTEACEAE

The family Proteaceae is amongst the oldest groups of flowering plants. Proteaceous ancestors are recorded as fossils some 300 million years ago; long before the great united landmass of Gondwanaland began breaking-up to form the southern continents. Even by this time the family had already diverged into the "protea" element — which subsequently proliferated in southern Africa to become the familiar genera *Protea* and *Leucadendron* etc; and the Australian and South

American Proteaceae typified by the genus *Grevillea* and containing the predominantly Australian genus *Banksia*.

Interestingly no genus is common to both South Africa and Australia, though South America shares more than half its genera with Australia. This adds substance to the theory that Africa drifted apart from Gondwanaland long before the parting of what are known today as Australia and South America.

Banksia and *Banksia*-like pollen retrieved from Australian sediments have been reported from about 60 million years ago. Cones and leaves of now extinct Banksias have been recovered from a range of sites throughout Australia indicating that the genus arose under tropical and subtropical conditions which pervaded the continent up to 50 million years ago.

Isolation of Australia from other land masses coupled with the onset of aridity and desertification of three quarters of the continent are believ-



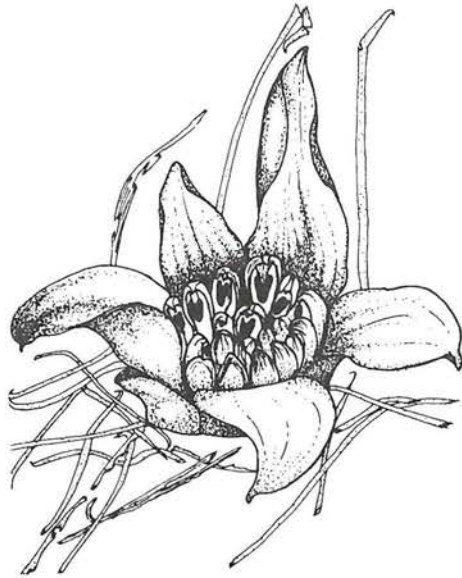
Seeds, two in number, are held in duck-bill like protuberances which open with age or after fire. (Photo K. W. Dixon).

ed to have contributed to the diversification and proliferation of the bewildering array of growth forms found in the genus *Banksia*.

The name *Banksia*, published in 1781, commemorates Sir Joseph Banks, a botanist who accompanied Captain James Cook on his voyages of discovery to Australia. The first species described was *B. serrata*, collected by Banks from Botany Bay, New South Wales.

Examples of *B. serrata* may be seen growing in the Kings Park Botanic Gardens.





Western Australian UNDERGROUND ORCHID

Rhizanthella gardneri, Western Australia's unique underground orchid, was discovered by accident in 1928 during land clearing operations. During the next 51 years, only a further 7 findings of the orchid were made, each time during clearing work, each time accidental.

Interest in the orchid was spurred by the discovery in 1979 of 11 plants in a viable but highly vulnerable population. The find was made by a farmer, John McGuiness, while clearing land for agriculture near Munglinup, in the State's southeast. Professor J S Pate, of the University of Western Australia, and Dr K W Dixon, currently Research Officer with the Kings Park Board, secured support from the World Wildlife Fund Australia, and set out to find whether further untouched populations of this most fascinating species existed. Should such finds be made, it was intended to take action to ensure the protection of the species.

The search for RHIZANTHELLA

Bearing in mind that there had been no opportunity for deliberate research into the habitat and distribution of the orchid, the researchers were starting with a sheet of paper that was very nearly blank in establishing a search procedure. The 1979 discovery of a number of examples rather than single specimens allowed, however, some generalisations to be made.

The most important assumption made was that, from evidence corroborated even by the first discovery, it appeared that the orchid was saprophytic in nature (living off dead or decaying organic matter), and that the matter from which it appeared to derive its sustenance was the Broom Honey-myrtle *Melaleuca uncinata*.

Despite the rarity of specimens upon which to test this assumption, the researchers were ex-





Each flowering head consists of numerous smaller flowers nestled at the base of and protected by large petal-like bracts. (Photo R. Peakall).



Although fully covered by soil and debris occasional specimens of the Underground Orchid do protrude the tips of the bracts above soil. (Photo S. Gibbings).

cited to locate a single specimen in 1980 after deliberately searching amongst *M. uncinata* thickets near Babakin, some 500 kms distant from Munglinup.

When World Wildlife funds became available in January 1981, the parameters of the search were becoming more finely honed. A revisit to the Babakin site confirmed a total of 15 plants, all growing within 25cm of the base of a Broom Honey Myrtle. Highly variable soil types in the vicinity pointed to some tolerance on the part of the orchid, but were of little help in trying to produce watertight criteria upon which to predict its location.

It was also noted that all 6 discoveries made before 1979 had been made within the 300mm to 400mm rainfall areas of the State, giving a second valuable clue to the orchid's habitat.

The researchers were thus armed with the assumptions that *Rhizanthella* occurred in close

proximity to *M. uncinata* and between the 300 and 400mm isohyets.

They then engaged the services of the LAND-SAT earth satellite, launched as part of the International Geophysical Year in 1968, supplying data to a large number of subscribers around the world. The satellite, although circling the Earth in a criss-cross pattern some 780 kms above its surface, is capable of producing clear video pictures of surface areas as small as 52 x 79m, and to permit the calculation of the percentage of area covered by particular crops or types of vegetation, their condition, their percentage of water uptake and any deficiencies in nutrients from which they might be suffering.

The pictures produced by the satellite recognize the 'spectral signature' of any type of vegetation, in much the same way as a needle traversing a record groove can translate variations within that groove into music and speech. Images received are colour encoded by computer, enabling the



A group of native orchid enthusiasts (THE W.A. NATIVE ORCHID STUDY GROUP) at the conclusion of a day spent searching for the Underground Orchid. The technique whereby the surface leaf litter is removed by hand causes no ill effects to the Underground Orchid. (Photo K.W. Dixon).



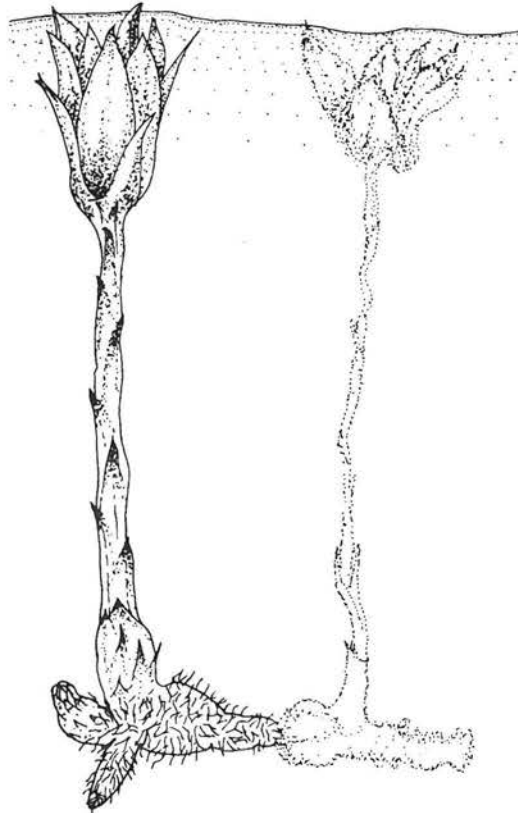
An Underground Orchid discovery at the base of the host plant, *Melaleuca uncinata*. (Photo K.W. Dixon).



Typical Underground Orchid habitat showing a drift net being installed amongst the Broom Honey myrtle (*Melaleuca uncinata*). Such nets aid in recording the presence of small mammals which are believed important in seed dispersal of the Underground Orchid. (Photo K.W. Dixon).



Seeds of the Underground Orchid need special conditions to germinate. In this case the seeds (some germinating) are being grown to investigate the relationship the orchid has with seedlings of the host plant, the Broom Honeymyrtle (*Melaleuca uncinata*). (Photo K.W. Dixon).



New stems of the underground orchid rise each year from 'daughter tubers,' which are extensions from the previous year's tuber. The previous growth remains as a blackened stem, while the new flower head or capitulum just breaks the surface, opening to reveal its cluster of pink orchid flowers within.

visual recognition of similar types of surface plants.

LANDSAT transparencies generated from tapes held either by the Western Australian Lands and Surveys Department or the EROS Data Centre in Dakota, USA, were used to recognize stands of *M. uncinata*, and this information was overlaid onto surface maps of the State. Ground verification of this information confirmed that the method was 80% reliable in locating stands of the Broom Honeymyrtle thought to occur in company with the orchid.





The large, berry-like seed pods of the Underground Orchid contain numerous brown seeds. (Photo K.W. Dixon).



One of the lucky ones. This searcher has located an Underground Orchid in prime flowering condition. Less than two hundred flower-heads of the orchid have been found since it was discovered in 1928. (Photo K.W. Dixon).