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Photography by Merv Hodge

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FLOWERING AUSTRALIAN TREES FOR THE GARDEN

AUSTRALIAN TREES

This issue is devoted to Australian trees. A subject that may not be of general interest but is vital to our survival, see page 206. Previous issues have described hundreds of trees as indexed with some from this issue below.

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EUCALYPTUS TREES IN THE GARDEN

by Roy Gray

Until recently few members of the genus *Eucalyptus* were considered to be of use to the home gardener and few large landholders made use of them apart from a few species such as "Sugar Gum" and "Tuart Gum". However, during the last decade there has developed a trend for the greater use of the genus in all kinds of planting. Possibly an awareness of the need to produce an ecological environment to counteract some of the extensive clearing which has been necessary in the development of land has been one of the reasons for the greater use of *Eucalyptus* trees. Perhaps a growing national awareness has been another reason.

What are in fact the uses of *Eucalypts* in the garden? There are many, but these seem to be important—To provide a haven and food for birds; Wind Shelter; Shade; Aesthetics.

A Haven and Food for Birds—Species with a long flowering period are the most useful for attracting nectar eating birds. Where it is possible to find room for a number of species it would be an advantage to select them so that flowers are present for the greater part of the year. Some species with long flowering periods are *Eucalyptus lehmannii*, *E. torquata*, *E. stricklandii*, *E. megacornuta*, *E. lansdowneana*, *E. caesia*, *E. calycogona*, *E. stoatii*.

A more extensive list of *Eucalypts* for flower in each month of the year, tree height, flower colour, rainfall area etc., is given in "Australian Plants", Vol. 2, pp. 38.

Wind Shelters can be provided with some species of *Eucalypts* provided lower shelter can be taken care of with small bushy shrubs or with a low wind-permeable fence. There are few if any *Eucalypts* which remain foliated to the ground. Most species lose their lower foliage after a period and present bare trunks, thus allowing the wind to sweep under the shelter belt.

Shelter—The comparatively sparse foliage of the *Eucalypts* is no real disadvantage where shelter is concerned. Research carried out in N.Z. shows that densely foliated trees provide no more efficient shelter than do sparsely foliated trees. The range of species which can be used for shelter is very large, almost any species which is suitable for the site in other respects can be used. The taller kinds would be used where shelter is to be provided over a large area, and the smaller kinds close to buildings and drains.

Shade—Apart from a few species like *E. botryoides* and *E. microcorys* most *Eucalypts* cast only a light shade. This is sometimes an advantage especially in home gardens where lawns and shrubs need some light. The most sparsely foliated kinds such as *E. citriodora* and *E. nicholi* make good garden specimens for this reason. The fact that nearly all *Eucalyptus* are fast growing makes them ideally suitable for shade production.

Aesthetics—There has been a change in more recent years in the public's attitude towards aesthetics. The floriferous garden with lush green, cool temperature trees no longer appeals to many. The more austere appearance of Australian trees and particularly *Eucalypts* is now quite popular. The white trunks of the tall forest gums, the deeply furrowed black bark of the Iron-Barks, or the twisted trunks which are characteristic of the Mallees are very useful to landscape gardeners.

Fast growing species are usually in demand for shelter, and therefore the following species are sought after.

Small to moderate height—*E. lehmannii*, *E. nutans*, *E. cneorifolia*, *E. dumosa*, *E. diversifolia*, *E. sargentii*, *E. platypus*.

Tall Trees—*E. maculata*, *E. sideroxylon*, *E. globulus*, *E. microcorys*, *E. melliodora*.



Eucalyptus eremophila, "Tall Sand Mallee"

One of the most widespread mallees in the southern part of Western Australia, this species grows in sandy loam soil extending from about Dalwallinu eastward to beyond Kalgoorlie and southward in much of the wheat belt. With branches from ground level, it is often up to twenty feet and sometimes as high as thirty-five feet tall with smooth, grey-brown bark. Abundant flowers from June to October can be pink or red, but bright, creamy or yellow inflorescences are most common, and the long, pointing bud caps and drooping flowers with sub-glossy leaves are distinctive for the species.

The tall sand mallee is extremely drought-resistant, able to grow in an annual rainfall of 8 inches. It is also frost-resistant and will adapt to sand, sandy loams and clayey soils, and has grown successfully in a salty area. It is an exceptional species for arid-zone planting for ornament, windbreak, or as a street tree, and its suitability for such climates is given note by the name *eremophila* which means 'desert-loving'.—Quoted from the book "Eucalypts" by Stan Kelly, see reference page 198.

Eucalyptus tetraptera

Four-wing Mallee, W.A.

Shrub 6-12 ft.

Pink flowers, October, November

Although usually of straggly habit, this is a remarkable Eucalypt with massive 4-angled pods 3 inches in length. The illustration shows the pink flowers after the 4-winged red caps have lifted. The red-stalked leaves are thick, shiny and may be up to 10 inches long. Seed is sometimes difficult to germinate. On account of its novelty this tree should be grown in gardens and parks. It was first described and named by a Russian botanist in 1849. Drought and frost resistant.

This colour plate and the above description is taken from the book "Shrubs and Trees for Australian Gardens" by E. E. Lord by permission of the Lothian Publishing Co. See page 210 for a review of this excellent book.



Which species are best for the home garden? Some study of the habits and environmental requirements of the species should be undertaken before planting. While many kinds are quite adaptable, others are highly specialized in their requirements. The small bushy Mallees and Malletts are generally inhabitants of the lower rainfall areas, they commonly grow in thickets thus supporting each other. To grow these plants as single specimens on lawns tempts disaster.

The average lawn receives in excess of 40" of water per annum and this can cause root-rot disorders in many low rainfall species. There are however, a few kinds of dwarf Eucalypts which tolerate lawn conditions quite well—*E. spathulata*, *E. cosmophylla*, *E. fasciculosa*, *E. cneorifolia*, *E. leucoxylon rosea* (dwarf), *E. sargentii*.

Isolated specimens of these smaller Eucalypts often suffer serious wind damage. To avoid this, close planting of groups of three or more of a single species is recommended. It is unwise to plant more than one species in a particular group because the fastest growing kinds have a tendency to dominate the slower kinds. That is, if one were to plant *E. spathulata* in a group with *E. forrestiana*, within a period of a few years the latter species would be suppressed by the former. The spacing of plants within a group can be quite close, even four feet would not be too close.

The variety of dwarf Eucalypts useful in the high rainfall area such as the Adelaide Hills is almost as restricted as the variety available for planting on lawns on the plains. Such species as *E. torquata*, *E. erythrocorys* and *E. stricklandii* are only satisfactory on very well drained exposed sites.

The tall forest Eucalypts should be planted more commonly in our cities. Many suburbs lack an interesting sky-line. Obviously they must be positioned with care. The taller Eucalypts require more water and therefore are more inclined to do well on lawns. Of the many species which can be grown in our city and suburbs, the following are suggested—*E. citriodora*, *E. botryoides*, *E. maculata*, *E. globulus*, *E. viminalis*, *E. cladocalyx*, *E. camaldulensis*, *E. microcorys*, *E. leucoxylon* (colour plate page 196), *E. sideroxylon*.

As far as is known there are no Eucalypts which stand the most exposed sites on our windswept southern coast, but there are a few kinds which can be grown on the moderately exposed sites, one or two streets back from the sea—*E. diversifolia*, *E. gomphocephala*, *E. stricklandii*, *E. torquata*, *E. botryoides*, *E. porosa*.

What is the best kind of planting stock? To answer this question one should examine the growth habits of the genus. In nature seedlings germinate in the late autumn and early winter (southern Australia) and quickly make a deep root system so that they can survive over the following dry summer. The fast growing root system should not be seriously impeded. Therefore when purchasing seedlings make sure they are small healthy plants in deep containers. Plants in pots or small propagating tubes are not recommended.

Plants which have constricted roots are of little use; if the roots are untangled before planting there is a strong chance that the seedlings will die from root damage and if they are planted with constricted roots there is a strong chance that the resultant tree will blow over within a few years.

Seedlings can be planted in the garden at any time of the year, but the best results are obtained from planting in the warmer weather. Even mid-summer planting can be more successful than mid-winter planting. Species which are subject to frost or wet or cold, such as *E. citriodora* should not be planted in the winter.

EUCALYPTS FOR COUNTRY

The Physiological Effect of Excessive Organic Manure on Eucalyptus Species

by Alan Logan

Past issues of "Australian Plants" have dealt with various utilisations for the genus *Eucalyptus*; street and specimen trees, landscape, farm protection, etc. In this paper the author will present the observations of the effect of excessive animal manure on various *Eucalyptus* species where these are used for stock shade and shelter.

As our property, near Tumbarumba in southern N.S.W., was being progressively developed, small areas of locally occurring *Eucalyptus* species were retained for stock shade and shelter. Over a period of years, large quantities of animal excreta have built up under these trees, in some areas to a depth of about six inches. As few of our native plants will tolerate even small amounts of organic fertilizers, such large amounts have proved disastrous to the species involved with two exceptions.

The following species have been affected over a period of from ten to fifteen years; *E. dives*, *E. radiata*, *E. macrorhyncha*, *E. bridgesiana*, *E. goniocalyx* and *E. rossii*. The first sign of deterioration is a lack of foliage, followed by individual limbs or possibly one side of the tree dying and eventually the whole tree succumbs, the complete process taking from three to five years. All trees of the susceptible species do not die at the one time, the number dying is dependant on the individual tree's position in the area, relevant to where the stock shelter most.

While the above species have proved susceptible, on two species the effect of the excessive manure has been quite the opposite. Trees of *E. melliodora* and *E. polyanthemos* actually thrive under these conditions, making vigorous growth and becoming very floriferous. None have died or shown signs of deterioration at any time.

REPLANTING

Obviously, from the above observations, the last two are the predominant species used for all replanted areas. Some of the susceptible species have their individual uses, *E. dives* for the extraction of *Eucalyptus* oil from the leaves, *E. macrorhyncha* for milling timber and the extraction from the leaves of the very valuable glycoside, Rutin. *E. melliodora* and *E. polyanthemos* are by far the best of our local eucalypts. Both have a hard durable timber suitable for most purposes, attractive blue-grey foliage and a pleasing appearance, while *E. melliodora* is world renown for the quality of its honey.

***Eucalyptus melliodora*.** A large tree 60 ft. or more in height, usually with a massive bole and large spreading crown. Leaves small, lanceolate to broad-lanceolate, 1-2 ins. long, blue-grey, flowers small, white or dusky-pink in the var. *rosea* form.

***Eucalyptus polyanthemos*.** A medium sized tree to 50 ft. in height. Sometimes a multi-stemmed mallee type tree with a wide spreading bushy crown. Leaves ovate to orbicular, 1½-2½ ins. long, blue-grey or green-grey, mealy, flowers small, creamy-white.

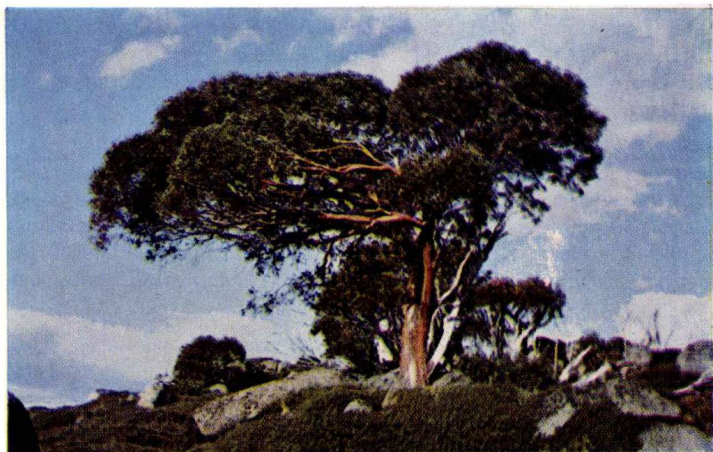
In the last area replanted in 1968, two non-indigenous species were planted in conjunction with *E. melliodora* and *E. polyanthemos* to test their susceptibility to the above conditions and to add colour to the plantation.



Photography by A. Logan

Eucalyptus leucoxylon* var. *macrocarpa rosea

EUCALYPTUS FOR COLD SITUATIONS

***Eucalyptus pauciflora* var. *niphophila*—"The Snow Gum"**

For details of cultivation of Eucalyptus trees that have been proven for garden cultivation in cold situations, see page 215.

Plants of *E. sideroxylon* var. "Faucett's Pink" were alternated with *E. melliodora* var. *rosea* in one row and *E. leucoxylon* var. *macrocarpa* *rosea* were alternated with *E. polyanthemos* in another row. While the time duration since planting has not been sufficient to gain a definite opinion as to their suitability for the conditions, the following observations have been encouraging.

***E. sideroxylon* var. "Faucett's Pink".** A superior form of *E. sideroxylon* var. *rosea*. Vigorous grower to 60 ft. with broad-lanceolate to elliptical blue-grey leaves 1½-3 ins. long. Plants are healthy, from 8-10 ft. high and have yet to flower but colour is described by N.S.W. Forestry Commission Amenities catalogue as crimson. Young foliage is very susceptible to insect attack.

***E. leucoxylon* var. *macrocarpa* *rosea*.** A large flowered form of *E. leucoxylon* var. *rosea* with broad-lanceolate mid-green foliage 3-8 ins. long and large, to 1½ ins. in diameter, creamy-pink to deep-pink or crimson flowers. This species has not proved satisfactory here in general farm planting, usually being unthrifty with scale and the flowers pale and small. The same conditions apply to most of the plants in the plantation with the exception of two specimens planted in the area with the highest accumulation of manure. The best specimen is six feet high, very floriferous with no sign of scale and magnificent deep-pink 1½ in. diameter flowers. Although only three feet high, the other plant is healthy, the foliage sparse but no sign of scale and this autumn the branches were completely massed with creamy-pink flowers. It is evident from the above observations that these species will prove suitable for planting in areas with high organic material and the present unthrifty plants should respond favourably when stock have access to shade and shelter under the mature trees.

EUCALYPTS

Where can I learn more about these fine trees?

There is a reference to 224 species of *Eucalyptus* in previous issues of "Australian Plants" and these will be fully indexed at the end of Volume No. 6. Here it is proposed only to refer to the principal articles that will assist you with their application and cultivation.

Eucalypts Of (or for) Various Areas

Eucalypts for Queensland, 2:79; Eucalypts of Central Australia, 2:170; *Eucalyptus* on Clay Soil Near Newcastle, N.S.W." 3:209; Culture in South Australia of Indigenous Eucalypts" 5:310; *Eucalyptus* of the Mount Lofty Ranges and Southern Flinders Ranges 5:330; Tasmanian Eucalypts 5:115; Some Sydney Eucalypts 5:176; Eucalypts for Victorian Gardens 6:163.

Eucalypts—Which Ones Will Grow Where?

As well as the advice for specific areas as above:

Eucalypts for Inland Areas 1:8, 14; Small Eucalypts for Heavy Soils on Inland Plains 1:11, 7; Eucalypts as Street Trees 2:49, 55, 4:73, 5:35, 113; Eucalypts for Your Garden, 2:38; Eucalypts to Flower All Year Round 2:38; Quick Results with Eucalypts 3:95; Eucalypts for Wet Situations 4:25; Garden Eucalypts, Frost & Wind Resistance, 4:69; Eucalypts in Cold Countries, 5:263; *Eucalyptus* in Urban Development 5:364; Eucalypts in Dry Areas 5:322; Eucalypts for Limey Soils, Heavy Soils, Light Soils, Acid Soils, etc. 5:83.

Eucalypts—Their Propagation and Care

Propagation from Seed 4:71, 128, 159; Planting Out, Care, Pest Control 4:213; Root Pruning 4:161; Breeding to Secure Early Flowering 3:357; Grafting 2:35; Air Layering 4:246.

EUCALYPTS—THEIR CLASSIFICATION AND BOOKS FOR REFERENCE

There are some 450 species in Australia and this has led to a great deal of difficulty in correctly naming them. Even to the botanist the mountain of technical jargon is formidable and for years they have been relying on the publication.

A Key to the Eucalypts Price \$2.50 plus 50c postage

This book relies for its classification on the buds and fruits and this produced

Eucalyptus Bud & Fruits Price \$2.00 plus 20c postage
where the buds and fruits of all the species are sketched. Based on this form of classification a major work was produced for the layman.

The Eucalypts by Penfold & Willis Price \$15.00 plus 50c postage
Recent developments and studies have at last produced

A Classification of the Eucalypt by Pryor & Johnson See page 230
This recent work promises a clearer understanding in the future and future issues will present the genus along these lines

WHAT EUCALYPT IS THAT?

The books above offer little help for the laymen who would like to know more of our eucalypts. There are a number of books available that will help, by far the best one being the first one listed closely followed by the second one.

Forest Trees of Australia

Produced by the Department of National Development—reviewed on page no. 231.

Shrubs & Trees for Australian Gardens by E. E. Lord Price \$15.00 plus 50c postage
Reprinted many times this large book still remains the best overall reference.

Eucalypts by Stan Kelly, Chippendale & Johnston Price \$12.00 plus 40c postage
A book of exceptional value it illustrates in full colour the buds, flowers, fruits and leaves of 250 species. The text is brief but gives all information needed.

Other Smaller Books

"Native Trees of Australia" by Millett & Hosel—See page 231 for a review.

"A Field Guide to Australian Tree" by Holliday & Hill Price \$3.75 plus 25c postage
282 species of trees over a wide range of families and habitats, described.

"Trees of Australia" by H. Oakman Price \$1.95 plus 15c postage

"Australian Eucalypts" by Millett—Booklet in Periwinkle series \$1.50 plus 15c postage

"Trees of the Sydney Region" by Child—Booklet in Periwinkle series \$1.50 plus 15c postage

CORRECTIONS—

The beautiful colour plate on page 96 of issue 38 is *Eucalyptus preissiana*, not *E. crucis* as labelled. The street tree on page 113 of 39 issue is *E. lehmannii*.

EUCALYPTS IN THE SYDNEY AREA

A report following a group discussion at a Society meeting in Sydney

Same Eucalypts which are indigenous to the Sydney area, and may be adapted to garden culture, are as follows:

- (a) *Eucalyptus gummifera*. The "Red Bloodwood". A fine tree of variable shape which flowers well every second year.
- (b) *E. punctata*. "Grey Gum". A beautiful tree for shape and foliage.
- (c) *E. eximia*. A small, slow growing tree of good shape with a heavy flowering of golden blossom.
- (d) *E. saligna*. "Sydney Blue Gum". Excellent in a very big garden.
- (e) *E. piperita*. "Sydney Peppermint". A pleasant tree with tough bark on the main trunk, and smooth, scribbled upper branches.
- (f) *E. haemastoma* and *E. macrantha*. "Scribbly Gums". Showpiece for any garden with magnificent sculptured forms.
- (g) *E. capitellata*. "Black Stringybark". A useful tree to grow as an orchid.
- (h) *E. botryoides*. Good for coastal areas.

Many of the "imported" Eucalypts do not grow well in Sydney sandstone. Some which may be considered as reliable are:-

- (a) *E. leucoxylen*. Some good coloured flowers.
- (b) *E. sideroxylen*. Black trunk and pink flowers.
- (c) *E. cladocalyx* var. *nana*. Dwarf sugar gum—recommended.
- (d) *E. nicholii*. Fine leafed peppermint. Beautiful tree, needs good drainage.
- (e) *E. melliodora*. "Yellow Box".
- (f) *E. citriodora*. Attractive tall, slender habit with beautiful trunk, but tends to be very brittle.
- (g) *E. andreana*. "Willow Peppermint". A fine drooping habit, flowers heavily—highly recommended.

Generally West Australian Eucalypts do not grow satisfactorily in Sydney. Only in areas of brown clay loam over shale could one expect any success. Free air circulation is essential and it is also thought that these species do not like root competition. Some western species with which members had had some success were:-

- (a) *E. torquata*. Some good specimens 6 or 7 years old and 20 feet high.
- (b) *E. caesia*. Pink flowers and beautiful silvery white limbs. Often loses leaves but grows well in heavy soil.
- (c) *E. ficifolia*. A problem tree, although there are many good individual specimens known, some 40 years old. Mr. Hewett suggested regular lopping to establish a better balanced root system.
- (d) *E. lehmannii*. "Bushy Yate". Attractive bright green foliage and unusual greenish yellow flowers. Grows well to small tree.

Other species which had shown promise for a limited time included *E. erythrocarys*, *E. preissiana*, *E. kruseana*, *E. nutans*.

The Forestry Commission recommends very early and heavy feeding with urea. This is especially essential in sandstone soil, and has been demonstrated to good effect in the plantings of trees for the koalas in the Hallstrom Fauna and Flora Reserve at Berowra. Growers have reported success with "Gro-plus" and Blood and Bone, and also noted the disappearance of gall from previously affected trees, after regular feeding was commenced.



Photography by M. Hodge

Melaleuca viridiflora is a tropical coastal species growing to 20-30 ft. The flower colour varies and plants may be near white, green, or various shades from pink to red. It is a paper bark *Melaleuca* which has proved to be reliable in Brisbane gardens. The terminal flower heads usually have from one to six "bottle-brush" flowers but greater numbers are sometimes seen—one tree is known to have produced an enormous cluster of 21 flowers. It can be propagated from seed or cutting but the colour of seedlings is unreliable and cuttings are recommended to reproduce good colour forms. Take cuttings soon after flowers are finished when the plant produces new growth. The flowers are produced during autumn and have a strong honey scent. It is an excellent plant to attract nectar-feeding birds and insects to the garden.

QUEENSLAND TREES

A SELECTION by M. W. Hodge

There are so many good ornamental native trees that it was difficult to make this selection without feeling that there were others which should have been included. One wonders why more of them are not seen in home gardens as most of them are attractive when not in flower and spectacular when in flower. Small suburban allotments discourage many people from attempting large trees but most of the species mentioned are of moderate size and could be tried.



Photography by M. Hodge

EUODIA ELLERYANA

Euodia elleryana (previously known as *Evodia elleryana*) is a medium sized tree found in nature from the Richmond River to North Queensland. It is an attractive shade tree growing to about 30 ft. in height in cultivation. Birds are attracted to the many clusters of pink flowers and the fruit. It self sows quite readily and seedlings are frequently found nearby. There appears to be little trouble growing this attractive species which is suited to normal suburban gardens.

Oreocallis wickhamii is a beautiful tree from Queensland's tropical coastal region and the Atherton Tableland. It can be planted in the open and it requires good drainage and regular watering until established. The large clusters of orange-red flowers are very spectacular and attract a great deal of attention during the flowering period which varies with individual plants from August to November. The first flowers are likely to be seen when the plants are 7-8 years old. One known specimen carried its first flowers soon after the first sighting of adult foliage and flowered only on the branches which carried adult foliage. See page 5 of issue No. 37 of Vol. 5 for a full colour plate of this species and of *Oreocallis pinnatum*. This latter species has not been as reliable.

Eugenia leuhmannii is a slow growing small to medium tree in home gardens in the region of 20-30 ft. with occasional very old specimens growing above this height. It responds well to moderate pruning and may be kept down to desired limits. It appears to have most of the good points required by growers. It is pest free—no noticeable damage to leaves or bark by insects, and is completely free of scale insects which frequently attack other *Eugenia* and related genera. Periodically a burst of new growth produces bronze to red new foliage which gradually changes to green. The small white flowers which have predominant stamens, occur during late spring and are followed by small red fruit. Occasionally specimens are reported to be covered with flowers but generally the plant should be grown for its foliage. See page 204 for *E. wilsonii*.

It is normally reliable here and its compact habit should make it first choice as a screen or specimen plant.

Backhousia citriodora is a small to medium tree of about 20 ft. in height and found in nature along Queensland coastal strip from Brisbane to Mackay. The white flowers appear here during November and December. The flowers have predominant stamens and are in clusters of about 3" in diameter. It is easily grown but difficult to propagate from cutting and rarely sets fertile seed in cultivation. It sometimes layers itself where branches touch the ground.

When grown in rich soil in an open position with adequate watering it has very compact habit with branches down to ground level. A feature of this species is its lemon scented foliage.

Hymenosporum flavum is a medium sized tree to about 20-30 ft. The cream to yellow flowers are produced during spring. Occasionally specimens are found with red markings in the centre of the flowers. It is easily grown and under normal garden conditions is usually long lived. The common name is "Native Frangipani".

Barklya syringifolia—a small to medium sized tree in home gardens, growing to approximately 20-30 ft. in height. It has heart-shaped leaves and produces 6"-9" cylindrical golden flower spikes during November. Its natural distribution is Northern N.S.W. to Mackay in coastal rainforests. There appears to be little difficulty in growing this plant in home gardens.

Buckinghamia celsissima—a tree from the Atherton Tableland and tropical coastal rainforests. In Brisbane it grows to about 30 ft. in height. It is used extensively as a street tree and as a specimen tree in home gardens. Frequently the lower limbs are lopped to leave a bare trunk near the base of the plant but occasionally specimens are seen carrying foliage right to the ground. The near white cylindrical flower spikes grow to 8 or 9 ins. long and cover the tree in a spectacular display during summer.

QUEENSLAND EUCALYPTS

The larger eucalypts found naturally in Queensland may be widely grown for shade or the birds and the bees. In searching for a small garden species with colourful flowers we have found the ones from the far north that spread across into the Northern Territory are giving promising results.

Eucalyptus ptychocarpa is a northern tropical species well suited to Queensland coastal districts. Many Brisbane growers in the past have been disappointed by losses of the colourful West Australian Eucalypts, particularly *E. ficifolia*, which usually succumbs during the hot wet months. *E. ptychocarpa* thrives here during the summer particularly during wet periods, so it certainly lives up to its common name "swamp bloodwood". The large leaves are a feature of this plant but they are only produced during wet periods or when the plant is well watered. A leaf on one plant was measured at 5" wide and 14" long. It is known to thrive in Brisbane and Townsville so it should do well in most Queensland coastal districts.

In Brisbane the flowers usually appear during summer and autumn but odd clusters sometimes appear during winter and spring. The flowers of plants grown in Brisbane usually vary from pink to red but occasionally white specimens are noted. It will flower when about three years old. One problem noted is insect damage on the young leaves particularly on small plants. One inland grower has established a plant in spite of severe frost which cut it back badly during the winter.

Other northern coloured Eucalypts which are being tried here are *E. phonicea*, *E. miniata* and *E. setosa* (pink form). Give them good garden conditions, reasonable drainage with a preference for the heavier soils.

COVER PLATE—

Eucalyptus setosa, Rough-leaved Bloodwood

This is an inhabitant of shrublands and mixed open forests mainly in the northern part of the Northern Territory and adjacent areas of Queensland and Western Australia, where it usually grows on rocky ground. It reaches up to 30 feet in height, but is more often from 12-20 ft. high; sometimes being rather crooked in growth. Scattered occurrences are found in the sandy spinifex areas of central Australia near Tennant Creek, and in these parts it is known as desert bloodwood. The cover shows my pink flowered form.

The bark is grey and flaky. Bristle-like hairs on the young growth, the buds, and sometimes on the fruits and mature leaves, are distinctive for the rough-leaved bloodwood. The specific name *setosa* is a reference to these setae or stiff hairs. The tree was first described in 1843 from a specimen collected on an island in the Gulf of Carpentaria in 1802 by Robert Brown and F. L. Bauer who were on a voyage with Matthew Flinders.

It is recorded as flowering in winter months and also sporadically in summer, but my plants flower in December. One flowered before planting out in 1966 when only 9 ins. high and has prospered since.—M. Hodger.

QUEENSLAND GREVILLEA

Queensland is abundant with fine Grevillea trees many of which are described in our No. 45 issue. The colour plate on page 9 of that issue has now been confirmed as *Grevillea pinnatifida* not *G. mimosoides* as labelled. Our most famous Grevillea is *G. robusta* "Silky Oak" but as it is so well known we include here another exceptional species.

Grevillea pteridifolia is a small tree of 15-20 ft. from tropical coastal and inland regions. I have seen it growing near Townsville, Cardwell, Torrens Creek and Balcaldine. Sometimes it is seen in the company of *Melaleuca* in near swamp conditions. It is fairly reliable in Brisbane but a few losses have been reported because of strong winds or frost. There is a slight variation in flower colour but generally flowers are gold coloured and very attractive. They are very similar to the better known *Grevillea robusta* "the Silky Oak". The tree is much smaller than *G. robusta* and has become very popular in home gardens in recent years. The flowering season here is quite long i.e. from the end of May to September with occasional plants flowering into October. Nectar can be seen to drip from the flowers which attract many birds. Many fertile seeds are produced that often self sown.

MORE QUEENSLAND TREES AND SMALL SHRUBS

There are so many beautiful flowering shrubs from Queensland, most of which are not very well known. Readers are invited to describe their favourites. Space will permit just two more now, and another on the cover.

Pithecellobium grandiflorum—a small tree in nature but often remaining at shrub size in cultivation. It has a wide distribution from northern N.S.W. to Cape York. There are reports of sightings of this plant growing with mangroves along the coast but it is more often regarded as a rainforest plant. The large numbers of crimson flowers make this species a desirable plant well worthy of cultivation.



Photography by M. Hodge

EUGENIA WILSONII

This beautiful tall shrub is fully described on page 20, issue No. 37 of Vol. 5, an issue principally devoted to Queensland flora and its cultivation. However it was not illustrated. A really magnificent plant for the garden. Good garden conditions with some protection and ample water gives best results.

BUNYA PINE

by H. Oakman

Many writers adopt an almost defensive attitude when they describe indigenous trees as suitable subjects for public plantings. They point out all of the virtues of a tree and ignore its disabilities. This is hardly surprising as the general attitude towards native trees is often unsympathetic. The public usually prefers the more flamboyant trees and seldom fails to point out the faults that the native plantsman prefers to ignore.



It would, however, be extremely difficult to defend the Bunya Pine, *Araucaria bidwillii*, as being a suitable street tree. The photograph depicts a street in Ashgrove, Brisbane, Queensland, which was originally the entrance drive of a large estate. When this was sub-divided, the well established Bunya Pines were retained.

The trees in question, although quite dramatic in appearance have never been popular with the local residents. Their height creates unwanted winter shade, the leaves drop constantly throughout the year, and being stiff and sharp, they can make their presence felt. Furthermore the huge fruits, if not removed, can be a minor hazard during storms. In practice these are removed early in their development once a year using equipment borrowed from the Fire Brigade. In the process the tree gang seldom come away unscathed after clambering through the closely packed topmost branches which in turn carry their own share of sharply pointed leaves.

The Bunya Pine is of course an excellent tree for lining country highways or parkways, where its large size, shapely outline, and dark green colour makes it a dominant landscape feature. This dominance must however be carefully blended into the surrounding landscape and it should not be used without some preparatory investigation into its appropriateness for a particular situation. The Bunya Pine although originating from just north of Brisbane will accommodate itself to a variety of climates and seems to do well in most parts of Australia, even in some of the colder regions, providing that it has ample moisture and a deep friable soil. Given these conditions it makes rapid growth, quickly developing a stout central stem which persists to the top of the tree. The branches are held horizontal almost in whorls generally with most of the foliage at their tips. The mature tree usually has an outline resembling that of an old-fashioned beehive with the numerous branches showing through the thin layer of outer foliage. In older trees much of the lower foliage disappears leaving the branchless stem supporting a small triangular shaped crown.

The Bunya Pine belongs to the *Aroucariaceae* family of which the Hoop Pine and the Norfolk Island Pine are members. Because of their similar size these trees are also regarded as unsuitable for street planting although they have been used for this purpose in some of the coastal townships.

TREES

GREEN AIR CONDITIONERS

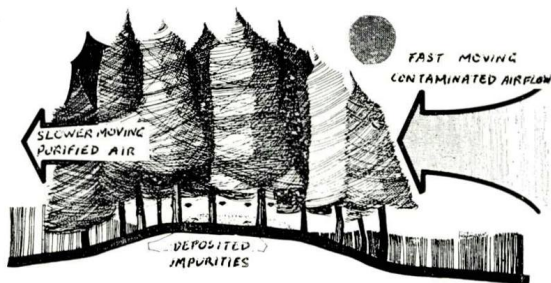
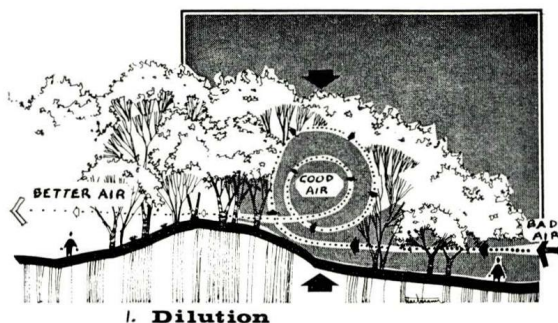
by Gary Robinette, Assistant Professor, University of Wisconsin

At a time when there is much talk about air pollution, it appears that one of the greatest sources of natural air conditioning is being overlooked. Plant materials are among the most effective air conditioners in existence.

Basic to an understanding of this function of plants is familiarity with both human and plant respiratory cycles. Human beings (and animals) inhale oxygen and exhale carbon dioxide (among other gases). Since plants need and absorb carbon dioxide from the atmosphere for use in the photosynthetic process, and since they also give off oxygen as a waste product, there is obviously a strong inter-dependence between plants and man. Plants function primarily to purify our air by absorbing harmful excess carbon dioxide and by giving off oxygen vital to man's survival. Without vegetation the life-cycle on earth would be broken.

There are other ways in which plants condition our air. The functions of commercial interior air conditioners include heating or cooling, humidifying or dehumidifying, cleaning and circulation of air, as well as ventilation. Plants, as external air conditioners, also control temperature, air flow, and moisture content.

The dilution of odours is simply the mixing of "good", or "clean" air with polluted air. The commercial air conditioner does this by forcing good air into an area containing stale impure air. Plants also mix good and bad air, but rather than forcing one kind of air into another, a process of filtration and dilution takes place. The uncontaminated oxygen enriched air is present in, around, and under vegetation. As the bad air flows through the good air, it is mixed with it and diluted.



Plants remove from the air impurities such as air-borne dirt and sand, fly ash, dust, pollen, smoke, odours, and fumes. It has been said correctly that "plants eat dust". There are at least six basic ways in which they do this. These methods or techniques are:

- (1) dilution,
- (2) precipitation or filtration,
- (3) narcosis,
- (4) oxidation,
- (5) air washing,
- (6) reodorization or masking.

Precipitation

The method of electrical precipitation in air conditioning involves the electrical charging of dust particles (which also carry odour), and the collection of these particles on a grid having a strong force field. Plants work on the same basis but instead of an iron grid the plants use leaves, branches and stems, and instead of an electrical charge, the pubescence (hairiness) and moisture on the leaves trap the dust-particles and hold them until they are washed away by the rain.

Narcosis

Narcosis is a temporary state of depression, and when used in regard to air conditioning, means an area relatively free of turbulence as opposed to the surrounding areas. In this semi-void, particles are allowed to settle out of the contaminant laden air. A wooded area, or a forest provides such a calm settling chamber for air pollutants.

Oxidation

Oxidation is the introduction of excess oxygen into polluted air. An acceptable ratio of "good" to "bad" air is one part of bad air to 3000 parts of relatively pure air. Along many of our nation's highways the ratio may be as low as 1:1000. It has been proposed that where possible, a wide green-belt be planted on either side of freeways and expressways. These green-belts could be converted to park lands and would readjust the air balance in two ways:

1. The unpolluted fresh air would dilute and diminish smog built up over expressways.
2. The green vegetation would actually remove pollutants and restore oxygen to the atmosphere.

Transpiration

The amount of water that is transpired by a growing plant is considerable. A birch tree, for instance, standing alone in the open loses 75 to 100 gallons per day. Mature apple trees transpire as much as 600 tons of water per acre per day. The fact that plants hold in suspension around themselves and on their leaves, large amounts of water enables them to act as air cleaners in another way. In commercial air conditioning, air washers are designed to produce intimate contact between air and water for the purpose of obtaining the transfer of heat and moisture between the two and removing impurities from the air. The moisture held in suspension on and around a plant serves as an air washer for the polluted windborn air passing around or over a plant.

Commercially, fumes and odours are controlled by masking. This is accomplished by replacing the obnoxious odour with a stronger, more powerful, bearable or pleasing smell. This reodourization, accomplished by air conditioners or aerosol atomizers, may also be performed by plants. There are many plants with particularly fragrant blossoms—Koreanspice viburnum, Honeysuckle, Jasmine or Mockorange—which may be effectively planted between the source and the recipient of a disagreeable odour.

Clean pure air of the proper temperature and humidity is absolutely essential to man. For this reason he has devised commercial air conditions to perform this function for his interior environment. It would be foolish indeed to neglect to take fullest advantage of the capabilities of the great natural air conditioners which can effectively perform the same function for his exterior environment.

How Effective Are These Conditioners?

How effective are these green air conditioners? Five references might serve to illustrate the efficiency of plants in removing air-borne contaminants from the atmosphere. The first two of these quotes from an article by Dr. Aloys Bernatzky entitled "Climatic Influences of the Greens and City Planning" which appeared in *Anthos* magazine (1966-1).

In fact, green spaces are the natural and only effective way of making the unnatural climate of the cities somewhat more natural. By measurements that he took himself at Frankfurt, Germany, the author has been able to prove that green belts—even though they were no larger in width than 50 to 100 metres—have the effect of reducing the temperature in summer by not less 3.5 centigrades, compared with the centre of the city. This corresponds to raising the altitude of the town area by 700 metres (counting one centigrade of decrease in temperature for every 200 metres of increase in level). These effects of the green spaces—which are, of course, all the greater the higher

the temperatures and the larger the surfaces—are highly significant, all the more as continually cool air from the green spaces was flowing to the built up centres while the measurements were taken. The relative atmospheric humidity showed an increase of 5 per cent in comparison to the town centre.

Dust Reducing Effect

Another important feature is the dust reducing effect of the greens. To begin with, *they produce no dust themselves*. Then, if there is no wind, dust elements in the air will settle on the plants in the parks. Measurements taken near the Frankfurt main station and in the town centre showed a concentration of 18,000 kernels per air unit, whereas measurements taken at the same time at the Rothschild Park (surface 4 hectares) showed a concentration of not more than 1000 to 3000 kernels per unit. As concerns dust particles the figures read 3000 in streets planted with trees, compared to 10,000 to 12,000 particles in streets without trees in the same area.

"What green spaces can perform in the interest of the climate of a city is best illustrated by the work done by a single tree. Let us take a free standing beech, 80 to 100 years old. With its crown of 15 metres in width and its height of 25 metres it covers a spot of 160 m². The total surface of all its leaves adds up to 1600 m². But this is the outer surface the inner surface of the leaves, i.e., the total of the cell walls which are active in assimilation, makes up a hundred times as much—according to plant physiologists (Walter)—that is 160,000 m². The dry weight of all the wood of this tree is about 240 cwt (15 m³ x 800 kg). Half of this is carbon. As one m³ of air contains 0.15 g of carbon on an average, the 120 cwt of this tree result from 40 million m³ of air. Consequently, in its 80 years of life this single tree has taken up and transformed the total carbon content of 40 million m³ of air (that is of 80,000 one family houses, or the volume of 3 houses per day). At the age of 80 this tree transforms 2352 g of CO₂ and 960 g of water (making a total of 3312 g) per hour into 1600 g of glucose, using up 6.075 Cal. of sunlight, and giving 1712 g of oxygen to the air totalling again 3312 g. As a man uses up the oxygen production of 150 m² of leaf-surface per year himself, theoretically 30 to 40 m² of green space are required per inhabitant from this point of view.

Improvement of the climate of a city is of special importance as far as the centre is concerned. That is where the green spaces are small—if there are any—and have a tendency of getting still smaller. It must be pointed out that green spaces are not interchangeable if they are to make any influence on the climate of the city. Or, in other words, *a tree cut down in the centre of the town cannot be replaced by a tree planted somewhere at the edge of the town, where its influence on the climate is irrelevant* (emphasis mine GR).

The next reference is from the book *The Climate Near the Ground* by Rudolf Geiger:

"As we may see from what has gone before, the passive influence of the forest on the wind field at its edge is much more effective than its active influence. The wind field for its own part is instrumental in controlling two other processes that take place at the forest edge, namely, the dissemination of seeds and distribution of dust. Along a country road at the western edge of a forest on a hot, dusty summer day, the filtering effect of the trees at the border can be seen in the white powder observed over everything. From measurements made by M. Rotschke (674) it appears that with winds perpendicular to the forest edge, in addition to the maximum at the edge itself, an increase in dust content is found in the inner border zone.

GROWING NATIVE PLANTS

Each issue usually carries at least one small section on the propagation of wildflowers. For the first time the reader is referred to the references in previous issues on page 190 and 198 and to two books:

Growing Australian Native Plants

A book especially prepared for the beginner and produced in full colour at such an economical price. See page 230 for a review.

Shrubs & Trees for Australian Gardens by E. E. Lord — Price \$15.00 plus 50c post.

No reference issue to any section of the Australian flora (especially trees) would be complete without recommending this amazing large book (462 pages 10" x 7") now in its 4th completely revised edition. The book is in three main sections, trees, shrubs and climbing plants and as an indication of how well each section is presented I will give just the headings in the section for trees.

1. The Management of Trees—when to plant, size to plant, how to plant, soil secrets, how and why to prune, time of pruning, enemies, damage and repair. Descriptive List of Australian Trees—175 species and varieties are described Eucalypts—91 species described. See pp. 192 for typical description. The Australian Wattles—Another special chapter describes 94 species. Non-Australian Flora—hundreds are described.

Conifers Including Australian Conifers—a well presented reference. Palms, Palm-like Plants, Cycads, Tree Ferns—including Australian species.

Tables of Trees recommended for zones those for Zone A (Mountains) being: Evergreen trees for small gardens—Deciduous trees for small gardens—Large gardens, spring effect—Large gardens, winter effect—All year round specimen trees—Weeping trees, large hedge or break wind (under 20 ft.) and (over 20 ft.) trees—Evergreen trees for quick effect (two sizes).

Zone B—Similar tables revised for southern Victorian gardens.

Zone C—Similar tables revised for Adelaide and North Victorian Gardens.

Zone D—Similar tables compiled for Sydney, Brisbane and Perth Gardens.

Calendar of Flowering Fruits.

Autumn Foliage Trees—Trees for Seaside Planting—For Overwet Soils.

2. Shrubs—Similarly, shrubs are described and tabulated as above.

3. The Hot Dry Inland—Similarly this area is carefully considered and naturally Australian flora by its very evolution, is used extensively.

ACACIA—WATTLE TREES

An issue on Australian plants that does not feature our wattles is most unbalanced as these are possibly our most valuable horticultural tree. However space does not permit but most past issues have articles on them.—Editor.

A feature of the Australian flora is the hundreds of species of Acacia found in a wide range of habitat. There are dozens trees that will make a spectacular show in your garden. 161 species are mentioned in previous issues of "Australian Plants" and these will be indexed at the end of volume no. 6. Here it is intended only to provide a reference to the principal articles that will advise you of the selection and cultivation of large Acacia trees.

Wattle Trees 1:6.4; Wattle in the Garden 3:70; Acacia in Poor Soils & Wet Conditions 1:9.11; Acacia for Clay Areas 5:83, 199; Acacia for Limey Soils, Acid Soils, etc. 5:84; Acacia of Central Australia 2:202; Cultivation of Queensland Acacia 5:15; Acacia of the Mount Lofty & Southern Flinders Ranges 5:295; Tasmanian Wattle 5:280; Some Sydney Acacia 5:170; Acacia for Melbourne Gardens 6:154; Wattles from Seed 1:6.5, 3:69.

EDITOR APOLOGISES

1. The quality of the colour plates in No. 48 was well below standard. I have changed the blockmaker.
2. There are no orchid articles in this issue. As advertised previously I could not get suitable slides but excellent illustrated articles are in hand for future issues. The next issue will feature terrestrials and the following one *Vanda* and then *Bulbophyllum*. I would like to see more slides of these.
3. This issue on trees will not be of general interest but the issues in preparation for 1972 will be exceptional.

TASMANIAN TREES

A series on Tasmanian Wildflowers by A. M. Gray

Nothofagus cunninghamii—"Myrtle", Antarctic Beech.

This tree occurs very commonly in Tasmania and is also found in Victoria. It varies from a small, stunted shrub at high altitudes, in exposed situations, to a large tree in sheltered valleys, often reaching 150 feet.

The leaves are small, $\frac{1}{4}$ " to $\frac{1}{2}$ " long by about the same in width, rhomboid in shape and dark green. The new shoots and leaves are reddish-bronze and most attractive. The flowers are unisexual and inconspicuous.

Most rainforest country, especially in Tasmania, is dominated by this species. In Tasmania its most common associations are with *Atherosperma moschatum* "Southern Sassafras", *Eucryphia lucida* "Leatherwood" (see Vol. 3, No. 26), *Anodopetalum biglandulosum* "Horizontal" (Vol. 3, No. 28) and also with *Phyllocladus aspleniifolius* "Celery Topped Pine" (Vol. 4, No. 34).

The timber is reddish-pink and straight grained and is much used for construction and joinery. Propagation is by seed.

Atherosperma moschatum—"Southern Sassafras".

Another conspicuous tree in Tasmania rainforests and fern gullies; it also occurs in Victoria and N.S.W.

A handsome tree, usually conical in overall shape and easily identified by this characteristic as well as by the light green foliage. The leaves are lanceolate or ovate-lanceolate with or without unevenly spaced serrations along the margins, the upper surface is shiny, the lower whitish. All parts of the tree, especially the leaves when crushed, are pleasantly fragrant.

The flowers are mostly unisexual, the male flowers are about 1" across, with showy creamish petals and a finely hairy calyx; the female flowers are smaller and less conspicuous. The timber is pale and somewhat aromatic and has been used for making clothes pegs on account of its non-staining nature. Propagations by seed or cuttings.

Persoonia gunnii—"Geebung"

One of the only two members of this genus found in Tasmania. *Persoonia gunnii* is confined to Tasmania where it occurs chiefly in sub-alpine shrub forests or at sea-level in the west and south-west of the island. It ranges from a small shrub in the sub-alpine situations to a small tree between 10'-20' high in sheltered coastal situations.

The leaves are obovate to spatulate the petiole $\pm$ erect then the blade spreading, giving the whole of leaf an 'S' shape appearance. The margins are entire and the surface glabrous or in some variants densely silky-hairy.

The flowers are fairly large $\frac{1}{2}$ "- $\frac{3}{4}$ " long with spreading tips to the petals, cream or yellow and fragrant, sometimes almost sickly. The fruit is a small drupe, reddish purple, $\frac{1}{4}$ "- $\frac{1}{2}$ " long and edible. Propagate by seed.

Olearia argophylla—"Musk".

Another tree of the wetter areas—fern gullies etc. It ranges from a shrub of about 6' to a tree up to 40'.

The leaves, 3"-6" long are broad ovate with denticulate margins; upper surfaces shiny and dark green, the lower surfaces covered with fine, dense hairs. The flowers are borne in large terminal heads, the individual florets creamish white. The lower trunk is usually gnarled and knotted and is often used for figured veneer work. Propagates from seed.

Other Tasmanian Trees

For descriptions of other Tasmanian trees, the reader is referred to the following issues of "Australian Plants".

Eucalypts	Vol. 5, No. 39
<i>Eucryphia lucida</i>	Vol. 3, No. 26
<i>Anopterus glandulosus</i>	Vol. 3, No. 27
<i>Anodopetalum biglandulosum</i>	Vol. 3, No. 28
Leptospermums and Melaleucas	Vol. 4, No. 30
Acacias—The Wattles	Vol. 5, No. 42
Conifers	Vol. 4, No. 34
<i>Telopea truncata</i>	Vol. 5, No. 39
Hakeas	Vol. 5, No. 42
<i>Agastachys odorata</i>	Vol. 5, No. 39
<i>Senecio brunonis</i>	Vol. 5, No. 39
<i>Richea pandanifolia</i>	Vol. 5, No. 39

The following plants occurring in Tasmania are in many instances large enough to be classified as trees:

- Banksia serrata* & *Banksia marginata*—Proteaceae.
- Cenarrhenes nitida*—Proteaceae.
- Lomatia polymorpha*—Proteaceae.
- Casuarina stricta* & *Casuarina littoralis*—Casuarinaceae.
- Phebalium squameum*—Rutaceae.
- Exocarpos cupressiformis*—Santalaceae.
- Dodonaea viscosa*—Sapindaceae.

VEGETABLE DYES FROM AUSTRALIAN EUCALYPTS

by Jean K. Carman

At a Seminar held by the Handweavers and Spinners Guild of Victoria in September 1967, some casual remarks about two different colours obtained from dyeing home spun wool with a dye from Eucalypt leaves, started this investigation.

With the help of my family, friends, the Botany Department of the University of Melbourne, the Field Naturalists and especially officers of the Forests Commission of Victoria, it has been possible to test most species of Eucalypt found in Victoria and a few like the "Western Australia Flowering Gum", *E. ficifolia* and "Lemon Scented Gum", *E. citriodora* grown so extensively in Victoria.

On commencing, it was wondered if each classified group would fall into a particular colour range, but it was not always so.

In the Stringybark group, the predominating colour was olive green with the exception of "Messmate", *E. obliqua*, bright yellow and "Mealy", *E. cinerea* and "Silver-leaf Stringybark", *E. cephalocarpa*, red.

The Box group was fairly uniform with colours in the orange shades. The exception there was "Black Box", *E. largiflorens*, but that may have been caused by seasonal conditions as it was tested during the winter months. "Apple Box", *E. bridgesiana* gave the same red colour as *E. cephalocarpa* and *E. cinerea*.

The Mallees were mainly yellow though *E. incrassata*, *E. dumosa* and *E. calycogona* were more orange in shade.

The largest group, the Gums, fell into two groups, those whose colours were in the range of yellow-olive green and a group whose colours were distinctly orange, namely "Manna Gum", *E. viminalis*, "Swamp Gum", *E. ovata*, "River Red Gum", *E. camaldulensis*, "Mountain Grey Gum", *E. cypellocarpa*, "Mountain Gum", *E. dalrympleana* and "Victorian Blue Gum", *E. bicostata*.

The Peppermint group was distinctly yellow. "Red Ironbark", *E. sideroxylon* was orange.

The barks of the trees produced varying shades of brown.

To carry out these experiments, the adult leaves were cut up and boiled with water in an enamel saucepan, with the lid on, for one hour. Then the liquid was strained and the wool, which had been mordanted in a Potassium Alum solution, was added and boiled 20 minutes. Throughout the tests the same procedure was used and all weights and measurements were checked. The wool used was Border Leicester X. I have since found that fine wool such as Merino gave softer, paler shades than the coarser wools.

The colours obtained were fast to the usual careful washing of woollen material and fairly fast to light.

There was not much opportunity to test dyes from trees of the same species growing in different areas. The few that were obtainable showed little or no colour variation.

The most intense shades were obtained during the hot dry summer months of 1967; but less than 24 hours after the drought "broke" the colour of *E. cephalocarpa* and *E. obliqua* changed dramatically. During the wet winter months "Mountain Ash", *E. regnans* and the "Snow Gums", *E. pauciflora* and *E. stellulata* were a drab colour instead of a clear yellow. This colour change during the wet season could apply to all species. It appears that the moisture content of the leaves is greater then, and the percentage of dye material in 1 oz. leaves would be less than that obtained from the same weight of leaves during the dry season.

Various mordants have been used, Sodium dichromate gives very little colour variation. Stannous chloride, Copper-sulphate and Ferrous sulphate give various shades and a whole range of colours can be obtained from one species by mixing the mordants.

Three shades can be obtained by using the *E. cephalocarpa* dye bath three times—red, orange, yellow.

The colours from the Eucalypts are very beautiful and they present a fitting compliment to our "sunburnt country".

Other native trees tested by using the same method, yield yellow colours—Wattles, Sassafras, Hazel Pomaderis, Musk Daisy Bush, Casuarina, Leptospermum, Melaleuca, Lilly-Pilly, Wild Cherry, Mistletoe, Callitris.

An historical exhibition depicting the life work and interests of Queensland women over the last 200 years was held in the Brisbane City Hall during the Queen's 1970 Cook Bicentennial visit. I was requested to create a cushion using wool dyed from Queensland Eucalypts. The wool used was Border Leicester, hand spun on a spindle and spinning wheel before being dyed then woven.

By using an alum mordant, the 20 species of Eucalypt growing in the Brisbane area gave only pale and drab yellow, with the exception of *E. grandis* and *E. microcorys* which gave a light red. However, colours ranging from light red, orange, yellow, green, brown, grey and black were obtained by using other mordants, stannous chloride, copper sulphate and ferrous sulphate.

An interesting discovery was wool mordanted with copper sulphate in a dye bath of leaves from the Tallow-wood, *E. microcorys*, with a little ferrous sulphate added, resulted in a strong black dye. This colour was obtained from only one other Eucalypt, the "Bastard Tallow-wood", *E. planchioriana*.

To this date 130 species of Eucalypts have been tested from each Australian State and the Territory of Papua and New Guinea with the help of officers of the Forestry Department.

California Report on Eucalyptus

by Ron Bracewell

Eucalypts have been a conspicuous feature of the landscape in California for so long, and are so obviously naturalized, that it is commonly thought, even by the older inhabitants, that the trees are native here. Of course, they were introduced from Australia, the earliest importations going back to just over one hundred years ago. I have been looking at the trees in the area where I live on the Stanford University campus. Several hundred mighty giants on the campus date back prior to 1870 when Leland Stanford acquired several farm properties, one of which already had avenues of gum trees. They are mostly Tasmanian blue gums (*E. globulus*) and red gums (*E. camaldulensis*) with a sprinkling of manna gums (*E. viminalis*). The blue gums are much stockier than the red gums—one near my house has a girth at eye level of over 20 feet—and they have all reached heights of about 100 feet. They are magnificent trees; there is some variation in the bark, but most often it is shaggy, rich and warm-coloured with great sheets peeling off, and reminiscent of a well known picture of Hans Heyesen's, the one that has a few sheep standing in the fallen bark. The old red gums are also delightful, but the old manna gums are wonderful. With their broad crowns, and stark white branches (pink at the end of summer), they are the ones that are preserved as building sites are cleared. Yet in their proclivity for dropping massive limbs they rival the blue gums.

On the campus there is one large *E. diversicolor* (karri) and nearby in Palo Alto there is a large *E. cypellocarpa*. There are specimens of *E. maculata* (spotted gum) and *E. citriodora* (lemon-scented gum) that are possibly old but I understand that large specimens around here have been killed by frost, so these two species, though they are best sellers in southern California, have been recommended against for many years in this area.

To finish the account of eucalypts that were planted 50 years ago or more and have survived I should add *E. linearis*, *E. paniculata* and *E. pellita*, and trees that resemble *E. botryoides*.

On the San Francisco Bayshore Freeway, which passes by here, there are several thousand *E. lehmannii* (bushy yate) growing in drained salt marsh, and the resulting dense screen, with very attractively contrasting light green leaf buds against old growth, is most pleasing. These shrubby bushes have hardly any fruit, and it may be very small, but another form grown with a trunk in gardens has compound fruit as big as a fist, and one should be grown in every primary school playground so the children can fit the enormous opercula on their fingertips.

The following list shows species that will certainly grow around here.

Eucalypts Around Stanford Planted Before 1965: E. albens, E. blakelyi, E. botryoides, E. bridgesiana, E. caesia, E. calycogona, E. camaldulensis, E. cinerea, E. citriodora, E. cladocalyx, E. cypellocarpa, E. dalrympleana, E. dielsii, E. diversicolor, E. diversifolia, E. dundasii, E. dwyeri, E. eremophila, E. erythrandra, E. erythrocorys, E. erythronema, E. eugenioides, E. exserta, E. ficifolia, E. flocktoniae, E. forrestiana, E. gillii, E. globoides, E. globulus, E. globulus var. compacta, E. goniocalyx, E. grandis, E. grossa, E. gummiifera, E. kruseana, E. lehmannii, E. leucoxylon, E. linearis, E. macrandra, E. macrocarpa, E. maculata, E. maculosa, E. maidenii, E. megacornuta, E. melliodora, E. neglecta, E. nicholii, E. nutans, E. ovata, E. paniculata, E. pellita, E. perriniana, E. platypus, E. polyanthemus, E. pulverulenta, E. punctata, E. redunca, E. resinifera, E. robusta, E. rudis, E. saligna, E. salmonophloia, E. sideroxylon, E. spathulata, E. tetraptera, E. torquata, E. uncinata, E. viminalis.

SOME GARDEN EUCALYPTS

*Part V by Richard C. Barnard**

Grown as a pruned bush or half standard tree, several species quickly make a beautiful evergreen provided they can be securely staked on exposed sites. Clipping has not proved satisfactory because uncut shoots very quickly grow up past the cut shoots. The latter may not develop shoots from the dormant bud producing tissue because there are enough leaves and uncut growing points manufacturing the hormone which inhibits their development. The cut shoots may develop shoots after some months or they may die back to a side shoot. Possibly coppicing followed by frequent clipping of the upper shoots from an early age might eventually succeed in the formation of a dense hedge but the inability of eucalypts to achieve a high order of branching is likely to prevent the development of a dense mass of shoots.

HEIGHT OF A EUCALYPT

One of the questions I am most commonly asked is "how tall will it grow" and the only possible answer is "as tall as you like to allow it". The height at which any tree changes from the pole stage (i.e. a narrow pointed crown with a stem up through it to a leading shoot growing rapidly) to the mature tree stage (without a definite leading shoot, a spreading rounded crown and little annual height growth) depends almost entirely on environment and little on genetics. In Australia in natural forests of one species, there can be a sudden change in size and form from giant forest trees to small stunted trees or bushes with a change from deep moist soil to shallow, dry soil. Eucalypts which have survived long enough, undamaged and unpruned, in this country have grown to a large size (70 feet to over 100 feet) and it is not yet possible to estimate the height to which more recent introductions will grow on favourable sites. Planting distances are suggested as follows:

Plantations of groups of trees (unpruned) 9 to 12 feet square, to close canopy.

Pruned trees (standard, half standard and bush) 12 feet or more for an "orchard".

Screens, 4 feet to 8 feet in the row.

Multi-stemmed coppice, pollarded and pruned shrubs to close canopy, 6 feet apart.

Coppice to close canopy each year, 4 feet square.

Incidentally, eucalypts make excellent firewood and kindling. With their rapid growth and coppicing powers, they would yield large quantities of fuel on a 5- to 8 year coppice rotation from a small area.

* Reprinted from Vol. XCI, Part 5 of the "Journal of the Royal Horticultural Society, England" with permission. Previous parts in this series have very clearly described the best methods for propagation of eucalypts from seed, their care as seedlings and planting out, their care as young trees and pest control. The series begins on page 69 of Vol. 4 with experiences and recommendations on frost and wind resistance. The conditions and experiences described are for England but also apply to all cold climates and high elevations. The sections on germination by seed, care of seedling and young plants and culture of young trees is especially recommended for all climates.

Following is a "short list" of the species considered the most desirable for private gardens for stated purposes. Leaf and bark renewal is rapid and eucalypts may be able to provide annually renewed bright colours in areas with a polluted atmosphere. It is hoped that some will be tried.

VERY COLD LOCALITIES, below 10°F for considerable periods each winter
E. pauciflora var. *niphophila*, provenance 6,000 feet or higher N.S.W. Specimen tree. *E. perriniana*, provenance 5,000 feet or higher N.S.W. Specimen tree or pollard.* *E. glaucescens*, provenance 6,000 feet or higher N.S.W. Specimen tree or coppice.*

COLD LOCALITIES, below 20°F, below 10°F only occasionally

E. perriniana, *E. glaucescens* (as above). *E. parvifolia*, coppice*, pruned tree. *E. gunnii*, coppice*, pruned tree. *E. pauciflora* var. *nana*, Tree, †coppice. † *E. mitchelliana*, specimen tree, pollard. *E. coccifera*, specimen tree, pruned tree.

MILD LOCALITIES, below 20°F for short periods only

E. dalrympleana, †. Specimen tree, pruned tree, pollard*. *E. pauciflora*, † specimen tree, pruned tree, pollard. † *E. pulverulenta*, † specimen tree, pruned tree, pollard.* *E. urnigera* var. *glauca*, pruned tree,* coppice, pollard.*

VERY MILD LOCALITIES, rarely more than 10 degrees of frost

E. cordata. † Tree or pollard.* *E. nortonii*. † Tree or pollard.* *E. viminalis*. Specimen tree, coppice. *E. nicholi*. Coppice.*

LOCALITIES VIRTUALLY FROST FREE, foliage plants, pot-culture or bedding

E. nicholi. † Coppice.* *E. polyanthemus*. † Coppice* or pollard.* *E. globulus*, †, *E. st. johnii* and many other species.

* = For beauty of juvenile foliage.

† = For colourful bark on shoots.

‡ = During the first winter, these species seem particularly sensitive to frost at ground level.

DESCRIPTION OF SELECTED SPECIES

***Eucalyptus pauciflora*.** Subseries of related species *Eucalyptus pauciflora* var. *niphophila* (The Snow Gum), *E. pauciflora* var. *nana* (The Woolgan Snow Gum) and *E. debeuzevillei* (The Giant Snow Gum) were previously regarded as distinct species but are now regarded as forms of *E. pauciflora* (The Cabbage Gum, also Snow Gum). The common name is derived from their natural occurrence in localities where snow is frequent. All have thick, green, glossy leaves and only a few pairs of juvenile leaves. The variety *niphophila* which occurs at the highest altitudes and at the limit of tree vegetation on Mt. Kosciusko (about 6,500 feet) is distinguishable by glaucous flower buds, fruits and bark on twigs and branches until bark-shedding starts on 3- to 4-year-old wood. The outer bark decorticates in medium to large plates from parts of the bole and older branches annually, starting in autumn. Newly exposed bark is pale cream, ageing to pale grey or greenish-grey in a year then becoming darker and turning reddish-brown before shedding. The result is a most beautiful blotched bark of several shades of cream and grey.

E. pauciflora spp. *niphophila* is the most delightful specimen tree, the gem in my collection of eucalypts. The glossy leaves reflect sunlight like small mirrors: the branchlets in winter are glossy dark red to orange-red; when growth starts in the spring they turn bluish-white with a glaucous bloom which may be rubbed off by branch movement in gales but is renewed by exudation during the growing season: branches, which have not yet started bark-shed, are also covered with the same glaucous bloom much of which persists through the winter: naked buds and leaf petioles are orange, newly opened leaves mahogany red to light brown, flowers silvery-white in clusters of up to fifteen, opening in early June in Devon where fertile seed has been collected from 5-year-old trees. None of my trees, first planted in 1958,

have suffered any damage from frost at any age and, after staking for 4 years, appear windfast. For eucalypts, it is a comparatively slow starter for 2 years then growing 3 to 4 feet annually. Rarely exceeds 20 feet in Australia at high altitudes.

Eucalyptus pauciflora var. *nana* has rather smaller leaves; yellow or orange glossy bark on young branches, larger flowers in early June, fertile seed collected at 4 years. Will make a slender tree and very colourful coppiced or pollarded plants. One tree and eleven coppiced plants have suffered no or slight frost damage, three coppiced plants died after the 1962-3 winter, all planted 1958. Not expected to grow to a large size as a tree.

E. pauciflora has dark-red glossy bark on shoots and larger leaves, very vigorous. Four out of nineteen coppiced plants killed during 1962-3. Occurs naturally over a great range in altitude and, accordingly, variable in frost resistance. Makes a handsome coppiced or pollarded plant and there is a fine tree in the Edinburgh Royal Botanic Garden.

CORDATINAE—Subseries of Viminalae

Eucalyptus perriniana (The Round-leaved Snow Gum). Remarkable for its orbicular, perfoliate juvenile leaves, i.e. circular leaves with the stem through the middle, which are produced for an indefinite number of pairs. The change to adult leaves may not take place until the second or third season. The juvenile leaves, as they die naturally, sometimes collect at the base of the shoot (like bills on a spike) and the leaf-scars encircle the stem. Adult leaves are long, narrow and pendulous. The species is described as glaucous but the form I have is sub-glaucous and the young juvenile and adult leaves are a very beautiful smoky-purple colour. Mr. V. R. Waldron has the glaucous form at Goudhurst in Kent. Young bark may be green or glaucous, flowers in threes, small, white, opening towards the end of July or early August. Some trees have flowered at 4 years and produced viable seed. Very hardy from the highest altitudes of natural occurrence and none of my plants have been damaged by frost, including 139 planted in 1961. Those in Kent also survived. Outstanding for its juvenile foliage and most easily managed as a pollarded plant on a 3-feet leg. It also makes a handsome tree but is not fully windfast under my conditions. A very fast grower reaching 18 feet in 3 years. Old bark is smooth and shed in patches but, so far, rather dull in colours.

Eucalyptus glaucescens (The Tingiringi Gum). A rare species confined to snowy mountains in Victoria and N.S.W. and, from 5,000 feet altitude, has proved quite hardy. Only one plant was raised from the first seed received in 1959, five from a packet in 1961 and two in 1962. None have been damaged by frost. All have or had intensely glaucous juvenile foliage. Two developed green bark on stems, pink bark on twigs and a delightful pink tinge to the young adult leaves. The remainder have a brilliant blue-white bloom on young bark and twigs (which wears off in winter as with *E. iphophila*), very glaucous young adult leaves ageing to sub-glaucous. Bark 4 or 5 years old starts shedding in reddish-brown flakes and patches exposing white bark ageing to grey. A new supply of seed received in 1965 appears to be the true very glaucous form. One tree has produced a few flowers in October for each of the last 3 years but no fruit has yet been set.

The "bluest" of all species with glaucous juvenile leaves and a very fast grower. My first choice for a coppiced plant and for a tree on sites not fully exposed to gales.

Eucalyptus gunnii—The Gunnii group of Cordatinae-Viminals.

Eucalyptus gunnii (The Cider Gum), *E. divaricata*, a minor variant and *E. archeri* (Archer's Alpine Gum) are now considered clinal variations of one species. All are sub-alpine Tasmanian species with glaucous juvenile foliage, persistent for one year's growth or rather more. Adult leaves green or sub-glaucous. Flowers in threes, white, July-August. Bark on branchlets very variable, green yellow, light brown, reddish-brown and in one form I have, glaucous. Old bark smooth and deciduous, scaly, pale green or cream when newly exposed soon darkening to grey or light brown. None of my trees have white newly-exposed bark as described in Blakely. Very fast growing (18 feet in 3 years), very subject to wind rocking for first 4 or 5 years but, if securely staked, has become windfast here. It appears to endure more root damage and root-restriction without serious loss of vigour than most species. Old trees are known, up to 100 feet tall, in many parts of Britain. Different provenances showed varying leaf and basal bark frost damage here in the 1962-3 winter. Thirty-two seedlings raised from seed collected from trees at Willaston (Cheshire), progeny of the famous Wittinghame (Midlothian) tree, planted in July 1962 were all unharmed in the following winter. A young tree of Brightlingsea (Essex) provenance had moderate leaf damage. Some pollarded Tasmanian and Canberra provenances had no, slight or moderate leaf damage and slight to severe basal bark damage. The same provenances coppiced, from which most foliage had been cut, suffered most and some were killed. Some of the bark kill may have been partially due to an autumn application of paraquat to grass around the base of the plants.

In gardens *E. gunnii* is most desirable as an annually coppiced plant for its beautiful glaucous juvenile foliage with silvery pink shoots, and as a pruned bush or tree for screening.

Eucalyptus urnigera (The Urn Fruited Gum). The commonest form has green leaves throughout its life and the glaucous variety has glaucous or very glaucous juvenile leaves and bark which persist for one or two seasons' growth followed by green or sub-glaucous adult leaves. Two famous trees of the green form were planted at Crarae Lodge, Argyll, about 1900 and the tallest is close to 100 feet. The progeny of these trees has been widely planted and grows well. The juvenile leaves are larger than most of *E. gunnii* and have a slightly dentate and crenulate margin. A vigorous grower, flowering young, in threes, cream, nearly 1 inch across and the fruits are urn-shaped. Old bark is deciduous, blotched reddish-brown. Occurs naturally at fairly high altitudes in Tasmania and seems fairly hardy but the tips of shoots on coppiced plants are often slightly damaged by early frosts. Of three adjacent trees planted in 1960 (glaucous form), one was unharmed, one killed and one had some shoots and leaves killed in the 1962-3 winter. Of twenty planted in 1961 and coppiced, four were killed and the remainder slightly damaged. Makes a very fine large tree, seems to become windfast sooner than *E. gunnii* and would be useful for screening with flowers giving additional beauty.

Eucalyptus parvifolia (The Small-leaved Gum). Occurs naturally on poor soils in N.S.W. from 3,500 up to 5,000 feet and appears very hardy from the highest elevations. A species very sensitive to root restriction and root damage. The leaves are usually green at all stages, occasionally sub-glaucous and I have one glaucous plant. It retains more side-shoots and branches; is more compact, bushy and umbrageous than most species. Juvenile leaves are small, persistent for one or more season's growth then gradually become longer but narrow and eventually alternate and petiolate at the

adult stage. Very small flowers in clusters of up to seven, white, opening in the second half of July. Bark is dull grey when newly exposed darkening to brown. There is a fine tree in Messrs. H. G. Hillier and Sons Winchester nursery, on which twigs were killed in 1962-3, but it was recovering vigorously with shoots which had reverted to juvenile foliage when I saw it in 1963, and natural seedlings had appeared under the tree. It is reported to do well on chalk in Sussex. Here in Devon, one pruned tree planted in 1960 was unharmed and of coppiced and pollarded plants 212 were unharmed fourteen were severely damaged but recovered and three died. The great beauty of this species lies in its "feathery" juvenile leaved shoots and in the "texture" of the mass of small, narrow, intermediate and adult foliage. For the former grow as coppice or pollard and the latter as a pruned bush or tree or a screen. It appears to become fairly windfast but offers a lot of resistance to wind.

Eucalyptus coccifera (The Mount Wellington Peppermint). A sub-alpine Tasmanian species which has been widely planted, frequently failed but there are a number of large trees in the milder parts of Britain. Like *E. parvifolia* it has a bushy, compact, much branched form when young on my rich soil but, I am told, a more slender form on less fertile soil. Reputed, and appears to be, wind resistant. Juvenile leaves small, green and persistent for about 2 years' growth. Adult leaves small, alternate and either green with yellow stems or glaucous (*pruinose* = silvery frosting) when young, the white bloom wearing off with age. The mid-rib forms a small hook at the ends of most adult leaves which is useful character for identification, but this hook has been found on some leaves of other species. Flowers in clusters of three to seven, fairly large, white, opening end of May or early June. Bark on old trees smooth, decorticating in small plates, dappled white and grey, very beautiful. The *pruinose* forms (Inverewe, Collation) are remarkably beautiful, but, unfortunately, this cannot be determined for certain until the adult foliage develops in the second or third year, which is too old for planting stock as it is very sensitive to root restriction and root damage. First planted here in 1961 and 1962; twelve plants unharmed, two slightly damaged and two killed in the 1962-3 winter so may be quite hardy from high altitude and local provenances. Does not appear to like coppicing or hard pruning (some die-back of cut stems) but light pruning to a side shoot has been satisfactory. Best grown as a tree, pruned bush tree and for screening for beauty of "texture" and "frosted" shoots.

Eucalyptus mitchelliana (Weeping Sally). A very rare sub-alpine species occurring only on Mt. Buffalo, Victoria, at about 4,000 feet elevation where it grows as a small unbragous tree with a weeping habit up to 50 feet tall. Seed was first obtained in 1964 and young seedlings came through the 1964-5 winter unharmed, including a minimum of 9°F, which is promising. Juvenile leaves for a few pairs only. Adult leaves long and narrow, green or bluish-green. Branchlets drooping with orange-red bark. Old bark smooth and white. May prove to be an outstanding specimen tree if sufficiently frost resistant.

Eucalyptus rubida—The *Rubida* group of *Cordinatinae*, *viminales*. See under less hardy ornamental species.

Eucalyptus dalrympleana (The Broad-leaved Kindling bark). A large tree up to 100 feet tall occurring in Victoria, N.S.W. and Tasmania between 2,000 and 4,000 feet elevations. An old tree (1940 or 1941) survived the 1962-3 winter near Willaston (Cheshire) but no others are known. Considered wind resistant, and my experience confirms this, if the tree is staked for the

first 4 years. Very fast growing. Juvenile leaves persistent to second or third season's growth, orbicular (distinct from *E. viminalis*), green or glaucous, young leaves coloured brilliant scarlet to pinkish-brown, pink or red bark on stems. Adult leaves green, long (up to 9 inches) and narrow, pendulous. Flowers in threes, white, opening October-November. Bark deciduous in large plates or long ribbons, pale cream or white when first exposed ageing through salmon-pink to light brown. Young bark turns bright red for a few weeks before shedding for the first time. Outstanding as a tree for the smooth pale bark on bole and branches and cascades of long green leaves moving in the slightest breeze. A brilliant spectacle as a pruned shrub from May-September for colourful young growth. Bark on seedlings and coppice shoots sensitive to frost at ground level so winter protection is advisable. One tree planted in 1956 in a sheltered position was over 40 feet tall and 36½ inches in girth at breast height when 9 years old and had most of its leaves, but no shoots, killed in the 1962-3 winter. Of pollarded trees planted 1958 and 1960, one was unharmed, one had slight leaf damage, twenty-two were killed to ground level but recovered vigorously, and sixteen killed. My 1956 tree has flowered and set good crops of fruit the last 3 years and the seed has germinated well. Seedlings have suffered no more than slight leaf damage in the last two winters. It is doubtful if any of the provenances tried can be classed as fully hardy but it is a species I would always plant, and re-plant if necessary, for its great beauty at all ages, fast growth and wind resistance.

Eucalyptus pulverulenta (The Silver-leaved Mountain Gum). A small straggling mountain tree with a stiff angular growth habit and the most brilliant silvery foliage of any. The provenances so far tried are only moderately hardy. Of those planted annually between 1957 and 1961, nine were killed, eighty-four killed to ground level but recovered vigorously, five suffered moderate damage and one was unharmed (which has now produced viable seed) in the 1962-3 winter. One hundred and sixty were planted in 1962 but only five recovered from frost damage. Juvenile and adult leaves are very similar, opposite, sessile and stem clasping, orbicular and silvery-glaucous aging to sub-glaucous, fluorescent bedewed in the sunlight. Grow as a pollarded plant, with basal protection in winter, or as a tree in a sheltered place.

LESS HARDY ORNAMENTAL SPECIES

Eucalyptus rubida (The Candle Bark Gum) is outstanding for its glaucous or sub-glaucous juvenile foliage, the bronze colours of young leaves and after 2 or 3 years bark, which turns pink and sheds in flakes or rolled-up ribbons to expose a lustrous white bark. The first provenances tried in 1958 were all killed to ground level in the 1962-3 winter. Twelve recovered from shoots arising below ground level which grew to 15 feet in 2 years and eleven died. A different provenance planted in 1961 which had been coppiced but not cut for foliage in 1962 showed more resistance, and fourteen survived without serious harm with two dead. A species well worth trying in milder and sheltered localities with winter basal protection.

Eucalyptus nortonii, previously known as *E. cordieri* (Mealy Bundy) was first planted in 1962; thirty-six were killed and eleven unharmed, but several (all coppiced) have died since, partly due to rocking in wind and die-back from cut stems. Juvenile foliage is glaucous, *crenulate* (sinuous) with delightful pink young growth and "frosted" shoots.

Eucalyptus cordata (The Heart-leaved Silver Gum) is less hardy than the above two species but a most lovely all-glaucous plant showing little

difference between juvenile and adult foliage. Bark is frost-tender at ground level. Of seventeen planted in 1961 and 1962 only one survived, those planted since have had some shoots slightly damaged each winter but recover quickly. Well worth growing as a pollarded plant in mild localities.

Eucalyptus viminalis (The Ribbon Gum) is a larger tree up to 150 feet tall, very similar to *E. dalrympleana* when mature, with a wide distribution in Victoria, N.S.W., South Australia and Tasmania going up to over 4,000 feet so there should be hardy provenances. The fastest growing species I have grown. One grew from 11 inches when planted in June to 9 feet 4 inches in 5 months, and the smallest out of twelve plants was 6 feet 2 inches. All were very much like coach whips but most straightened up quite well. Juvenile foliage is green, persistent for 2 or more years, opposite, long and narrow (4 inches by $\frac{3}{4}$ inch) very graceful, and the young growth is not coloured, otherwise very similar to *E. dalrympleana*, but the newly exposed bark is recorded as white to yellowish-white and shedding in long ribbons which hang from the branches, hence the name. Four pollarded trees planted in 1958 were all killed in the 1962-3 winter. Worth planting in mild or sheltered localities (at least for the fun of measuring weekly or daily growth), it could be "stopped" frequently during the first growing season to make a bushy plant of graceful form and if it survives a couple of winters one would have had one's "money's worth". A wind resistant species but needs very secure staking for 3 to 4 years.

Eucalyptus nicholi (Nichol's Willow-leaved Peppermint). An exquisite young plant and a most decorative tree growing up to 100 feet tall in N.S.W. and occurring on cold sites up to 3,000 feet elevation. The juvenile leaves are among the narrowest in the genus, narrow-linear (2 inches by $\frac{1}{4}$ inch or less) glaucous or green. Its beauty is enhanced by the colour of the growing shoots. I have two forms, one with pruinose-purple shoots and glaucous leaves (agreeing with Blakely's description) and the other with red shoots and green leaves from seed of a different provenance. Mature bark is described as sub-fibrous and persistent. I first received seed in 1964 and only fourteen out of twenty plants survived the winter. More planted in 1965 have suffered no serious damage. A few potted-on and kept in a cool greenhouse gave delight to all who saw them then and when stood out in the summer. Two plants were pruned to well developed lignotubers in early March and produced vigorous coppice shoots many of which were over 3 feet long by autumn to form a nicely shaped foliage plant. It is certainly well worth growing as a pot plant, for focal points in bedding schemes and outdoors in mild localities, particularly as a coppiced or annually pruned plant to stay at the fine-leaved stage. It is specially recommended for culture as an ornamental tree in Australia.

Eucalyptus globulus (The Tasmanian Blue Gum so-called on account of its bluish-white bark) is well known and commonly grown as a pot plant and for bedding at its juvenile leaf stage. It was a "fashionable" plant at the turn of the century and many grew to a large size, possibly due to a few mild winters following planting during which time the basal bark thickened and became resistant to moderate frost.

Eucalyptus st. johnii (Eurabbie) is very similar but occurs at higher altitudes, up to 3,500 feet in Victoria and N.S.W. so hardier provenances are possible.

Eucalyptus polyanthemos (Red Box) occurs in sheltered valley in N.S.W. up to nearly 2,000 feet and is grown on a larger scale in Southern France for commercial cut-foliage.

MANGROVES

MANGROVES IN EASTERN AUSTRALIA

by W. T. Jones*

Introduction

The name mangrove is derived from "Mangle groves" and referred to *Rhizophora mangle*, a common plant on the tropical and subtropical coasts of Africa and America. The term is now generally applied either to the individual species or to the vegetation dominated by gregarious trees (with characteristic root formations) which inhabit tidal swamps, muddy areas of silt at the mouths of river systems and other low-lying areas regularly inundated by the sea, but which are sheltered from strong wave action and tidal currents. The boundary between mangroves and the adjoining littoral forest is narrowly defined by the high tide limit, with little encroachment by the plants of either zone. Those tree and shrub species which always occur within, and very rarely extend far beyond the tidal limits, are considered here as mangroves.

Zonation

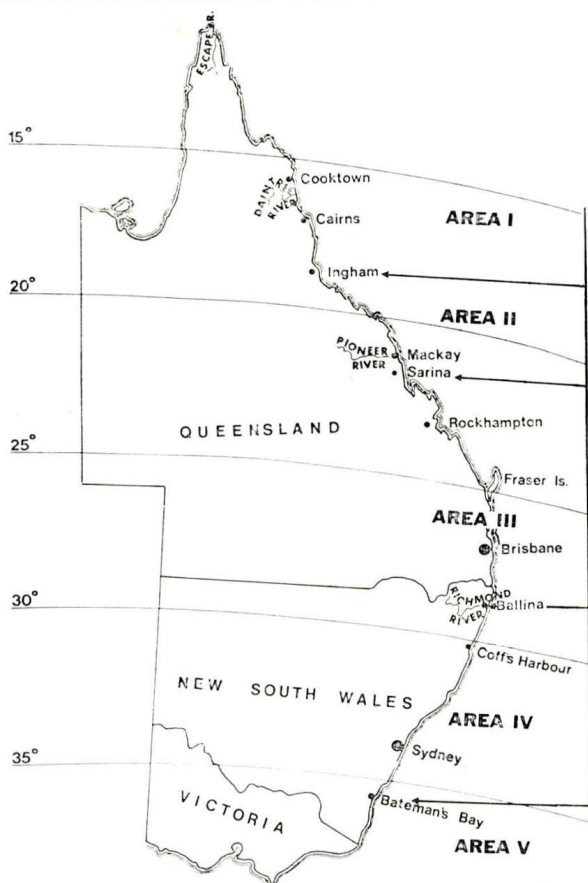
The mangroves of Areas I, II and III may be divided broadly into three zones: A—the outer zone on the seaward fringe; B—the middle or main zone; and C—the inner or landward zone. In Areas I, II and III the common mangrove of the outer zone is *Rhizophora stylosa*. Equipped with numerous stout, basal, stilt roots, and looping pneumatophores, as well as several thick, pendulous aerial prop roots descending from the branches, *Rhizophora stylosa* is securely anchored and able to withstand the constant movement of wind and sea. Two other species *Sonneratia alba* and *Avicennia marina* var. *resinifera* occasionally pioneer the outer zone; *Sonneratia alba* in rocky situations and *Avicennia marina* var. *resinifera* in the soft, muddy silts. *Bruguiera gymnorhiza*, *Rhizophora apiculata*, *Ceriops tagal* var. *tagal* and *Avicennia marina* var. *resinifera* are the main species found in the middle zone. Some species, such as *Excoecaria agallocha*, *Cynometra ramiflora* var. *bijuga*, *Osbornea octodonta*, *Heritiera littoralis* and *Scyphiphora hydrophyllacea* prefer the sheltered inner zone. In Area IV, with only three species, the species either grow separately or in apparently random association.

Certain species of mangroves form gregarious communities on one or another of the three main silt types—deep soft mud, sandy mud, or firm clayey mud. The colour pattern of the forest canopy when viewed from above demonstrates this gregarious habit and the preference for different sites. A broad expanse of mangrove forest in tropical areas will show distinct patterns of crown colour—the grey-green of *Avicennia marina* var. *resinifera*—the dull yellow of *Ceriops tagal* var. *australis* and the dark green of *Bruguiera* and *Rhizophora* species are examples.

Root Systems

The floor of the mangrove forest presents a complex of curving, twisted root shapes protruding from the mud and some species have developed specialized breathing roots, pneumatophores, which assume characteristic shapes depending on the species to which they belong. In *Rhizophora* they are looping and bow-like; *Ceriops* and *Heritiera* are in the form of buttresses; knee-like knobs in *Bruguiera* sp.; peg-like in *Sonneratia* and *Avicennia*; and plate-like or conical knobs in *Xylocarpus* spp.

* Deceased. late C.S.I.R.O. Long Pocket Laboratories, Indooroopilly, Qld.
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	AREA —	I	II	III	IV	V
<i>Acanthus ilicifolius</i> L.		X	X	X		
<i>Aegialitis annulata</i> R.Br.		X	X	X		
<i>Aegiceras corniculatum</i> (L.) Blanco		X	X	X	X	
<i>Avicennia eucalyptifolia</i> Zip. ex Miq.		X	X			
<i>Avicennia marina</i> var. <i>resinifera</i> (Forst. f.) Bakh.		X	X	X	X	X
<i>Bruguiera cylindrica</i> (L.) Bl.		X*				
<i>Bruguiera exaristata</i> Ding Hou		X	X			
<i>Bruguiera gymnorhiza</i> (L.) Lam.		X	X	X		
<i>Bruguiera parviflora</i> (Roxb.) Wight & Arn.		X	X			
<i>Camptostemon schultzei</i> Masters		X*				
<i>Ceriops decandra</i> (Griff.) Ding Hou		X				
<i>Ceriops tagal</i> var. <i>australis</i> C. T. White		X	X	X		
<i>Ceriops tagal</i> var. <i>tagal</i> (Perr.) C. B. Rob.		X	X			
<i>Cynometra ramiflora</i> var. <i>bijuga</i> (Spanoghe) Benth.		X	X			
<i>Excoecaria agallocha</i> L.		X	X	X	X	
<i>Heritiera littoralis</i> Ait.		X	X			
<i>Lumnitzera littorea</i> (Jack.) Voigt		X	X			
<i>Lumnitzera racemosa</i> Willd.		X	X	X		
<i>Nypa fruticans</i> Wurm.		X				
<i>Osbornea octodonta</i> F. Muell.		X	X			
<i>Rhizophora apiculata</i> Bl.		X	X			
<i>Rhizophora mucronata</i> Lam.		X				
<i>Rhizophora stylosa</i> Griff.		X	X	X		
<i>Scyphiphora hydrophyllacea</i> Gaertn.		X	X			
<i>Sonneratia alba</i> J. Sm.		X	X			
<i>Xylocarpus australasicum</i> Ridl.		X	X			
<i>Xylocarpus granatum</i> Koenig		X	X			

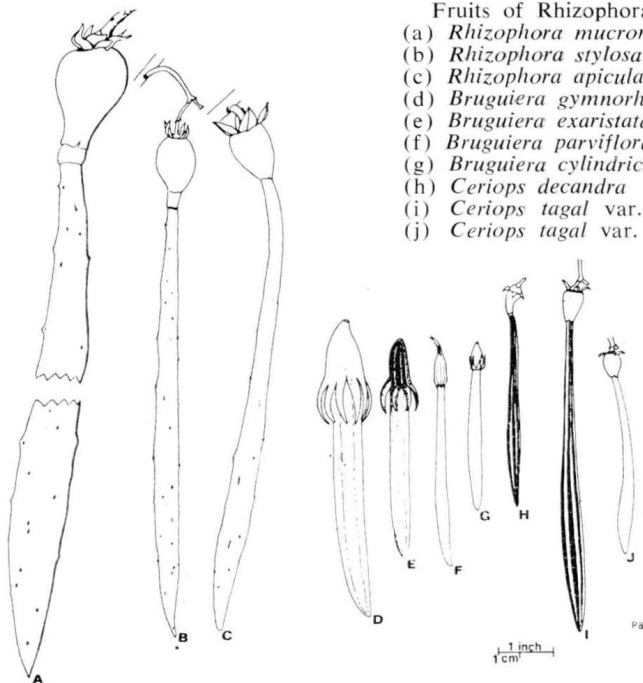
* Restricted to coastline north of the Daintree River.

FIELD KEY TO GENERA OF AUSTRALIAN MANGROVES

- | | | |
|---|---------------------|------|
| 1. Palm | <i>Nypa</i> | 2 |
| Not so | | 3 |
| 2. Leaf blade mostly 12 cm or more long | | 4 |
| Leaf blade mostly 10 cm or less in length | | 5 |
| 3. Stilt roots produced | | 6 |
| No stilt roots | | 7 |
| 4. Leaves compound | | 8 |
| Leaves simple | | |
| 5. Prop roots from branches | <i>Rhizophora</i> | |
| No prop roots from branches | <i>Bruguiera</i> | |
| 6. Buttresses present | <i>Heritiera</i> | |
| Buttresses absent | <i>Camptostemon</i> | |
| 7. Pneumatophores present | <i>Xylocarpus</i> | |
| Pneumatophores absent | <i>Cynometra</i> | |
| 8. Leaves opposite | | 9 |
| Leaves alternate | | 14 |
| 9. Underside of leaf grey | <i>Avicennia</i> | |
| Not grey | | 10 |
| 10. Leaves with interpetiolar stipules | <i>Scyphiphora</i> | |
| No interpetiolar stipules | | 11 |
| 11. Petioles with glands at base | <i>Sonneratia</i> | |
| Petioles lacking glands | | 12 |
| 12. Leaf margins finely toothed in upper half | <i>Osbornea</i> | |
| Leaf margins with spiny teeth | <i>Acanthus</i> | |
| Leaf margins entire | | 13 |
| 13. Terminal shoots spearhead shaped | <i>Ceriops</i> | |
| Not so | <i>Bruguiera</i> | |
| 14. Leaf surface grey below | <i>Camptostemon</i> | |
| Not grey | | 15 |
| 15. White latex present | <i>Excoecaria</i> | |
| No latex | | 16 |
| 16. Gland present at apex of midrib | <i>Lumnitzera</i> | |
| Not so | | 17 |
| 17. Petioles sheathing the stem | <i>Aegialitis</i> | |
| Not so | <i>Aegiceras</i> | |

Fruits of Rhizophoraceae

- (a) *Rhizophora mucronata*
 (b) *Rhizophora stylosa*
 (c) *Rhizophora apiculata*
 (d) *Bruguiera gymnorhiza*
 (e) *Bruguiera exaristata*
 (f) *Bruguiera parviflora*
 (g) *Bruguiera cylindrica*
 (h) *Ceriops decandra*
 (i) *Ceriops tagal* var. *tagal*
 (j) *Ceriops tagal* var. *australis*



Acanthus ilicifolius L.—Acanthaceae. "Spiny Mangrove, Holly-leaf Mangrove."

A small sparsely branched, speckled-stemmed shrub, attaining 1-2 metres in height; usually found along the littoral margins where it sometimes forms groves. The stems are supported at the base by a number of small stilt roots. The shortly stalked, glossy, opposite leaves are usually armed on the margins with a few sharp spines and terminating in a spine at the apex. Occasionally the spines are wanting and the margins are lobed and entire. The leaf blade is stiff and prominently veined. A pair of sharp spines are situated at the base of each petiole. The attractive blue flowers are borne on terminal or axillary spikes. Fruit, a glossy, brown capsule about 2 cm long, enclosing several seeds and capped at the apex with a persistent style.

Flowering period: August. Fruiting period: Dec.-Jan.

Uses: An ornamental shrub suitable for planting in saline situations, flowering as a small shrub from about 0.5 metres in height.

Aegialitis annulata R.Br.—Plumbaginaceae*—"Club Mangrove".

A bushy, brown-stemmed shrub 1-2 metres high, forming a clump of several stems in mature plants, usually found in rocky sites in somewhat exposed situations. Young plants of a single stem taper quickly from a broad base, giving them a cudgel-like appearance. The broadly ovate, alternate leaves are leathery in texture and are often pitted on both surfaces with small depressions which accumulate salt. The long green winged petioles sheath the stem at the base. Flowers—white, borne in axillary panicles—each small flower within a bract.

Flowering period: Sept.-Nov. Fruiting period: Feb.-Mar.

Distribution: Cape York to Frasier Island (lat. $10^{\circ}40'-25^{\circ}30'S$).

Uses: Worthy of cultivation in rocky saline situations in tropics.

Note: It is interesting to note that a plant of this species is the northern-most mangrove in Australia, growing on the extreme tip of Cape York.

Aegiceras corniculatum (L.) Blanco—Yrsinaceae—"River Mangrove".

A bushy shrub or sometimes a small, slender tree 3-4 metres high, often forming dense thickets along tidal creeks, rivers and along margins of the inner zone of mangrove forests. The blunt leaves are alternately arranged on the brown branchlets and often have a fine film of salt on their surfaces. When viewed through a field lens, tiny salt pits and small elongated resin secretions are visible on both surfaces. Attractive terminal or axillary umbels of white flowers are borne during winter months. The small curved horn-like fruits are viviparous and distributed by the tide.

Flowering period: May-Sept. Fruiting period: Nov.-Dec.

Distribution: Cape York to Kiama, N.S.Wales (lat. $10^{\circ}40'-34^{\circ}41'S$).

Uses: Tan bark for fish nets. Major honey source.

Avicennia eucalyptifolia Zip. ex Miq.—Verbenaceae—"Smooth-barked Grey Mangrove".

A smooth, mottled, bluish-grey barked tree 8-10 metres high and with pendulous, yellowish foliage, often gregarious on sheltered mud flats and inlets. Erect, slender, peg-like pneumatophores protrude from the mud about the base. Leaves opposite, mostly lanceolate, tapering gradually to a long sharp apex and borne on joined pendulous twigs. The underside of the leaves grey and woolly. Petioles and midrib yellowish. The panicles of small orange coloured flowers are borne in the axils of the leaves.

Flowering period: Sept.-Nov. Fruiting period: Mar.-May.

Distribution: Cape York to Sarina (lat. $10^{\circ}40'-21^{\circ}30'S$).

Uses: Boat knees, elbows.

Avicennia marina var. *resinifera* (Forst. f.) Bakh.—Verbenaceae. "White Mangrove, Grey Mangrove".

A large tree 8-10 metres high with a spreading grey-green leafy crown and finely fissured bark. Numerous erect, slender pneumatophores protrude from the main roots beneath the surface of the mud. This species is very common in southern areas and extends up rivers and creeks to the tidal limit. The opposite leaves are glossy green on the upper surface, grey and slightly woolly on the underside. Leaf-bearing branchlets have a jointed appearance. Panicles of small golden-yellow flowers are borne in the leaf axils. The fruiting body opens to expose two large cotyledons and a hairy curved hypocotyl—the stiff hairs curve upward and assist in fixing the hypocotyl in the mud.

Flowering period: Sept.-Oct. Fruiting period: Feb.-May.

Distribution: Mackay to Tasmania (lat. $21^{\circ}8'-41^{\circ}S$).

Uses: Boat knees, elbows. The tough wood has been used for making mallets.

Note: Adventitious roots from lateral branches have been noted.

Bruguiera cylindrica (L.) Bl.—Rhizophoraceae—"Small-fruited Orange Mangrove".

A small slender tree of the inner zone 7-8 metres high, with a pale grey, rough-barked stem and short buttresses at the base. Inverted V-shaped pneumatophores rise from the mud about the base, the bark often shedding from the topmost exposed area. The dark green leaves about 6-7 cm long and tapering at each end are collected in opposite pairs at the ends of the branchlets. Flowers are borne usually in twos or threes in the axils. Calyx 1.5 cm long not ribbed—lobes 6-9, green, reflexed and half the length of the calyx. Mature radicle slightly curved about 1 cm in diameter, and up to 15 cm in length.

Flowering period: Sept.-Oct. Fruiting period: Not seen.

Distribution: Known only from Cape Sidmouth, N. Qld. (lat. 13°25'S.).
Bruguiera parviflora (Roxb.) Wight & Arn.—Rhizophoraceae—"Slender-fruited Orange Mangrove".

A small, rough barked, bushy crowned tree of 5-6 metres in height, usually found in the inner sheltered zone. Small knobby inverted V-shaped pneumatophores spring from the mud about the base. The glossy blunt pointed leaves are grouped together in opposite pairs at the ends of the branchlets. Flowers in trichotomous cymes. Fruiting body narrow, distinctly fluted, as many flutes as calyx lobes, usually 7-8 lying parallel along the emerging radicle. Hypocotyl green and slender. In this species, the emerging cotyledons grow through the bottom of the calyx leaving the remains of the calyx encircling the hypocotyl.

Flowering period: Aug.-Oct. Fruiting period: Dec.-Feb.

Distribution: Cape York to Proserpine (lat. 10°40'-20°30').

Uses: Tan bark, poles for rough building, fish traps.

Campostemon schultzei Masters—Bombacaceae—"Kapok Mangrove".

A tall, cylindrical tree 10-12 metres high, of restricted distribution in eastern Australia, usually found on the margins of the sheltered inner zone, along tidal creeks and saline swales in the far northern tropical area. The alternate grey-green leaves vary from elliptic to obovate in outline, blunt and emarginate at the apex, tapering gradually to two tiny glandular lobes at the base; under-surface of leaves and petioles grey, woolly and dotted with reddish-brown glandular scales. Fruit a capsule containing two or more woolly seeds.

Distribution: Cape York (lat. 10°40'S.).

Bruguiera exaristata Ding Hou—Rhizophoraceae—"Ribbed-fruited Orange Mangrove".

A small tree 8-10 metres high, with dark grey, rough, fissured bark, usually found in the inner littoral zones, often extending some distance up rivers in the tropics. Erect, knobby pneumatophores rise from the mud about the base of the tree. Leaves sharply acuminate—narrow elliptic in outline 7-10 cm long and 4-5 cm broad, collected in opposite pairs at the ends of the green branchlets. Petioles yellow-green. Flowers solitary in the leaf axils. Fruiting body distinctly ribbed. Calyx lobes 8-10, spreading. Germination viviparous. Hypocotyl green and slender.

Flowering period: Sept.-Oct. Fruiting period: Jan.-Feb.

Distribution: Cape York to St. Lawrence (lat. 10°40'-22°15'S.).

Uses: Tan bark, poles for general use, rafters, arrow heads, fish traps; wood pale red and hard.

Bruguiera gymnorhiza (L.) Lam.—Rhizophoraceae—"Large-fruited Orange Mangrove".

A tree 10-12 metres high with dark grey, rough bark, buttressed at the base and a dense, green leafy crown—found in the mid and inner zones and occasionally some distance up rivers. Erect, knobby, kneelike pneumatophores spring from the mud about the base of the tree. The large, smooth, rather thick, glossy green leaves, collected in opposite pairs at the ends of the branchlets are elliptic in outline 15-20 cm long and 6-7 cm broad, terminating in a shortly acuminate apex. Flowers solitary in the leaf axils. Calyx lobes 12-13 spreading. Germination viviparous. Hypocotyl long and narrow.

Flowering period: Aug.-Oct. Fruiting period: Dec.-Feb.

Distribution: Cape York to Richmond R., N.S.W. (lat. 10°40'-28°31'S.).

Uses: Bark used for tanning fishing nets; wood hard and tough.

Ceriops decandra (Griff.) Ding Hou—Rhizophoraceae—"Flat-leaved Spurred Mangrove".

A gregarious shrub or small tree of the inner tidal zone, about 2 metres in height, with branching spurs at the base and short knobby pneumatophores. Sometimes attaining small tree size, but more often flowering and fruiting as a small shrub of 1 metre in height. Branchlets brown and slightly angular in

cross section. Leaves erect, flat, obovate in outline, rounded and blunt at the apex and tapering to the petiole. Leading shoots spread-shaped. Flowers axillary, clustered on a very short, thick, angular stalk. Fruiting body brown and wrinkled, slightly curved above the calyx which consists of five triangular lobes situated at a point one third of the distance along the fruiting body. Hypocotyl fluted, slender, broadened at lower end. Germination viviparous.

Flowering period: Aug.-Sept. Fruiting period: Nov.-Dec.

Distribution: Herbert River delta and Cairns inlet (lat. 16°55'-18°32').
Ceriops tagal var. *australis* C. T. White—Rhizophoraceae—"Yellow-leaved Spurred Mangrove".

A shrub or small, slender-stemmed tree 2-3 metres high, with broad, branched spurs at the base and short knobby pneumatophores rising from the mud about the tree; often found in near pure stands on raised clayey-mud flats. The dense, yellowish, erect opposite leaves are grouped at the ends of the branchlets; obovate in outline, blunt or rounded and emarginate at the apex. The leaf margins are usually revolute. The leading shoots are spear-head shaped. Flowers white, borne in pairs in the axils of the leaves. Fruit brown pear-shaped. Calyx lobes 5. Hypocotyl slender, smooth, cylindrical, not fluted, often reddish in colour when mature. Germination viviparous.

Flowering period: Oct.-Nov. Fruiting period: Dec.-Jan.

Distribution: Cape York to Moreton Bay (lat. 10°40'-27°30'S.).

Uses: Tan bark; used in tanning fishing nets; roots used as ornaments.

Ceriops tagal var. *tagal* (Perr.) C. B. Rob.—Rhizophoraceae—"Long-fruited Spurred Mangrove".

A small, slender, brown-barked tree 5-6 metres high, common in the inner sheltered zones with broad branching spurs at the base and short, knobby pneumatophores rising from the mud about the base. Leaves opposite, grouped at the ends of the branchlets, obovate in outline, usually flat and emarginate at the apex. The leading shoots are spear-head shaped. Flowers white borne in axillary cymes. Fruit brown pear-shaped. Calyx lobes 5—hypocotyl ca 20 cm long, distinctly fluted, and much broadened towards the lower end. Germination viviparous.

Flowering period: Oct.-Dec. Fruiting period: Jan.-Mar.

Distribution: Cape York to Sarina (lat. 10°40'-21°30'S.).

Uses: Tan bark, used in tanning fishing nets; roots as ornaments.

Cynometra ramiflora var. *bijuga* (Spanoghe) Benth.—Caesalpinaceae—"Wrinkle Pod Mangrove".

A small, rather straggly tree 3-5 metres high, usually found on the littoral margins of the inner zone. The alternate pinnate leaves usually have two pairs of leaflets on each rachis—each leaflet on a very short stalklet. Leaflet blade very unequal sided at the base and blunt and emarginate at the apex. The terminal pair of leaflets is usually much larger than the basal pair. Branchlets brown, roughened by presence of numerous small lenticels. Flowers borne in axillary clusters. The odd shaped pods are wrinkled on the outer surface. Each pod contains a single seed.

Flowering period: Sept.-Oct. Fruiting period: Dec.-Jan.

Distribution: Cape York to Mackay (lat. 10°40'-21°8'S.).

Uses: Small turnery; wood chips produce a purple dye in water.

Note: The leaflets of this plant are often damaged by leaf mining insects.

Excoecaria agallocha L.—Euphorbiaceae—"Blind Your Eye".

A tall cylindrical tree 12-14 metres high of the inner littoral margins and sheltered tidal lagoons. The outer grey bark is patterned with longitudinal rows of brown corky pustules. All parts when broken exude a milky latex which contains proteolytic enzymes which can prove extremely painful if splashed in the eyes and may even cause temporary blindness. Leaves obovate-elliptic, rounded at the base; bluntly acuminate at the apex and usually finely toothed on the margins. A pair of small glands are situated at the base of each leaf. Male and female flowers on separate trees. Male flowers in axillary racemes, sometimes solitary. Female flowers much shorter. Fruit a small, tri-lobed capsule.

Flowering period: Dec.-Feb. Fruiting period: April-June.

Distribution: Cape York to Coffs Harbour, N.S.Wales (lat. 10°40'-30°18'S.).

Uses: Interior carpentry; wood pale in colour and easily worked.

Heritiera littoralis Ait.—Sterculiaceae—"Looking-Glass Mangrove".

A tall tree attaining 15-16 metres in height, with broad, flat buttresses, usually found in the inner mangrove zone and along tidal creek margins. Bark

light grey, fissured, slightly scaly and shedding in thin flakes. The large oblong-elliptic leaves are variable in size, silvery white on the underside, also dotted beneath with small scales with reddish centres. Flowers small, borne in loose panicles in the leaf axils. Fruit clusters of brown, woody, sessile carpels, 5-7 cm long with a winged keel on one edge. Seeds distributed by tides.

Flowering period: Aug.-Sept. Fruiting period: Mar.-May.

Distribution: Cape York to St. Lawrence (lat. $10^{\circ}40'-22^{\circ}15'S.$).

Uses: Boat building in India, furniture; wood close-grained.

Lumnitzera littorea (Jack.) Voigt—Combretaceae*—"Red-Flowered Black Mangrove".

A bushy shrub or small tree 2-3 metres high, similar in habit to the white-flowered *Lumnitzera*, but less common than that species. The narrowly obovate alternate leaves are blunt and emarginate at the apex, somewhat succulent and brittle in texture and gradually tapering to the base. A small gland (domatia) is usually found at the apex of the midrib, also occasional smaller glands in the axils of the secondary veins. Flowers red, borne in terminal racemes. The fruiting body is ca 2 cm long, vase shaped, furnished about half way on either side with a small stipule and crowned by 5 broad spreading calyx lobes. Fruits transported by tides.

Flowering period: June-Sept. Fruiting period: Oct.-Dec.

Distribution: Cape York Pen. to Herbert River (lat. $10^{\circ}40'-18^{\circ}32'S.$).

Uses: This showy, red-flowered shrub is worthy of cultivation in situations such as muddy sea frontages and tidal creeks in the tropics.

Lumnitzera racemosa Willd.—Combretaceae—"White-flowered Black Mangrove".

A small tree 5-6 metres in height with a dark grey, fissured bark. The narrowly obovate, alternate leaves are blunt and emarginate at the apex, somewhat succulent and brittle in texture, and gradually tapering to the base. A small gland (domatia) is usually found at the apex of the midrib, also smaller glands in the axils of the secondary veins. The white flowers are borne in axillary racemes. Fruit—sessile, crowned at the apex by five more or less erect calyx lobes and furnished on each side of the fruiting body with a small stipule.

Flowering period: Sept.-Jan. Fruiting period: Mar.-May.

Distribution: Cape York to Fraser I. (lat. $10^{\circ}40'-25^{\circ}30'S.$).

Uses: Suitable subject for planting in saline situations.

Nypa fruticans Wurmb.—Palmae—"Nypa Palm, Mangrove Palm".

A gregarious palm of restricted distribution, 4-5 metres in height with a creeping rootstock and found in the inner mangrove zone, bordering quiet backwaters and tidal swamps. The large fronds, usually 5-7, spring from a short thick stem. Fronds 6-7 metres long composed of 100 or more long narrow lanceolate leaflets, each leaflet terminating in a long needle-shaped point. A pair of well-defined parallel veins are situated on each side of the midrib with a number of fine parallel veins between. Numerous small, glandlike processes are spaced 3-4 cm apart along the midrib on the underside of the leaflet. Fruit a large, round compact head, often 40-50 lb in weight and composed of numerous, fibrous, pear-shaped fruits, each fruit enclosing a single nutlet 2-3 cm diameter. Seeds distributed by the tide.

Flowering period: Unknown. Fruiting period: Nov.-Dec.

Distribution: McIvor R. and Herbert R. Delta (lat. $18^{\circ}32'S.$), Qld.

Uses: Large fronds used in the Philippines and Malaya as roof thatching and the inflorescence used for making a "toody".

Osbornea octodonta F. Muell.—Myrtaceae—"Myrtle Mangrove".

A bushy shrub or small crooked tree to 5 metres high, with brown stringy-bark, found along the margins of the inner zone of mangrove forests in the tropics. Small obovate leaves with a blunt emarginate apex are arranged in opposite pairs on the four angled branchlets. The upper half of the leaf margin is irregularly toothed and the lower half entire. Prominent oil dots visible with the aid of lens. The brittle leaves when crushed have an aromatic scent, somewhat like eucalyptus oil. Petioles very short and reddish in colour. The pale, creamy green sessile flowers are borne one to three in each axil. Calyx lobes 8.

Flowering period: Jan.-Feb. Fruiting period: Mar.-April.

Distribution: Cape York to Sarina (lat. $10^{\circ}40'-21^{\circ}S.$).

Uses: Crushed leaves rubbed on the skin by fishermen as an insect repellent.

Rhizophora apiculata Bl.—Rhizophoraceae—"Tall-stilted Red Mangrove".

A tall tree attaining 10-12 metres or more in height with a grey wrinkled bark, and tall stilt roots. Pendulous roots descend from the lower branches and long looping, bow-shaped pneumatophores extend away from the base. Usually

found in the middle zone, where it often forms stands of tall poles. The branchlets in opposite pairs. Apex of leaves acute and tipped with a small projecting point which falls as the leaves mature. Fruit stalk under 2 cm long, thickened beneath the calyx. Calyx lobes 4, each lobe bearing a small hook-like gland on the inner surface below the apex. Hypocotyl long, green and dotted here and there with raised lenticels. Fruit brown, pear-shaped. Viviparous seedlings distributed by the tide.

Flowering period: Sept.-Oct. Fruiting period: Dec.-Jan.

Distribution: Cape York to Sarina (lat. $10^{\circ}40'-21^{\circ}30'S.$).

Uses: Timber durable; net racks, building, firewood and tanbark.

Rhizophora mucronata Lam.—Rhizophoraceae*—"Long-fruited Red Mangrove".

A tall, slender tree 10-12 metres in height with dark coloured wrinkled bark and tall stilt roots, some of the taller stilts springing from the tree two metres above ground level. Pendulous roots descend from the lower branches and looping bow-shaped pneumatophores extend away from the base of the prop roots. Usually found as an occasional tree of the mid zone in deep mud. Leaves large, elliptic collected in opposite pairs at the ends of the branchlets. The large leaves are acute at the apex and tipped with a brown deciduous projecting point which falls as the leaves mature. Undersurface of leaves dotted with reddish-brown glands. Fruit stalk slender ca 4-5 cm long. Calyx lobes 4. Hypocotyl long and narrow, green with raised brown lenticels scattered over the surface. Fruit brown, pear-shaped, 6 x 3.5 cm. Germination viviparous. Seedlings distributed by the tide.

Flowering period: Sept.-Oct. Fruiting period: April-June.

Distribution: Cape York to Repulse Bay (lat. $10^{\circ}40'-20^{\circ}30'S.$).

Uses: Net racks, rough building, firewood, tan bark.

Rhizophora stylosa Griff.—Rhizophoraceae—"Spotted-leaved Red Mangrove".

A small pioneer tree 4-5 metres high of the outer fringe of mangrove forests, with long, aerial prop roots descending from the lower branches, and supported at the base by several stout stilt roots. Long looping, bow-like roots which function as pneumatophores extend away from the base, each loop anchoring in the mud. Leaves opposite on the branchlets, thick and brittle in texture. The obtuse apex is tipped with a small deciduous, projecting point—sometimes absent from mature leaves. On the undersurface of the leaves numerous, small, raised reddish-brown glands are visible. The terminal shoots are usually red. Flowers in cymes branching in pairs, two small bracts beneath each flower. Fruit brown, pear-shaped, calyx lobes 4. Hypocotyl long and narrow, dotted with prominent lenticels.

Flowering period: Aug.-Sept. Fruiting period: Dec.-Jan.

Distribution: Cape York to Richmond River, N.S.W. (lat. $10^{\circ}40'-28^{\circ}31'S.$).

Uses: Wood pale, tough, durable; bark used for tanning.

Scyphiphora hydrophyllacea Gaertn.—Rubiaceae—"Yamstick Mangrove".

A small shrub of 1-2 metres, but more often met with as a low, straggly shrub less than a metre in height, along the inner margins of tidal swamps, not regularly inundated by the tides. The glossy leaves are opposite, obovate, rounded or obtuse at the apex and tapering gradually to the base. Between each pair of leaves are two broad interpetiolar stipules which is a family character. The leading shoots and nodes are usually sticky with a resinous substance. The small cymes of flowers are borne in the leaf axils. Fruiting body fluted and crowned at the apex by the persistent calyx.

Flowering period: Aug.-Sept. Fruiting period: Nov.-Dec.

Distribution: Cape York to Townsville (lat. $10^{\circ}40'-19^{\circ}12'S.$).

Uses: Worth cultivating as a border in saline situations; used by Aborigines for making true yam sticks.

Sonneratia alba J. Sm.—Sonneratiaceae*—"Pornupan".

Usually a small bushy tree but sometimes attaining 8-10 metres in height and a diameter of 0.5 metres in Cape York Peninsula. Trunk cylindrical, not buttressed but often knobby and irregular in large trees. Tapering aerial roots (pneumatophores) similar to those of *Avicennia* spring from the mud for some distance from the tree, from a few inches to three feet high. The tall pneumatophores often branched at the apex, have the appearance of young trees, but apparently do not bear leaves. Leaves opposite on the branchlets; brittle in texture and terminating in an obtuse or rounded apex. The young leaves are usually tipped at the apex with a reddish, recurved thornlike process. Two small glands are situated beneath the base of each petiole, one on each side. Leaf-bearing branchlets brown and somewhat angular. The large, nocturnal white

A CLASSIFICATION OF THE EUCALYPTS

by L. D. Pryor and L. A. S. Johnson

Eucalyptus, like many other large genera, has always presented special problems in classification. As knowledge of the genus has been accumulated, so there have been progressive modifications of the way in which the species are grouped in the various classifications proposed or adopted for the genus.

There have been marked advances in recent years by the application of newer methods of study such as those having a genetic basis or involving anatomical or chemical aspects.

As a result, the authors have been able to set out a full classification which expresses more clearly than has been possible previously, the relationships—as they see it—of the various species to one another and to groups of species at a range of levels from subgenus to subspecies. At the same time, a quite large number of binomials is dealt with and it is noted that many of these cannot be ranked as species or subspecies, and so much that has been cluttering up *Eucalyptus* literature is thus set to one side in the arrangement. The index allows ready reference to these.

The result of the treatment is that the number of species in the genus is listed as about 450 together with some additional 130 subspecies. However some 70 of these still remain to be described and their position is indicated only by code at present.

The letter coding has been used to facilitate reference to particular species. The authors recognise that there is still considerable scope for additional work and they expect a need will arise to produce a second edition of the Classification in the future.

A classification of this kind has many uses but in particular it allows a more ordered view of the genus and a better appreciation of the relationship of species to one another. Anyone interested in *Eucalyptus* whether in the course of work in forestry, agriculture, or horticulture; in aspects dealing with conservation and barks, or whether purely for enjoyment of natural forms or the pursuit of knowledge, will find considerable use for this work.

BOOKS

Growing Australian Native Plants by F. J. C. Rogers Price \$2.95 plus 25c postage

Fred Rogers is well known as an experienced wildflower grower for many years. He is the past Federal President of this Society and of the Victorian Region. He has addressed students and home gardeners on the Australian flora and its cultivation for many years and written books and numerous articles in magazines on the subject. Over the years people have tended to ask the same questions on problems associated with growing our wildflowers and finally he has prepared this book.

Beginners find it is not so easy to follow the vague advice of others and are not as successful as they would wish in turning a small piece of their garden into a fragrant bush setting. Fred Rogers will be the first to advise anyone that it is not easy to reproduce nature in such an entirely different environment but if the simple, practical, detailed and precise instructions in his book are followed results will be very pleasing.

Chapters headed "Planning and Planting A Native Garden" with sections headed Planning, Preparing the Holes, Planting, Planting Times, Mulching, Pruning; "Propagation", Seed, Cuttings and Division; "Making and Planting a Rockery" and "Attracting Birds to Your Garden" are especially written for guidance of the beginner. For those who already have a successful native garden the chapters on "Ground Cover Plants & Climbers", "Background Plants", "Large Shrubs and Small Trees", "Small Shrubs", "Plants for the Rockery" and "Specific Plants for Specific Cities" will give a proven guide as to the plants that will give you best results. This 82 page (page size 11" x 8") book illustrated with 51 colour plates and many clear photographs and diagrams is remarkable value.

Better Fruit Growing for Australian Gardeners by D. Brown Price \$4.50 plus 30c postage

This 210 page book is written by a very experienced orchardist who has specialised in growing healthy abundant fruit trees of all varieties. The information is in a simple practical style but goes into considerable detail over factors that will ensure good fruiting. The advice is specifically for those home gardeners who can spare room for a few small fruit trees of variety and for those who have the space for a small orchard to include a range of trees.

Fly High Reach Far by Frank Glen Price \$4.50 plus 25c postage

The experiences of the "Flying Padre" Supt. of the Far West Inland Mission who defied the dangers of our inland with dedication and courage.

NEW BOOKS ON TREES

All books reviewed, in fact any book on wildflowers on the Australian scene are available by mail only from the Editor, 860 Henry Lawson Drive, Picnic Point, N.S.W. 2213.

Native Trees of Australia by M. Millett & J. Hosel Price \$3.95 plus 25c postage

This 112 page (6" x 9" page size) book is an excellent introductory guide to the vast subject of Australian Trees. Only 34 species are fully described and illustrated in colour but this has been done in the perfect manner. A large colour plate of the tree is supplemented by four smaller colour plates showing the leaf, the flower, the fruit and another distinguishing feature such as the trunk. The descriptions are adequate and easy to read.

Eucalyptus Buds and Fruits—The Dept. of National Development Price \$2.00 plus 20c postage

This book is produced as an aid to the identification of Eucalyptus species by presenting illustrations of typical buds and fruits arranged according to the order set out in Blakely's "A Key to the Eucalypts". Illustrations of hybrids and doubtful species and varieties have been omitted from previous editions and the whole genus revised such that the 446 species illustrated (including a few varieties of distinctive characters) now contains 259 new illustrations.

Forest Trees of Australia by Hall, Johnston & Chippendale Price \$8.50 plus 50c postage

The third edition of this book with very wide general appeal now contains 340 pages. The total of 133 trees described includes an additional 51 to the previous edition. What makes this book so popular is that two large pages are devoted to each species. The left hand page has a very good general description of the tree, its characteristics and its habitat and a map showing its area of distribution while opposite on the right hand page is a photograph of the tree in its natural environment together with a photograph of its bark, leaves in each stage of growth, its buds and its fruits. There has also been included in this edition a key to the species that are found in each of five geographic regions of Australia.

Available separately are 4 page leaflets (26 to date) each describing another species of *Eucalyptus* with illustrating photographs available at 10 cents each including postage.

Pollution and Conservation in Australia, by A. Martin Price \$3.95 plus 25c postage

A layman's guide to the causes, effects and control of pollution, this 112 page book (page size 9" x 6") reveals, examines and comments on this problem of our civilization under the chapters headed *The Sleeping Giant*, *The Awakening*, *The Soil*, *Rivers and Lakes*, *The Oceans*, *The Air*, *Fire*, *Noise and Rubbish*, *Pollution and Conservation*, *Pollution and Population*, *Pollution and You*.

Periwinkle Series of Colour Booklets Price each \$1.50 plus 15c postage

This series of booklets, usually 112 pages (7" x 5" page size) are well known for their practical value, clear expert descriptions and illustrations, many in colour. Latest releases are:

Animal Behaviour by Harry Frauca Price \$1.50 plus 15c postage

The animal kingdom is discussed under headings of Instinct & Learning; Activity and Rest; Food and Feeding; Water; Shelters and Nests; Hygiene; Communication; Orientation and Navigation; Colouration; Aggression and Defence; Courtship and Reproduction; Parental Care.

How to Photograph Australian Wildlife by J. Raithby & H. Beste Price \$1.50

Photographing wildlife is a hobby that is becoming very popular. There is little thrill in shooting wild animals or birds but it is quite a challenge to photograph them and enjoy the experience afterwards. This book advises you in simple terms, how to enjoy this hobby.

Australian Bushcraft by M. W. Plate Price \$1.50 plus 15c postage

You will acquire the experience of competent bush roamers by reading this book with such clear practical advice under the headings of *Camping Vehicles and Equipment*; *Camping Hints*; *Erecting a Tent*; *Bush Cooking*; *Living Off the Land*; *Water*; *Fire Without Matches*; *Snakes & Insect Pests*; *Knots*, *Snares and Traps*; *Prospecting*; *Direction Finding*. Keep a copy handy when you go bush.

Australian Dictionary of Biology by J. & P. Child Price \$1.50

A valuable reference to the terms used in simple biological descriptions.

Flora and Fauna of the Australian Capital Territory — N. T. Burbidge — Price 80c — 20c post.

The main title of the book is *Mountains, Slopes and Plains* as the country of the A.C.T. is described for these general environments. The fauna and flora is simply described and illustrated in chapters entitled *Trees and Flowers* (for each of the above regions); *Toadstools and Mushrooms*; *Mammals*; *Birds*; *Insects*; *Freshwater Life*; *Fish*, *Frogs and Reptiles*. With 76 pages 8" x 7" and many colour plates this is a valuable guide for residents of Canberra and to its tourists.

Canberra Botanic Gardens Price \$1.35 plus 15c postage from The Gardens, Canberra

With commendable vision the botanic gardens established at Canberra is devoted entirely to the cultivation and display of Australia's wildflowers. A difficult task because of Canberra's climatic extremes and a challenge to the versatility of our flora and the competence and the garden staff. This book on the gardens gives a little of the history of the venture, and leads us to the present establishment. A section leads the reader on a tour through the gardens as illustrated by a detailed map. Beautifully illustrated with many coloured plates of native flowers and birds this 52 page book (8" x 7" page size) will be of special interest to visitors to the gardens.

Growing Native Plants Price 60c plus 12c postage from Canberra Botanic Gardens, Canberra

One purpose of the gardens is to stimulate interest in our wildflowers which will lead to enquiries. To provide information on the wildflowers seen it is intended to produce a series of 24 page booklets and on each page to illustrate in colour, one species with an associated description of general interest. Vol. 1, 1971 is the first available describing 13 species together with a general article on ground cover plants and Banksia.

Kangaroo Is. Wildflowers I. Jackson—\$1.20 from Island Newspapers, Kingscote, 5223.

A 68 page booklet in which 189 species of the wildflowers that may be commonly found on Kangaroo Island are described in simple terms. 130 simple line diagrams make these descriptions easy to follow. The book is not intended for the expert, but for the nature lover who would like to be able to identify the wildflowers seen on the island. However it will also be a guide to the gardener as the plants are grouped into chapters headed 1. Limestone Areas; 2. Coastal Areas & Salt Marshes; 3. Plants of the Ironstone Rubble; 4. Lilies, Iris, etc.

Australian Bush Birds by Harry Frauca Price \$3.95 plus 20c postage

The book describes and illustrates, 32 of them in full colour, the most common bush dwelling birds that may be seen within a few hours drive from any of the main cities. As well as details of size, distribution food, habits and calls of each of the birds selected there are hints on recognition of most birds, the basis of classification and a section on the structure and life cycle of birds. This 135 page (9" x 6" page size) book is good value.

WILDFLOWER STUDY GROUPS

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

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

Some Study Groups and their leaders are:

Acacia: Mrs. J. B. Armitage, 10 Anembo Road, Terrey Hills, N.S.W. 2084.
 Banksia: Jim Carney 28 Linlithgow Street, Mitcham, Victoria, 3132.
 Blandfordia: Don McNair, 42 Ingall Street, Mayfield, N.S.W. 2304.
 Boronia: Alan Ward, 66 Cecil Street, Gordon, N.S.W. 2072.
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MANGROVES—continued from page 229

flowers, one to three, are borne in the upper axils or terminal. Fruit to 3 cm diameter, flat on top, many seeded, with 7-8 calyx lobes.

Flowering period: Aug.-Sept. Fruiting period: Oct.-Nov.

Uses: Said to be used in the islands for canoe building; an ornamental shrub for saline situations in the tropics.

Xylocarpus australasicum Ridl.—Meliaceae—"Cedar Mangrove".

A shortly buttressed tree of the inner mangrove zone, 7-8 metres in height with a pale green crown and a dark grey longitudinally fissured scaly bark. Pneumatophores rising from the mud about the base of tree are in the form of conical knobs. Mature trees are sometimes bare of leaves during the late winter months—the new leaves appearing in the spring. Branchlets brown in colour, dotted with small raised lenticels. Leaves pinnate, the leaflets arranged in opposite pairs; 2-3 pairs of thin textured leaflets to each leaf without the terminal odd one. Leaflets rounded and slightly oblique at the base, bluntly acuminate at the apex. Flowers in axillary panicles. Fruit 8-9 cm diameter, several seeded, distributed by the tide.

Flowering period: Sept.-Oct. Fruiting period: Feb.-April.

Distribution: Cape York to Magnetic I. (lat. 10°40'-19°12'S.).

Uses: Small turnery; timber has a grain and texture similar to that of Red Cedar.

Xylocarpus granatum Koenig—Meliaceae—"Cannonball".

A smooth barked tree of 7-8 metres in height with a spreading leafy crown. The trunks of old trees are often gnarled and irregular in shape and have a mottled appearance, due to the shedding of irregular patches of dead bark scales. Deep plank roots meander away from the base, undulating over the muddy floor, here and there rising from the mud in narrow, ridged, plate-like pneumatophores. Leaves alternate, pinnate 4-6 leaflets to each leaf, rounded at the apex, tapering and slightly oblique at the base. Small panicles of pink flowers are borne in the axils. The large, round cannonball fruit, often 11-12 cm in diameter, has a thick rind which splits into 4 parts and contains 12-18 irregular shaped pink, pithy processes, each of which encloses a single seed. Seeds distributed by the tide.

Flowering period: Nov.-Mar. Fruiting period: Jan.-May.

Distribution: Cape York Peninsula to Sarina (lat. 10°40'-21°30'S.).

Uses: Cabinet wood, fancy turnery, boat knees; the timber has an attractive grain, similar to that of Red Cedar to which it is related.

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 21-23, 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.

Other Books by the Society

WEST AUSTRALIAN PLANTS FOR HORTICULTURE is one of the books by the 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.

"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 flora of W.A.

Available from Editor, 860 Henry Lawson Drive, Picnic Pt., 2213—\$3.00 plus 20c postage.

"The Language of Botany"—A reference to Botany.

Do you know the meaning of the terms used by botanists? This jargon is necessary to adequately describe the plants. Do you know the various forms of plant life? Do you know how plants grow? Do you know the meanings of plant names? All this information is contained in the form of a dictionary with all the words you wish to check arranged alphabetically in the book "The Language of Botany". The book so adequately covers the language of botany "it has been accepted as a standard reference by Universities, Horticultural Colleges and Schools. Available from the editor for \$1.50 plus 15c postage.

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***Lagunaria patersonii* G. Don.—Pyramid Tree, Norfolk Island Hibiscus.**

Pyramid Tree is the solitary species of the genus, *Lagunaria*, and belongs to the "Mallow" family which includes such genera as *Hibiscus* and *Abutilon*.

Native to coastal Queensland as well as to Norfolk Island, it is a very ornamental and useful tree, which has long been in cultivation.

The tree usually grows erect and pyramidal, with a dense, low branching crown, and little spread. Height varies according to conditions but seldom exceeds 30-40 ft. Bark is rough, dark grey, and shallowly fissured. Leaves are oval shaped, rather rough in texture, dull green with a whitish scurfy under surface. The new leaves are much paler, providing a pleasing contrast.

Occurring singly in the leaf axils, the flower buds are small and conical. They open to reveal handsome, rose pink, Hibiscus-like blossoms, 1½-2 in. across with 5 velvety textured, recurved petals. They flower over a long period during the warm months of spring, summer and early autumn.

Lagunaria is successfully grown throughout Australia, particularly near the sea, where it has proved that it can withstand cold, salt-laden winds without visible "burning off". Tolerant of most soils including almost solid limestone, it is often used for planting on inland properties, but is not drought resistant.

Easily raised from seed, it grows rapidly, but requires some protection from extreme cold during its early years.

Description taken from the book "A Field Guide to Australian Trees" by Holliday and Hill for \$3.75 plus 25 cents postage sent to Editor.