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Colour photography by Frank Hurley

Block by courtesy of John Sands Pty. Ltd.

HIBBERTIA AUREA

The photographer had labelled his slide *Hibbertia hypericoides*. As the flowers shown here do not appear to be stalked, it is more than likely the very similar species, *H. aurea*.

A PUBLICATION DEVOTED TO THE PROPAGATION AND CULTIVATION OF
AUSTRALIAN WILDFLOWERS, ORCHIDS, TREES, ETC.

CONTENTS AND PREFACE FOR THIS ISSUE

The theme of this issue is wildflower creepers and climbers. The objective of this publication is to advise on the cultivation of Australian wildflowers and the many beautiful creepers and climbers play their part in the horticultural picture. Besides providing flowers and foliage to grace our gardens they also play an important part in providing the environment for the cultivation of other wildflowers that have been difficult to cultivate. The reader is to read the article "The Root And The Soil" on page 208 and the conclusions reached for: HOT WEATHER, WATER POOR GARDENING.

The gardeners in the southern areas of our continent are now experiencing what is normal for many of our readers in dry inland areas, how to maintain a refreshingly cool, pleasing garden with very little artificial watering. This has been the subject of previous issues and over the next few issues we shall review the lessons we have learnt the hard way. Will readers please forward comments to the editor. As lesson one please refer to: "The Root and the Soil" by W. M. Martin—page 208.

CREEPERS AND CLIMBERS—MANY FOR GROUND COVER

"Some Native Creepers" by A. E. Brooks—page 200. Many proven creepers are described.

"Creepers For Seaside" by Vera Scarth Johnson—page 199. Many northern creepers

Creepers are listed alphabetically below together with other wildflowers in this issue.

PLANTS FOR DIFFICULT AREAS

"Natives On Heavy Soil in the Monsoonal Tropics" by A. K. Bates, Mareeba, Qld.—page 198.

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"Street Tree Planting—*Pittosporum rhombifolium*", by H. O. Oakman—page 203.

"Orchids for that Hot Situation—Grow an Australian Orchid" by R. F. Leaney—page 205.

BIRDS—WILDFLOWERS—PEST CONTROL

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"Birds Defended" by Barbara Salter—219.

"Pests on Native Plants—Use of Pesticides—217.

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GROWING WILDFLOWERS AND THEIR PROPAGATION

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How to Grow those Small More Difficult Wildflowers—page 193.

"Growing Wildflowers—Trees, Planting Out and Care of Young Trees" by R. C. Barnard—page 213.

"Growing Wildflowers—The Root and the Soil" by W. M. Martin—page 208.

"Propagation of Pea Flowered Plants" by Ross Doig—page 231. "Propagation" by Fred Hall—page 223.

"Propagation of Creepers and Climbers—Pandorea" by W. M. Bristow—page 202.

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Bianonacaceae—The Family—page 202.

"Billardiera"—All species are mentioned, *B. cymosa*, *B. longiflora*, *B. scandens*.

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"*Eucalyptus ficifolia*"—The Red Flowering Gum by Dr. J. S. Beard—page 225.

Eucalypts—Planting and Care of Young Trees by R. C. Barnard—page 213.

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"*Hardenbergia*" by A. E. Brooks—200. "A Northern Creeper by S. E. Stephens—201.

H. retusa—201. "Native Lilac—*H. violaceae*" by F. Hall—223. *H. violaceae*—224.

"*Hibbertia*" by H. W. Hewett—191. "Some More *Hibbertia*" by W. M. Martin—196.

"*Hibiscus*—Some Flora of Tropical North Qld." by L. K. Bates—197.

"*Hoya australis*" by Vera Scarth Johnson—page 226.

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"*Marianthus*" by Ross Doig—231 and by A. E. Brooks—229. *M. pictus*, *M. erubescens*,

M. ringens, *M. bignoniaceus*.

"*Pandorea*" by W. M. Bristow—202. *P. jasminoides*, *P. pandorana*.

"*Pittosporum rhombifolium*—A Street Tree" by H. O. Oakman—203.

"*Sollya*—The Genus"—222, mentions all species. "*Sollya fusiformis*" by Ross Doig—222.

Urena lobata—198.

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AUSTRALIAN PLANTS — PAST ISSUES

Volume No. 1 (bound) issues 1-12, has now sold out. Except for issues 2 & 3 the remaining 10 issues are available at 40 cents each + 5c postage or \$4.00 + 20c postage for the Vol. 1 set. Supplies of Volume No. 2 (issues 13-20) at \$6.00 + 20c postage are still available, many of the issues being no longer available singly. Volume No. 3 (issues 21-28) is now available fully bound at \$6.00 + 20c postage. Issues prior to this issue and later than No. 29 are available singly at 40c + 5c postage.

Each bound volume also includes a special publication of the Society. Volume No. 2 has "The Language of Botany", a 60 page glossary of botanical terms now available separately at 40c + 5c postage as well as "West Australian Plants". Volume 3 includes the book "A Catalogue of Cultivated Australian Native Plants", a publication of outstanding value available only with the bound volume No. 3.

HIBBERTIAS

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

With the search for the spectacular in the growing of Australian Native Plants, there has been a tendency to overlook some genera, which while being by no means unspectacular, might fall into the category of those whose individual flowers are relatively short lived and hence have not drawn attention to themselves as subjects for decorative cutting purposes. Many of our Eastern species of *Hibbertia* could be classified thus and their popularity among gardeners seems to have had a later start than many plants with now familiar names. Nevertheless with the increasing enthusiasm for the growing of our native plants and in particular the search for useful ground covers and suitable subjects for rockery effects, it is pleasing to see *Hibbertias* at last assuming their rightful place.

SOME EASTERN SPECIES OF HIBBERTIA

Known commonly as "Guinea Flowers", all Eastern species have flowers of a bright primrose yellow, generally of the order of 1" to 1¼" diameter, although in several cases, this dimension is greatly exceeded. Flowering occurs mostly during spring and early summer, although with some species it occurs also spasmodically throughout the greater part of the year according to the weather pattern, a fact which, when considered with the cascading growth habit of some of the ground cover varieties, and their tolerance of most garden conditions of soil and exposure, adds greatly to their horticultural value. It should also be noted that all Eastern species grown to date in our area have shown themselves particularly easy and fast to reproduce by vegetative means, as well as long lived under cultivation.

Beadle, Evans and Carolin's "Handbook of the Vascular Plants of Sydney Districts and Blue Mountains", lists some twenty varieties, although to date we have records of the satisfactory growing of only four named and two unidentified Eastern species.

Hibbertia scandens grows generally as a twining or trailing shrub, with a flower diameter generally in excess of 2", and is our most commonly cultivated species. It has proved hardy and reliable under all conditions, but when grown in competition with large shrubs and trees growth rate is often considerably reduced to the extent that it assumes the form of a small shrub to about 18" high. It is found naturally in coastal areas on dune sands and in forest country with heavy soils. Flowering is most profuse where adequate sunlight is available, and occurs throughout the year.

Hibbertia dentata grows naturally in shaded forest areas on Hawkesbury sandstones and shales, with size and incidence of flowering similar to *H. scandens*. Its twining and trailing habit of growth is also similar, but, as may be expected from consideration of its natural habitat, it shows a distinct preference for shaded areas. Under garden conditions it will flourish with very little direct sunlight, and with its generous production of striking flowers, its value in this specific and difficult aspect must ensure its future popularity.

Editor's Note: The theme of this issue is "Native Climbers & Creepers." These are introduced by two widely grown species of *Hibbertia* and the reader is referred to other articles commencing on pages 199 and 200 for more species of creepers. Mr. Hewett describes more species of *Hibbertia* from the eastern states on pages 195-196, after two especially fine *Hibbertia* from Western Australia are described. This arrangement was necessary because of the set pages on which colour plates may occur. Readers are invited to submit further notes on species of *Hibbertia* known to them.

SOME WESTERN SPECIES OF HIBBERTIA

The Western section of our continent is the home of a great many other species of *Hibbertia*, most of which have the bright primrose flowers noted above and at times born in dramatic profusion. Also some most attractive colour forms varying from light cream with primrose stamens, through old gold, to one species, *H. miniata* with orange red petals and violet black anthers.

**HIBBERTIA MINIATA**

Blocks loaned by the South Australian Museum with the permission of Miss A. M. Ashby.

Hibbertia stellaris is now becoming a familiar sight in our gardens. This hails from the coastal areas in the south-west of W.A. where it reputedly grows in sandy situations. Flowers are smaller than most species of *Hibbertia*, being approx. $\frac{3}{4}$ " diameter, but during its long spring and summer flowering season, they are borne in profusion with colour ranging from deep yellow to a rich old gold. On a compact plant to about 9" high by 18" diameter, of soft fine mid green foliage with red stems, they present a most striking spectacle.



Blocks donated by N. B. Thomson.

HIBBERTIA STELLARIS

The plants growing naturally in Western Australia with a plant shown above.

This species has been well known among Sydney gardeners for some three or four years and owing to its ease of propagation by cutting (rapid striking will occur from every node) and its vigorous growth rate, it gained an early reputation for rockery use. Subsequent behaviour has indicated the

Editor's Note: HOW TO GROW THOSE SMALL MORE DIFFICULT WILDFLOWERS. Readers are invited to study the above contribution on *Hibbertia stellaris* for a guide as to action to be taken to cultivate some of those small undershrubs that have not proved reliable in the garden to date.

need for much more detailed study of growth requirements. It has been found that specimens in a sandy medium in large containers have maintained vigour and appearance for several years whereas garden grown plants have generally enjoyed a very short life followed by unsightly browning off and die back and in most cases by complete death. As yet, insufficient cultural data is available to explain this phenomenon with any degree of certainty and accordingly much more research must be carried out. Fortunately, as noted above, this species is so easy to propagate that I feel sure, in the near future, we will be in a position to nominate, with confidence, conditions for satisfactory establishment.

Despite the above remarks however, regarding the problems with *H. stellaris*, I have had the pleasure recently of recording a number of well grown and very robust specimens, which have survived beyond the span of vigorous life usually obtained, and although it is a little early to draw firm conclusions, a study of their various growing conditions as listed below may give a lead to growth requirements in Sydney region.

(a) Flower box treatment against the Eastern wall of a house, using walling of unjointed sandstone ballast and soil of grey bush sand. Watering was carried out regularly so that the soil was never permitted to dry out. As may be imagined from the aspect, exposure to full sunlight was greatly restricted.

(b) A warm sunny location on a steep hillside sloping to the south, where free drainage of approximately 3'0" depth had been achieved by terracing. Sandstone ballast was again used as walling material with grey bush sand filling. Planting was carried out adjacent to the outer edge to achieve maximum drainage depth and watering was regular as in (a) above.

In both (a) and (b) a light dressing of N.P.K.—10-9-8 fertiliser had been applied at the end of winter.

(c) A warm rockery situation with approximately 4" build up above adjoining surface level, facing due north and close to the wall of a house. Rich dark grey sand had been introduced to fill a depressed area some 10' or 12' diameter to a depth of approx. 4'0". Soil on the site generally was a heavy brown loam over clay, and with the location described above, the effect must undoubtedly have been to maintain the sand fill in a condition of permanent dampness. Large pieces of sandstone ballast were placed on the surface near the roots of the plant in an effort to stabilise soil temperature and watering has been frequent enough to prevent drying out of the surface soil.

(d) A rockery of sandstone and fine textured dark grey loamy sand placed against the Eastern wall of a house. Sunlight is restricted considerably by some tall shrubs and a profusion of smaller rockery plants, which in conjunction with frequent watering (nightly during summer), would tend to produce humid air conditions close to the ground surface.

(e) A location near the base of a bank which has been made over to rockery and now carries a considerable amount of low foliage. At the head of the bank, on the western side, the house adds to the protection from drying summer winds, while east and north of the specimen several tall shrubs give partial protection from direct morning sunlight. Its protected position suggests that a significant degree of natural humidity would be retained near ground level which would tend to compensate for the fact that, unlike the preceding specimens, watering has been applied relatively

infrequently. Soil is a light textured sandy loam, of comparatively shallow depth over sloping shelf sandstone, and although no special provision has been made for drainage, waterlogging, even during heavy rains would be unlikely to occur.

In addition to the above examples, plants under the following conditions are maintaining healthy appearance with reasonable growth, though by no means as dense and vigorous.

(f) Flower box treatment in a warm position north of a home, yet so protected by taller shrubbery that broken shade only is encountered by the specimen. Soil is a gravelly medium textured loam and watering has been very infrequent.

(g) As an undershrub protected by medium height foliage in dry rockery conditions of sandstone with grey bush sand, where watering during summer has been applied only lightly with the object of providing conditions of increased night humidity for the foliage rather than soaking of the soil.

If one might presume to draw conclusions from the foregoing performances, I think it might be said of *H. stellaris*:

- (1) Light open sand seems to be the most desirable growing medium.
- (2) Unless grown in a situation where air humidity is naturally maintained, care should be taken to obviate drying out. The additional watering necessary to achieve this, may in turn tend to encourage the development of fungal troubles, unless drainage is virtually perfect and soil temperature during summer is prevented from increasing unduly.
- (3) Under "starvation" conditions, the life of specimens can be considerably extended. This phenomenon has been observed with much of our flora, and seems to indicate an inbuilt method of survival against the rigours of a sometimes harsh climate. Unfortunately the garden value of a specimen grown under these conditions is severely limited.

Before concluding these notes on *H. stellaris*, I should mention that records indicate severe damage on occasions from attack by thrip. This has resulted in severe browning off of the foliage, preceding die back, and it has been felt by some growers that control of this insect posed the major problem to the successful growing of the species. While I hold personal reservations in regard to this viewpoint, it should not be ruled out, until sufficient research has been done to enable us to plant this beautiful West Australian *Hibbertia* with a much greater degree of confidence.

MORE EASTERN SPECIES OF HIBBERTIA

Hibbertia procumbens is now being grown quite extensively, and forms a dense cascading mat to 3" high and up to 3' diameter, with flowers occurring throughout the year. It has attractive dark green, fine foliage which self layers under favourable circumstances. Although reputedly a moisture loving variety, it has grown well in Sydney gardens, both under average conditions of hand watering and exposure, or in full sunlight without any attention at all except provision for a light mulching of crushed blue metal. When it is remembered that Sydney has recently experienced some prolonged drought periods, this species must surely be rated a hardy and most useful rockery subject.

Hibbertia obtusifolia has also been extensively grown, mostly the completely prostrate form. Although not reported self layering as with *H. procumbens*, it nevertheless forms a most attractive compact cascading cover of similar dimension. This species also has been proved hardy under all garden conditions, but the increased vigour shown when in a warm situation is also reflected in its flowering habit. It appreciates frequent watering, and when grown as above flowering occurs throughout the year and follows several days after periods of rain or heavy watering.



Block donated by N. B. Thomson.

HIBBERTIA TETRANDA AND RAINBOW PLANT

There is some doubt over the correct naming of this *Hibbertia*. However it does show a characteristic form of many species of *Hibbertia* indicating how valuable they are for use in the garden.

MORE HIBBERTIA—Some Notes from W. M. Martin, Melbourne, Victoria

I have six species growing, namely *H. scandens*, *H. sericea*, *H. fasciculata*, *H. procumbens*, *H. stricta*, *H. stellaris*. As I have been growing them only about five years, I haven't reached any definite conclusions; but I am sure of some things. *H. procumbens* requires a little summer water for survival. It is an attractive little species for the rock garden. It flowers sparsely over a long period. *H. sericea* and *H. fasciculata* resent summer watering. I think it is the humidity which kills them. They are very drought resistant; but look their best if the soil is slightly moist. Both are very floriferous for a month or two. Both these species have proved impossible to date to establish in clay soil. *H. stricta* grows, but is very sparse in flowering—its likes are not yet determined. *H. scandens* is the toughest of all. It flourishes in very dry spot, yet another in watered part of garden is also healthy. It makes much better growth if provided with support for climbing. *H. stellaris*, growing in rock pocket in broken sunlight is a gem. A compact bush of 12" round in 18 months, it flowers for months. Watered thoroughly at fortnightly intervals in continued hot dry weather.

THE FAMILY DILLENIACEAE

The family *Dilleniaceae* is represented in Australia by the very many species of *Hibbertia*, four species of *Fachynema*, two species of *Tetracera* and one species of *Dillenia*, *D. alata*. We shall deal with these in a future issue. Will readers please assist by forwarding notes.

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HIBISCUS

SOME FLORA OF TROPICAL NORTH QLD. — THE "HIBISCUS" GROUP

First of a series by L. K. Bates, Page St., Mareeba, Qld.

Four members of family Malvaceae have so far come to my notice among the marvellously varied flora in this area. Two of these could be excellent garden subjects.



Photography by L. K. Bates.

The flower colour shown of *Hibiscus rhodopetalus* is that of an old flower bleached by the tropical sun. A new flower or one in the shade is a rich pink with a hint of orange.

Hibiscus rhodopetalus is an extremely interesting prostrate plant with striking flowers 3 or 4 ins. across (5 ins. in the garden). It grows, as do many small plants in this area, from a carrot-like tuber, appearing at about the onset of summer showers and continuing through the wet until the ground dries in winter. It is found on a variety of sites from granite hills in the mountains to heavy clay flats which waterlog in wet weather. Flowers last

for one day and are produced in abundance during the growing season. It is hardy, transplants easily, and will grow in a pot; but the lovely small prostrate form is difficult to reproduce.

Hibiscus normanii is found in moister gravelly mountain areas, and as I've seen it, is a dense shrubby perennial up to 4 ft. Leaves (very hairy), and general habit are quite unlike our other *Hibiscus* here. Two flower colour appear on each plant, the flowers being pink when just opened for the first time, turning to white in a mature flower. The white flower, picked and kept in water, closed at night completely reverting to the pink (immature) colour, reopened next day turning white, and again closed pink that night. An altogether lovely plant, though it could be slow growing.

Hibiscus meraukensis also flowers during the wet months, growing as an open shrub to 4 ft. Its habit reminds me somewhat of *Hibiscus radiatus*. Produces a profusion of one-day flowers 3 or 4 ins. across, of the palest lilac-pink with dark pinkish-red throat. Leaves lower on the plant are lobed "maple leaf" shape, while young leaves are simple. Fast growing, but possibly not as attractive as the previous two.

Urena lobata is a tall, thin, spindly plant almost weed-like in appearance which daily produces many lovely little one inch "*Hibiscus*" flowers, a rich mid-pink shade. Found in abundance among tall grasses in savannah-woodland areas.

Editor's Note: I am particularly anxious to receive reports and colour slides of other species of *Urena*. There are only three species, all in the north.

NATIVES ON HEAVY SOIL IN THE MONSOONAL TROPICS

Report from L. K. Bates, Page St., Mareeba, N.Q.

North Queensland suffers no worse extremes of climate than elsewhere in Australia, but the arrival of the wet has been anxiously awaited to see its effect on non-local (and especially dry area) plants. Though this report is only preliminary, established plants all being under two-years-old and ranging in height from 12 feet to only a few inches, results to date would indicate a good tolerance to conditions here by many native plants.

During the last eight months dry, when only 276 points of rain were recorded, the soil was kept continuously moist—those who have knowledge of the rapid effects of dry out from a tropical sun will understand why—all plants, rain-forest or desert, northern or southern, receiving the same treatment, and all being in full sun. This was followed by 40 inches during the wet, including 24 inches in eleven days in March. Difficulties in growing natives in this part of the tropics mainly concern moist conditions, not heat.

Soil is a blue clay (reputedly among the heaviest in North Queensland), overlaid with a top dressing of a fairly heavy loam, from 0 to 6 inches in depth. A barely perceptible slope is sufficient to carry off most surface water, though underground water level was at, or near ground level for many periods (ascertained by digging narrow cylindrical holes at various points—this soon gives an indication of how high water level comes and how long it takes to lower away from plant roots).

No building up of areas had been carried out, and while the following lists indicate this to be generally unnecessary, some lowering of the water table is being attempted by simply digging in path areas, leaving the other (larger) areas 6 inches or more above path level. Most of the casualties will be tried again in a built up area using a much more open medium.

Continued on page 232

CREEPERS FOR SEASIDE

by Vera Scarth-Johnson, Bundaberg, Qld.

May I suggest a few creeping plants suitable for a hot sunny situation, especially for a seaside garden, either to be used as ground cover or in a rocky. All are very common here and therefore often ignored.

Though the plants (except *Eustrephus latifolius*), naturally come from sandy, coastal land they all do well in my garden which is red forest loam. I have neither watered nor fertilized them, merely mulched the land with garden rubbish before planting. The only watering has been when they were first planted as cuttings direct into the ground.

Abrus precatorius is growing in my garden not so much for the beauty of the flowers which are an insignificant pinkish lilac, but for the pods which grow in clusters, opening out wide to show shining red and black seeds. The beauty of these seeds is that they cling to the pod and do not fall when picked so are invaluable as a dried decoration for the house



Continued on page 226

Editor's Note: This cutting and continuing of articles on other pages is regretted. It is usually essential as the colour plates can only go on certain pages for minimum printing costs. In this issue however I have also tried to present the information in a form for ready reference in the future.

SEASIDE GARDENS

A number of previous issues have described plants for sea side planting and grouped them into zones depending on their recommended proximity to the sea. We have a study section on this problem and readers are invited to report their observations to J. L. Freeman, Collins Street, Merimbula, N.S.W.

SOME NATIVE CLIMBERS

by A. E. Brooks

HARDENBERGIA

The Blue Coral Pea or Native Wistaria of Western Australia (*Hardenbergia comptoniana*) is a good plant with which to introduce this article. It is worthy of the honour because it has been cultivated in gardens since 1790, it is vigorous and produces a magnificent display of sprays of colourful blue or purple flowers in spring. It is not difficult to grow if given a reasonable amount of sunshine, but will not stand severe frosts. This species is characterised by pods with no pith between the seeds. Also there are 3-5 leaflets.



HARDENBERGIA COMPTONIANA

Photography by Ron Hill, reproduced from "Growing Australian Plants" by courtesy of of Rigby Ltd., Adelaide. Available from your bookseller for \$3.75.

While the Blue Coral Pea is confined to W.A., and is the only species in that State, the Purple Coral Pea (*H. violacea* syn. *H. monophylla*) is found in all other States in temperate forests near the coast or in the mountains. The leaves are much larger than those of the first species, and occur singly instead of in threes. The purple flowers are of more intense colour than the W.A. species, but it does not grow as high up trees or other support, perhaps climbing to a height of about six feet.

Frequently, this species is found growing prostrate along the ground when large areas of several square yards may present a magnificent sight in springtime.

This must be our most colourful climbing plant, and there are also pink and white climbing varieties as well as shrub forms of all three colours.

Mr. Brooks describes other climbers on this article on page nos. 222 and 228.

Editor's Note: The last plant described *Hardenbergia violacea* is indeed a very variable plant and the naming has caused considerable confusion to the home gardener. Together with a full colour plate of the climbing form on page 224, is a short note from the Government Botanist of N.S.W. on its correct nomenclature.

THE GENUS HARDENBERGIA

There are three species in the genus, *Hardenbergia comptoniana* Link. from W.A. as illustrated above, *H. violacea* (Schreev.) Stearn with its many forms as described and illustrated on page no. 224 and *H. retusa* Benth. (previously included, incorrectly, in the genus *Vandasia*) a little known plant from the N.E. of Queensland as illustrated on the next page.

A NORTHERN CREEPER

by S. E. STEPHENS, Cairns, Qld.

Hardenbergia retusa is a common twiner on sand ridges in Cairns City and on the sand ridges along the coast north of Cairns. The plant grows right to the top of the sea beaches. It grows in association with *Acacia* spp. and other mixed vegetation found on sand ridge locations. It is a vigorous climber and will quite densely cover trees up to 20 or more feet high. If no trees are close it will grow just as profusely sprawling over the ground.



Photography by S. E. Stephens.

HARDENBERGIA RETUSA

A note from the Government Botanist of Qld.

Hardenbergia retusa. Other than *Hardenbergia violacea* and *H. comptoniana* the only species of *Hardenbergia* is *H. retusa*. This is found in coastal Queensland from about Cairns north usually on sand at no great distance from the sea. It also occurs in southern New Guinea.

It is a handsome trailing shrub with large trifoliate leaves. The leaflets which may be up to 5 inches long are broadly obcordate, pinnately nerved and finely reticulate. The flowers are up to $\frac{1}{2}$ in. long, showy, violet (sometimes spotted with yellow), fasciculate and the fascicles racemose, the racemes in terminal panicles. The calyx is toothed with the upper two teeth connate; the standard broadly orbicular, emarginate; the wings adherent to the keel and slightly longer. The pod is up to 3 inches long, rusty pubescent, flattened but turgid, empty inside except for the large oblong seeds.

At one time some authors regarded *Hardenbergia retusa* as constituting a distinct genus *Vandasia*. The inflorescence, venation and relative length of wings to keel separate it from other species of *Hardenbergia*, but I think that it should be retained in *Hardenbergia*.

PANDOREA

PROPAGATION OF CREEPERS AND CLIMBERS by W. M. Bristow

***Pandorea jasminoides*.** My first knowledge of this plant's ease of striking from cuttings came by chance a number of years ago. I took home a spray of flowers of the creeper *Pandorea jasminoides* on a two-inch stem and put them in water. Due to an oversight the vase was not emptied out until a week later, when it was noticed that the two compound leaves were still green and shiny.

The thought struck me—"Plant it", and I did, in a mixture of sand and soil under a tree with a jar over it. I left the jar on for several weeks. It struck and grew quickly. Two months later it was planted out in poor shaley soil on a southerly slope not far from a soakage trench. The plant grew and thrived. Its almost white bignonia-like flowers with deep plum coloured throats were two inches long and two inches across the top.

So well did it thrive that it grew all over everything else. After some years, having to choose between it and a number of other plants which were in danger of being smothered, I was forced to cut the vine out.

In the meantime I had given a cutting to a neighbour. She planted hers away from any drainage water. It grew less robustly and is still on her fence among a mixture of other creepers. Its shiny leaves are a most attractive feature of the vine.

***Pandorea pandorana*.** I have since experimented with the smaller flowered species—*Pandorea pandorana*—and find it is also easy to strike. The short half-hardened side shoots seem to be the best material.

There are a number of *Pandoreas* in coastal and mountain areas in south-eastern Queensland. Flower colour is generally two-toned cream and brown, yellow and brown, or pinkish cream and dark red, but there is one plain yellow with tiny flowers in heavy trusses which almost weigh the vine down they are so numerous.

This is certainly a vine any average gardener could strike and grow.

THE PLANT FAMILY BIGNONIACEAE

In the next issue it is proposed to describe the remaining plants in this family. As well as three other species of *Pandorea* (*P. baileyana* from N.E. N.S.W. and Lamington Plateau, Qld.—*P. nervosa* from rain forests of N.E. Qld. *P. doryoxylon*, a shrub from Central Australia), there is one species of the genus *Tecomnanthe*, *T. hillii*, one species of the genus *Neospicacea*, *N. jucunda*, three species of the genus *Dolichandrone*, *D. filiformis*, *D. heterophylla* and two species of *Deplanchea*, *D. tetraphylla* and *D. hirsuta*. Will readers please report on what they know of these plants and forward on loan any colour slides that they have.

PITTOSPORUM RHOMBIFOLIUM

by H. O. Oakman — A series on Street Trees

Under suitable conditions the Diamond-leaved Laurel as this tree is occasionally called, makes an excellent street tree. One could however, easily become discouraged with it as it can be a disappointing subject when in less than ideal situations. A typical well-developed tree is dense, with closely packed thin branches, well-covered with small (3 to 4 inch) shiny deep green leaves with toothed margins. Small, cream coloured flowers are produced in great profusion during October-November, but the beauty of this tree is its covering of small orange fruits; these last for ten weeks during which birds are attracted by the small black sticky seeds contained in the orange capsules.

The outline of the crown is usually rather irregular. Under forest conditions a slender stem free of branches for about two-thirds of the height is developed, but when in a solitary-tree environment there is a tendency towards low branching, with the obvious concomitant of early pruning to produce a branch-free bole. The slender lower branches will droop in the rain necessitating more footpath clearance than for other street trees.



Pittosporum rhombifolium

A tree in High St., Willoughby, N.S.W. The display of orange-coloured berries is particularly good as this form is propagated by seed and planted by the Willoughby Municipal Council. The photograph was taken in June but the berries were still there several months later. The tallest tree is 20 ft. and this appears to be its maximum height in this situation. The council nurseryman advises that this tree is not particular as to soil and likes full sun. Comments and photograph by D. N. Dove.

This *Pittosporum* is usually found on the fringes of the rainforests and requires rich soil and ample moisture. It is a surface-rooter and will not tolerate exposure to strong winds so that staking is essential during its early growth. Forest height is around 60 feet but street trees seldom exceed 20 feet.

Stocks are generally obtained from seed and as there is a good deal of variation in the vigour of the young plants, only the strong growers should be selected for street planting. Most of the 70-odd species of *Pittosporum* are subject to scale insect attack with the resulting sooty mould, but this species seems to be less susceptible, particularly when the trees are healthy.

DENDROBIUM SPECIOSUM

by L. P. Butt, Brisbane, Qld.

I once heard it said of Australia's giant *Dendrobium speciosum* that were it an exotic it would be more highly regarded than it is in its native land. Of the many familiar sights of Queensland spring, the flowering racemes of this king of the dendrobiums is something the orchid lover never tires of seeing.



Photography by L. P. Butt.

The plant illustrated was originally brought from Mt. Tamborine, S.E. Qld., with a collection of small staghorns and elkhorn ferns, 35 years ago. Placed on a mango tree it continued to flower and grow along with the ferns until in 1960 the mango tree was cut down to a stump just above the orchid. Continuing to grow and flourish, *Dendrobium speciosum* encircled the stump and when in full flower each September is such a coronet of yellow blooms it is a sight to behold.

When photographed the plant had 60 racemes of brilliant yellow flower spikes. The stems are 24 inches long topped with the usual stout rigid ovate-oblong leaves. The buttercup yellow flowers are more typical of species found further north.

Dendrobium speciosum occurs along nearly all the east coast of Australia and is known by several common names all of which do nothing to enhance the true nature of the orchid. In various locations the inflorescence varies in colour from pure white, off-white, cream through to clear yellow.

Several varieties are recorded, *var. curvicaule* with its curved stems and white flowers, *var. hillii* with long and comparatively slender stems and white flowers, *var. nitidum* with narrow long stems and small flowers, the lateral lobes of which bear purple striping and a variety known as *var. grandiflorum*, a clear yellow variety with huge florets nearly twice the size of those of the type form. There is some doubt over this latter variety as the only published description with this name is *var. hillii forma grandiflorum* but Bailey's description would not suggest that it is a form of *var. hillii*. The illustrated specimen is early of the type *D. speciosum* and the deep yellow blooms are typical of the S.E. Qld. forms.

This orchid has crossed in the wild with *Dendrobium gracilicaule* (producing a plant known as *D. gracillimum*) and with *D. kingianum* (producing a plant known as *D. delicatum*). The central N.S.W. forms of *D. speciosum* and *D. kingianum* form the cross known as *D. kestevenii*.

Dendrobium speciosum is to be found high on the trunks of rain forest trees as well as on rocks in certain localities. It is very adaptable and can also be cultivated as a terrestrial in a garden rockery if leaf mould and fibrous material are packed around it. Take care not to bury the budding "eyes" at the base of the pseudo bulbs.

ORCHIDS FOR THAT HOT SPOT

PLEASE GROW AN AUSTRALIAN NATIVE ORCHID—YOU CAN YOU KNOW

by R. F. Leaney, F.R.H.S.

Almost anybody from North Queensland to Victoria could have a few Australian native orchids, you don't even have to have a garden. I know where there's a lovely specimen of *Dendrobium speciosum*, growing on a brick wall alongside a second storey window. Its been there for years and flowers magnificently, full sun of course. If *D. speciosum* grows in its native state on a bare cliff-face in full sun, why not pray, on a wall in exactly similar conditions?

Now what about all those lovely stone foundations, almost nothing else will grow on them. The big secret of course, is getting the plants very tightly and firmly fastened in the first place, this may mean plugging the wall, but I've had to put plugs into rocks to hold *D. speciosum*, so I cannot see that this is a disadvantage.

For those of you who are lucky enough to have a garden with a tree or a stump, the problem is already solved. It is quite easy to get a log from the bush and make yourself a stump placing around the base a good circle of solid stones to form a rockery. If you make a rustic effect, not fitting the stones together too well, you'll get good drainage and this is important. A few solid clumps of *D. speciosum* jammed tightly in some more large stones, fill up all odd corners with bush leaf-mould and charcoal, tucked in underneath. Big lumps; and don't be afraid to jam the plants tightly, this is the big secret for rapid establishment.

Do not stop at *D. speciosum*, some good clumps of *Dendrobium kingianum* and *D. linguiforme* can be poked in here and there in corners and crevices and if anything, they will establish faster than the *D. speciosum*.

If you have a good average rainfall, say above 25 inches, do not be too heavy-handed with the water, rain in a normal season should just about take care of them. But a soak with a hose occasionally in dry weather, particularly in the summer should help them along. A shovel full of broken-up cow manure or fowl manure is just the thing, once a year in the spring when the plants have become established. Just sprinkle it over the whole outfit and water in.

If you can make your native orchid feature in a spot in the full sun, this is the place. I have collected plants of *D. speciosum* growing on a rock-face in the full sun, when the rock was too hot to touch with the hand, how this doesn't just boil the plant up I do not know.

In southern areas and inland districts subject to frosts, it may be necessary to throw a bag over the plants at night in very bitter weather, especially if growing round a stump in the open—but this should never be necessary under a tree because of the sheltering effect of the branches. As your orchid garden becomes consolidated, you will no doubt discover a number of terrestrial orchids which can be put in corners. I would start with the lovely golden-flowered *Diuris sulphurea*, it is very easy to transplant and makes a lovely clump in no time. Of course these are terrestrials and they should be planted in well-consolidated "earthy" pockets.

Regarding procurement of plants, they're all protected, but can usually be obtained from orchid suppliers or nurserymen, particularly those specialising in native plants or native orchids. Dodge the poor pathetic little scrappy piece however much you are tempted to give it a home, such pieces can take years to establish and flower and are often outright heartbreakers. Look for the strong compact, healthy, well set-up clump with plenty of root-base, in short a good, strong, forward-growing plant.

Just a few points again, because these cannot be over-emphasised, good drainage, full or nearly full sun, sheltered if possible from bad draughts and wild winds and very firmly jammed in or attached. Once you have your plants in do not be tempted or persuaded to tamper with them, leave them alone, if they grow over the top of each other, all the better. Most native plants, particularly native orchids, do not like disturbance of any kind. If it's a big stump inclined to be hollow at the top, jam a good solid piece in there also, it'll thrive.

If you follow these simple rules you will never regret starting a native orchid garden.

AUSTRALIAN ORCHIDS

We have in preparation for publication early in 1968 a book of the above title by A. W. Dockrill. The book will fully describe every species of epiphytic orchid native to Australia with a large full sketch of every species. In addition all the terrestrial orchids in the tropical regions of Australia will also be fully described and illustrated. As this represents hundreds of species the magnitude and importance of this work may be appreciated.

It is expected that this book will be available in October, 1968. Do not send orders or money until advised in our September 1968 issue. However I do need the help of photographers. It is intended to illustrate this book with numerous full colour plates. We are short of suitable colour slides, both 35 mm. and 2 inch square. The deadline for the availability of these colour slides has now been set at February 1968. If you have any colour slides of native orchids or can take some before this date, will you please forward them to R. Deane, 157 Beecroft Road, Cheltenham, N.S.W. They will be well cared for and those not to be used, returned promptly. Those to be used will be returned to you in March 1968.

Will all readers please support this marvellous venture.

COSMELIA R.Br.

by Betsy R. Jackes (Townsville University College)

An article in a series each describing the species in a genus of the plant family Epacridaceae.

A monotypic genus endemic to Western Australia particularly the environs of King George's Sound. Usually in wet swampy areas quite often in association with *Lysinema lasianthum*. *Cosmelia rubra* R.Br. is an erect glabrous shrub 0.5-2 m. high. The broad, sheathing leaf bases completely cover the branches. The broad, spreading leaves taper into a pungent point. The bracts which are similar to the leaves, form an involucre around the sepals. The striking, red flowers are solitary and terminate very short axillary branches. The flattened staminal filaments lightly adhere to the corolla-tube.



From T. E. GEORGE, Reservoir, Victoria:

This plant is a little gem. It should have been introduced into the garden long ago. I know it only from the first unforgettable meeting beside the lower Kalgan Road in W.A. It is a straggly little shrub but each stem has a few red, more than one inch long, tubes sticking out sideways and not hanging downwards as in *Astroma conostephioides* of western Victoria and the Grampians.

Editor's Note: I was not successful in getting a colour slide of this plant. Will a competent photographer please take a photograph during the next flowering season.

GROWING WILDFLOWERS

The objective of this publication is to assist the home gardener in the cultivation of our beautiful Australian flora in public and home gardens. Too much myth surrounds this very simple but rewarding hobby. Some wildflowers do indeed need special care as with many of the garden exotics but most will grow quite well under average garden conditions provided that the soil is not alkaline and is reasonably drained. Most errors are made with the watering of natives. They will give pleasure in your garden for many years with very little attention (pruning after flowering is usually essential so fill up the household vases when in flower) including watering, if this is done intelligently. The following article is commended for your study.—Editor.

THE ROOT AND THE SOIL

Author's Note: I have prepared this article firstly to explode the popular myth that "roots go searching for water"; secondly to confound a recent report that "tan-bark is no good as a mulch because it is too rich"; and thirdly, because I watch with a mixture of anger and amusement every year, people watering the surface of their gardens after a sunny day even in winter. I think they should be told what they are doing to harm the garden. There are probably many members also, who never water because of the popular myth that native plants should not be watered nor fertilised—W. M. Martin.

The nature of the root system of a plant, and the depth to which it extends vertically and laterally, depend upon such factors as the soil moisture, the soil air and temperature, and the physical nature of the soil. In general, the root systems of woody plants, such as trees, spread out laterally rather than penetrate deeply into the soil. The greatest number of roots is frequently found in the upper 4 ft. of soil. The depth of penetration may vary from 2 to 30 ft. The lateral extent is commonly greater than the spread of branches.

In an intensive study of the fibrous root system of winter rye, an important grain and forage plant, it was found that one plant 20 inches high, consisting of a clump of 80 shoots, had the extraordinary root system shown below.

Kind of Root	Number	Total Length in Feet
Main Roots	143	214
Branches of main roots (secondaries)	35,600	17,800
Branches of secondaries (tertiaries)	2,300,000	574,000
Branches of tertiary (quaternaries)	11,500,000	1,450,000
Total	14 million	2 million feet

The total surface area of these roots amounted to more than 2500 sq. ft., compared to an area of 51.4 sq. ft. of the 80 shoots with their 480 leaves.

ROOT STRUCTURE

The structure and growth of the root are in many ways like that of the stem. Growth in length results from extension in the zone of elongation. The cells in this zone elongate after absorbing soil solution. This zone of elongation merges rapidly into the zone of maturation, and within a short distance from the tip of a growing root, mature primary tissues are being formed. This zone is also approximately equal to the root-hair zone, which extends backwards several millimetres or centimetres, depending upon the root and its rate of growth.

The root hairs are specialized structures that aid in the work of absorption by increasing the root surface and the contact with soil particles. Land plants absorb water and solutes through the root hairs, by the epidermal cells between the root hairs, and by the cells in the zone of

elongation behind the root cap. The root hairs are so numerous, that an idea of their extent and number, will help in understanding how plants can obtain large amounts of water from soil that appears dry to the touch.

The rye plant previously mentioned had more than 14 billion root hairs with a total area of more than 4000 sq. ft.—equal to the floor space in three average houses. This, added to the roots proper, gave this grass plant a total area of 6500 sq. ft., about 130 times the total area of the shoots and leaves.

Root hairs increase the absorbing surface of a root system as much as 20 times. This intimate contact of root hairs and soil has a practical disadvantage to the gardener. In the process of transplanting, these root hairs are torn from the plant, greatly reducing the ability of the plant to absorb water.

The root hairs and other surfaces of the young root do not constitute the chief absorbing surfaces in all plants. Exceptions to this situation are found in a number of kind of plants in which the young active portions of the roots are invaded by specific soil fungi. The resulting association is intimate and complex, and the combination of root and fungus is termed a mycorrhiza (fungus root). Micorrhizal plants are very common, and include ferns, monocots, and dicots. The fungi are thought to digest some of the organic matter in the soil, and thus make nitrogen and minerals available to the plant, enabling the plants to grow in unfavourable soil conditions.

MINERAL ABSORPTION

Mineral salts are obtained from the soil by diffusion into the permeable young tissues near the root tip and in the root-hair region. The process is known as osmosis, and the minerals must be in solution. If the soil solution is of a greater concentration than the cell solution, then the cell will lose water to the outside soil solution, leading to a shrinkage of the cell. This process is known as plasmolysis. The wet cellulose walls of cells are readily permeable to most dissolved substances.

An understanding of the interactions between roots and the soil is an essential part of an understanding of plants. Soils vary in kind almost as much as the plants that live in them. It is the abode of many organisms, for here live bacteria, fungi, algae, protozoans, insects and worms of various kinds, from earthworms to microscopic nematodes.

SOIL TEXTURE

Soil contains materials in three states—solid, liquid and gaseous. The solid portion is composed of both inorganic and organic materials; the latter alive or dead. The solid inorganic material is composed of mineral particles classed as sand, silt and clay. Sand particles range in diameter from 2 to .02 millimetres, and silt from .02 to .002 mm. Particles less than .002 mm. (about one ten-thousandth of an inch) in diameter are classed as clay. The varying proportion of these materials determines the soil texture, and on this basis soils are divided into four large groups: sands, loams, silts and clays. A typical loam soil is one containing about 40% each of sand and silt and 20% of clay.

SOIL STRUCTURE

These fine particles in the soil are generally grouped into larger aggregates of varying size and form. The particles in the aggregates are joined together by compounds produced mainly by bacteria during the decay of organic material. The quantity and arrangement of these aggregates determines the soil structure.

Just as important as the solid portions of the soil, are the pore spaces between the aggregates. The size and shape of spaces are determined by the size and arrangement of the particles and aggregates. The pore spaces contain air or water, or both, and constitute between 30% and 60% of the soil volume. The ratio of air to water in the pore spaces greatly determines the suitability for plant growth. As roots respire like the other parts of plant, the amount of aeration in the soil is important. The aeration is determined by the sizes of the air spaces. In sandy soil the large pore spaces allow free movement of air and water, whereas in clay soils, which have microspores usually filled with water, the air movement is restricted. The addition of humus to sand increases the water holding capacity by the addition of the microspores in the humus, and the formation of better aggregates. In clay soil the humus increases the aggregation and forms larger pores favouring air movement.

THE SOIL WATER

The water in the soil could be classed as gravitational, capillary and hygroscopic. Much of the water added to the soil, seeps into the subsoil and becomes part of the ground water or drains away. This water, which the soil is unable to hold against gravity, is known as gravitational water. The movement of this water leaches out large quantities of soluble fertilizer, which is thus lost to plants. This water can be absorbed by roots; but is of little value as it drains away in a few hours.

The water held in the soil against gravity is capillary water. It fills the smaller pore spaces and is present as films around the larger particles. The capillary water can be classed as available and unavailable capillary water. After drainage has ceased after rain or irrigation, water may continue to move by capillary action, much as water will rise in a capillary glass tube. This movement may be downward, lateral or upward into drying surface soil. The upward movement tends to keep the surface soil moist. A dry soil surface is evidence that rapid capillary movement to the surface has ceased. As soil is dried by this movement the moisture films become thinner until the moisture columns break and capillary movement ceases. When the movement of free capillary water has ceased, and the soil surface is dry, the soil just below the surface contains an ideal level of moisture for the growth of most plants. The percentage of moisture in the soil at this point has been termed the field percentage.

The field percentage moisture level is the most important one for plants, and represents the effective storage capacity of typical soils. In the absence of plants, such moisture may be held in the soil for years. Plants will however absorb about half of this moisture.

Absorption is rapid at first, and then slows as the moisture films become thinner and the water is more strongly held on the surfaces of the soil particles. When these surface forces reach about 14 or 15 atmospheres, the remaining water becomes unavailable to plants. All growth stops, and the plant becomes wilted. The percentage of moisture in the soil at this point is called the permanent wilting percentage. Wilted plants will stay alive in this soil for a period that is a measure of their drought resistance.

The capillary water in the range between the field percentage and the permanent wilting percentage may be termed the available capillary water. The amount of water held in a particular soil at the field percentage or the permanent wilting percentage is determined by the soil texture. A clay

soil will hold about four times as much water in a form plants cannot use (the permanent wilting percentage); but also holds about four times as much that they can use (available capillary water). Unavailable capillary water is the water in the range between the permanent wilting percentage and the hygroscopic water. The latter is the remaining water in air-dry soil, and has no significance to plant life.

It has been shown that there is essentially no movement of available capillary water. During periods of high transpiration, the water in the immediate vicinity of the roots is removed so rapidly, that each absorbing root becomes surrounded by a layer of dry soil. Since water does not move appreciably in the moist soil in which plants grow; continued moisture absorption by the roots depends upon the growth of roots into new areas of soil. These roots grow, not in search of moisture, but because local conditions of moisture and aeration are favourable to their growth. Roots will not grow through even a thin layer of soil at the permanent wilting percentage; but will grow wherever available moisture occurs.

The practice of cultivation to produce a dust mulch has been generally abandoned. A considerable amount of water has already been evaporated by the time soil is dry enough for cultivation, and as the surface dries, capillary movement ceases, and a layer of dry soil, through which water does not move by capillarity is thus produced without the aid of cultivation. The soil may lose water by evaporation; but this loss is greatly exceeded by the water removed by roots and, transpired by the leaves. Plants remove water stored in the deeper layer of the soil beyond the reach of surface evaporation.

Garden Preparation for Summer

There are two main aims in preparing the garden for summer. Firstly to take greatest advantage of what rain may fall, and what little artificial watering we are allowed, so that the maximum amount can be absorbed by the soil. Secondly, to reduce evaporation from the soil, and transpiration from the leaves of the plants so that the plants will get maximum benefit from the soil moisture content.

For those who have truly a "bit of bush at your door" most of the problems are solved naturally; but for most of us who retain a little more formal attitude and beds of "specimen" plants then artificial means must be resorted to.

In the bush, the drying winds are considerably cooled in passing through the larger trees, so that smaller plants in the open on the lee side of these larger trees, are somewhat protected from the transpiration effects of hot winds, which are considerable. If at the same time they are also in partial or broken sunlight, they are also protected from direct radiation heat.

This natural protection can be reproduced in the garden by planting suitable larger windbreak trees, preferably Eucalypts and Casuarinas and the like on the prevailing wind side of block. If the windward side of block also happens to be the north side, then care must be taken to restrict the height of trees to reduce shade over the whole garden. Many Eucalypts, Casuarinas and some Wattles are particularly suitable as they are of an open structure which will allow sufficient light and sun through for good

growth. Not more than 60% obstruction should be offered else serious damage could occur during gales, and humid unpleasant conditions will prevail without sufficient light airs across the block in calm weather. In about five years from planting these trees will have produced a natural litter which will be a good catchment area for rain or artificial watering, and will almost totally inhibit the growth of weeds which transpire a considerable amount of soil moisture.

For the open areas of the garden we must insulate the soil surface from hot drying winds and direct sun, at the same time inhibit weed growth and provide an absorbent surface which will aid in water absorption by preventing run-off, holding water to the surface soil. Most native plants have deep roots which will sustain them under drought conditions; but most of the feeding roots are in the upper layers, and if we want our plants to look their best, we must maintain the soil moisture content above the wilting percentage, in the upper foot or more. If we can maintain the top surface moist by preventing evaporation, then we will prevent losses by capillary movement from lower in the soil.

Although dust mulches are no longer in use, other mulches of straw, shavings, manure, leaves, etc., reduce surface evaporation, and retard weed growth. They also protect the soil from the impact of rain, thus keeping the surface porous and increasing the absorption of rain.

Roots will grow upwards into any surface layer if moisture is sufficient. This is the explanation of roots growing into tan-bark mulch which holds water well. I have observed the roots of a Silky Oak growing up two feet into a heap of sub-soil temporarily stored under the tree; and the roots of any plant can be observed just under the surface of any lawn nearby.

Watering—There is no doubt that many gardeners get a wonderful psychological kick out of seeing the whole garden fresh and damp from a quick watering at the end of a hot summer day. However, the temptation must be firmly resisted, as this will do considerable harm. During good seasons, the harm may not be very apparent; but the roots are being "drawn up" to the surface by these light waterings, and when periods of drought arrive, the plants will undoubtedly succumb.

The ground must be thoroughly moistened beyond the main root zone. This means doing a section of garden each day within the time available, so that each section is on a weekly cycle or thereabouts, which will be adequate. If water restrictions are prohibitive, then lawns and annuals must be neglected in favour of the foundation shrubs which are harder and slower to establish.

There is no doubt that most gardeners overwater in times of plenty, so members should rest assured, that with a little intelligent help, their gardens should survive the summer drought.

Editor's Note: This article will be continued in our next issue where the use of mulches will be described. For those who want to act immediately, previous issues 12 and 13 recommend what to use.

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GROWING WILDFLOWERS — TREES

While the following article was written with Eucalypts in mind the advice given by an obviously competent and experienced gardener is of special interest to all of us who wish to grow shrubs and small trees to best advantage. Also the fact that it is not written by an Australian but a commercial grower in a cold country, carries not only a lesson in the adaptability of our flora but an appreciate look from outside at a natural beauty too many of us do not fully appreciate.

SOME GARDEN EUCALYPTS by Richard C. Barnard.

Reprinted from Vol. XCI, Part 5 issue of the "Journal of the Royal Horticultural Society, England" with permission—Part IV of a series in Australian Plants on Eucalypts.

PLANTING OUT YOUNG TREES

There is no doubt that one of the commonest causes of failures in this country has been the use of planting stock which is too old and too large. Such plants must have incurred root damage, root restriction or both. The harmful effects may become apparent in a few months or not for a few years but such plants are variable in performance and unreliable as regards survival. They rarely, if ever, have the vigour of young seedlings planted in summer. There is no point in planting a 3 feet to 6 feet tall tree when a 6 to 12 inch seedling can reach 12 to 18 feet in 3 years and 40 feet in 8 to 10 years as some of mine have done here, and is much more likely to survive.

Having a fertile soil and knowing that an excessively rich soil can cause unbalanced growth or even prove lethal, I used to recommend that no fertilizers should be added prior to planting. It has become evident that seedling eucalypts need adequate supplies of nitrogen as well as moisture to make good growth. On infertile sites, hoof and horn or bone-meal should be added and if the site is dry (sandy or on a bank) moist peat or leaf-mould should also be mixed in. It is not known whether dung has a beneficial or harmful effect. Eucalypts are known to grow well in all soil types, acid and alkaline, but are considered intolerant of very wet conditions.

Choice of planting sites is worth some thought. Eucalypts are so beautiful that they are a delight to sit and look at and to see several times a day. The first essential is full overhead light and as much sunlight as possible. Many eucalypts have been planted near tall trees (presumably for shelter or frost protection) from which they grow away towards the light. Shoots will be "drawn" and leaf colour poor compared with those in full light and they will suffer from drought and competition from the established trees. Shelter from prevailing gales is desirable, though not always possible, but avoid spots where winds accelerate through gaps, as in a hedge and between buildings. Put the very glaucous-leaved species where they will be seen with morning dew and sun on them or against a dark background and those to be annually pruned for their colourful young growing shoots where they will be seen with the evening summer sun shining through them and the leaves will glow like jewels. The pale or blotched bark of trees with deciduous outer bark stands out conspicuously in every situation.

My commercial plantations were first made in cultivated soil, then either grassed down for species grown on a "leg" or mulched with straw for those cut back to ground level annually. Later I sowed grass seed first and planted the following year, killing the grass at the planting spot with paraquat in advance. The planting hole was made just large enough to take the plant and firm the back-fill with the finger tips. On poorer soils cultivation in advance, incorporating hoof and horn or bone-meal and peat or

leaf-mould, and breaking up the sub-soil if heavy clay or chalk is advisable. The soil must be firm and moist when planting.

Eucalypts should always be planted deep, i.e. the top of the ball of soil should be $1\frac{1}{2}$ inches below the level of the surrounding ground. Leave a depression about 1 foot diameter to facilitate watering and fill up level before winter. This will protect the lignotuber, a basal swelling which develops at about cotyledon level, which will produce new shoots in the event of any catastrophe killing the above-ground parts of the plant.

It is essential that the ball of soil is thoroughly moist when planting any container-grown plant and particularly important in summer with plants in active growth. The plants can only draw moisture from the ball of soil until their roots have grown into the surrounding soil and, if dry when planted, it does not take up moisture from the surrounding soil. I now make it a standard practice to plunge pots in a bucket of water until most bubbling stops, allow to drain, then plant and water thoroughly ($\frac{1}{2}$ gallon per plant if hot and sunny). If no good rainfall follows planting, daily watering is necessary for 10-14 days to keep the ball of soil moist until the plant's roots have grown into the surrounding soil. If the soft tips to the shoots show signs of wilting, water without delay. If they wilt beyond a certain point, the tips will die and the plant be checked though new shoots will develop from below the dead shoots.

CARE OF THE YOUNG TREES

The single stake close to the stem which is customarily used to support newly planted trees is not suitable for eucalypts which grow so rapidly at the base that they are soon pressing against such a stake and removal without damage is difficult. Strong durable stakes should be put in not less than 1 foot from the plant, two at least and preferably three equidistant stakes are required to which a temporary cane close to the plant is secured at the top by wire or strong twine. The eucalypt is tied to the cane whilst young (sweet-pea rings are suitable until autumn gales are due) and later to the stakes, removing the cane. It is of the greatest importance that the young tree should not rock at the base in gales and if the tree and stakes start rocking the latter must be strengthened. Plants which are to be cut back in the second year will not need such strong staking as those to be grown as a tree. The three equidistant stakes also serve as a useful framework for winter protection during the first winter and to support the new shoots of cut-back plants for a year or two.

Regular attention to ties is important or "strangling" will soon take place with rapid growth. Discarded nylon stockings are excellent either cut in sections for small trees or whole on larger. It is an advantage to have conspicuous ties which can easily be found as renewal two or three times a year is needed on the fastest growers (over 3 inches girth increment annually has occurred here).

The growth of young saplings can be seriously checked by root competition, particularly during the first growing season. Keep a 2 foot radius round plants free of weeds for the first 2 years by hand weeding. Do not fork or hoe near young eucalypts as they are intolerant of root damage and the effects may be long lasting.

I have never given any eucalypts winter protection, until this (1965-6) winter, to test seedling hardiness. I am now giving protection to seedlings of

a few very beautiful species which have shown under trials that they may be killed or killed to ground level as seedlings by 10-12 F. of frost (20-22 F. at 3 feet above ground level on an unscreened thermometer). I am using a 3-inch deep basal mulch of bracken and a pair of up-ended low-barn cloches tied together with no overhead cover. A hessian screen would do as well. Seedlings under 1 year old are definitely less frost-resistant than in their second winter and, to avoid disappointment, protection is recommended. My first experimental commercial plantation was made with ten plants each of twelve different species of high altitude provenances, sown in April-May 1958 and planted out in August. By the following April only four species (*E. niphophilla*, *E. perriniana*, *E. pauciflora nana* and *gunnii*) were live above ground. All but two species (*E. stellulata* and *E. dives*) recovered from basal shoots 100 per cent, except *E. rubida*, 70 per cent. By the end of the summer there was little to choose between the ten surviving species as regards healthy appearance. None suffered any more than slight leaf "scorch" in subsequent winters until 1962-3 though most were "stripped" of all saleable shoots every winter for cut-foliage and cut back to near ground level or a short "leg" every spring. The other species were *E. aggregata*, *E. parvifolia*, *E. pauciflora*, *E. pulverulenta* and *E. dalrympleana*.

Eucalypts once through their first winter need attention only to keep them free from weeds in the second growing season and the renewal of ties for 4 to 5 years. Pruning is difficult to explain and is discussed later.

PEST CONTROL

Only one pest and one disease appear to be important. The pest is the Blue Gum Psylla (*Ctenarytaina eucalypti* Mask), a sap-sucking insect which I have found on seedlings all over this country. As it feeds only on eucalypts, eggs must be imported with seed. It feeds on the very young shoot ends and forms silky white filaments. The only harm done has been to distort or weaken the tips of shoots of the very glaucous species while at the juvenile leaf stage. The insect's life cycle is very short and multiplication very rapid, particularly in late summer when winter egg-laying starts. Frequent applications of DDT or Malathion dusts are necessary for control and are more effective than spraying owing to the water-repellant nature of the glaucous bloom on the leaves. It is no doubt present, but appears to do no harm, on eucalypts which have reached the adult leaf stage. The green potato-aphis is occasionally found in large numbers on an odd shoot or plant and a caterpillar of the Satin Moth has twice been found eating *E. gunnii* leaves.

Eucalypts are known to be attacked by the "Silver Leaf Disease" (*Stereum purpureum*), a wound parasite which can only gain entry through wood exposed by pruning or injury. My cut-foliage plants offer plenty of opportunities to the fungus and some plants have been infected though diagnosis is very difficult. None of my trees have been attacked and, if wood exposed by pruning and injury is painted with tree-wound paint, infection is unlikely.

This article on Eucalypts is to be continued.

Editor's Note: This problem of pest control is a very real one in a few isolated cases, and over emphasised in most others. On the next page the use of chemical sprays are mentioned but I refer readers for comments on the above paragraph "Pest Control" and other pesticides to the article on page 218.

PEST CONTROL WITH CHEMICALS

Editor's Note: This publication does not support the control of pests by the use of chemicals. Our policy is ably defended by Mrs. B. Salter on page 218 and by her comments on articles below on pp. 219. In previous issues we have described how you can attract the native birds to your garden and if you do this you have controlled (not eliminated, see page pp. 220) your pest situation. Some readers have had troubles with pests on their eucalypts and their methods of control are given for those who want the other side of the picture. I urge readers to read the articles on pages 217 and 218 then try the methods given in previous issues nos. 25, 26 and 27 first.

FROM W. E. GILES, *Springside, via Orange:*

I have found *Metasystox*, one of the systematic sprays, satisfactory for the control of the scale that occasionally gives trouble in Eucalypts at Spring-side. This particular pest forms tightly packed colonies on the branchlets. Results are not spectacular as the dessication of the juicy bodies is slow and their total disappearance may take several months, but the small black ants always in attendance usually forsake them soon after spraying. It seems advisable to give a second spraying a week or two after the first. At the same time it also controls other sap-sucking pests like gall midges, which are hard to reach with contact sprays. Other systematics, e.g., Rogor 40, are probably equally effective applied during the growing season.

Unfortunately the insect enemies of Eucalypts are legion. Probably the most devastating here is the large scarab known as the Christmas beetle, because of its appearance in summer. Fortunately it is susceptible to most sprays, even our old friend D.D.T., although in seasons of prolonged activity such as this, more than one spraying must be given for control.

FROM J. TWYFORD, *Thornleigh:*

An entomologist friend advises the following spray for control of the gum tree scale, a sap sucking bug of the order Hemiptera:-

White oil 2 ozs., Malathion (25%) dispersible powder to one gallon of water. Spray liberally.

Ants attracted by the scale insects should be controlled by the use of Chloroane or Dieldrin at the base of the tree, as the ants repel the predators that attack the scale insects.

In some cases it may be advisable to give the tree some fertiliser in addition to the above treatment, to increase its general vigour.

FROM FRANK ROWE, *Charmhaven, N.S.W.*

My *Eucalyptus andreana*, 5 years old, ten feet high, were completely defoliated by a red spider—15 trees in all. My *Acacia baileyana* were killed outright, five trees, by borers. My *Tristania conferta* were riddled with holes big enough to insert a pencil. My *Eucalyptus ficifolia* were being bled to death by an insect popularly known as "ant cows." My *Grevillea banksii* were dried out by white scale.

Not a bird or an edible insect in sight. I did my block and bought a large quantity of Rogor and sprayed the place inside out. The result is healthy trees and plenty of flower. Having got rid of some of my more destructive pests, other insects—spiders, daddy long legs, etc., are coming back and so are the birds.

The fact that destructive insects keep coming back to the same place, even the one tree sometimes. In the bush this doesn't matter, there are trees elsewhere, but if you want to grow this tree in this place you must use insecticides.

PESTS ON NATIVE PLANTS

Pests and diseases are not usually a trouble to the grower of native plants in Australia. The balance of nature is a real if complicated thing. Over-multiplication of anything in nature is controlled by the consequent growth of something that preys on it.

Concern at the upsetting of the balance of nature and the unintentional destruction of birds and small mammals has been widely expressed of late in England in the *New Scientist* and in America in a leader in the *Saturday Evening Post* and other magazines. The famous science author Rachel Carson has published a book on the subject.

Chemical pesticides are not exactly a modern development. Tobacco juice (not nicotine sulphate) has been used for many years for sucking insects as a contact poison and arsenate of lead for chewing insects. These do not lead to resistance. The modern chemicals began with D.D.T. This was first used against mosquitoes but it was soon found that it killed almost all insects. Very soon the resistance problem became important and since then it has been a race between the ingenuity of the chemists and the resourcefulness of nature in developing resistance in insects.

The result is an increasing complexity of chemical products to kill insects, snails, fungi and plants. Some are fairly harmless but some, as parathion and the deadly organic mercury fungicides, are very dangerous to the human users.

The important thing is that they kill not only the pest they are aimed at, but all sorts of other things as well. There are many instances here. The plague of houseflies in the last few years has been encouraged by the destruction of Robber flies (*Asilidae*) which attack the adults and of predatory larva-eating beetles which have been destroyed by D.D.T. aimed at pasture grubs. "Lerp" insects (*Psyllidae*) did enormous damage to natural gums a few years ago, and it was noticeable that this began near orchards where D.D.T. had been used to control codlin moth. "Lerp" are controlled in nature like aphids, by ladybird beetles and lacewings and their relatives (*Neuroptera*).

D.D.T. kills insects as a nerve poison, makes them wobbly and they die slowly. They are then easily captured and eaten by birds and it has been proved that birds eating such poisoned insects tend to lay infertile eggs; and birds are essential in insect control.

The commoner pests seen on native plants are scale insects on gums and other plants. These are often protected by wax or lac coats and are not affected by chemicals but are attacked by parasites.

There are many kinds of caterpillars of moths and butterflies but these are only truly destructive on plants out of their normal environment. *Eucalyptus macrocarpa* is notoriously susceptible and I have had *Hakea multilinea* damaged in Adelaide where it would not be in its proper environment. Even the large boring grubs, ghost moths, longicars beetles etc. have their parasites (usually Tachinid flies) even though the black cookatoo no longer haunts the suburbs.

It may be said that the only chemicals free of the risk of upsetting the balance of nature are arsenate of lead against caterpillars and metaldehyde for snails (which are an introduced pest).

PESTICIDES AND WILDLIFE

By Roy Wheeler and Barbara Salter

Many of you have read Rachel Carson's book "Silent Spring", a best seller, a book on the dangers of synthetic pesticides. It caused a public sensation and provoked a furious controversy in the United States and other parts of the world when published in 1962.

Some big industrial chemists declared, that her opinion, that the long-lasting residues of synthetic pesticides were a greater menace to life and health than nuclear fall-out, was classed as "sentimental rubbish" and uninformed rot."

Reaction to Miss Carson's book was so strong that President Kennedy asked for a special report from his Scientific Advisory Committee. After a thorough investigation the committee brought in a shock verdict in May, 1963. It found that many of Miss Carson's basic allegations were justified and recommended an intensive long term study by Government scientists to the effects of pesticides on human and animal health.

It took Miss Carson four and a half years' research in America, Great Britain and other parts of the world to gather the material for "Silent Spring". The story is not a pretty one, in fact it deeply shocks most readers. The unrestricted use of toxic pesticides in America alone, wiped out whole wildlife communities. The sprays and pesticides were used in most cases to destroy a certain pest and with no thought of the side-effects, long term or otherwise, or the reaction that would follow the breaking of the ecological chains that is so apparent in all things belonging to nature. Bird-life suffered just as much as the rest of the wildlife, particularly the fish, and it will take years—if ever in some cases—of careful nursing and watching to bring back these wildlife communities to what they were before the thoughtless onslaught.

We don't want this to happen here in Australia, but we have evidence that this has already started. The gradual reduction in our wildlife is going on all the time by the unrestricted use of toxic pesticides, and we must do something now if we are to stop this tide of destruction to our wildlife.

Up to 1962 I was not aware of any effect which poisonous pesticides might have had on my birds. In actual fact, my records show that in winter 1959, a number of White-plumed and Yellow-faced Honeyeaters died from what I then thought was disease. I had no knowledge of pesticides in those days, but a record of their symptoms made at that time tallies exactly with those of what I now know to be pesticide poisoning. The Yellow-faced Honeyeaters were the earliest recognised victims; I found birds staggering about the garden, blundering into obstacles, unable to land or to remain perched, falling to the ground, screaming and in convulsion. I tried bringing them indoors, keeping them warm, feeding them with nectar, raw egg, brandy, gin, Disprin, but always they died, in great distress. From the flock of 50 to 60, 20 died in the winter of 1963, just in the garden; several have died each succeeding year and now only a dozen birds remain. As their numbers have never built up again, I assume that the species has been decimated in the bush also; they come to the garden only from March to September, and it is possible that they pick up the poison in their "other" home, possibly the Mornington Peninsula where there are many orchards which are sprayed at frequent intervals.

Some birds from each species have died every year. During one terrible week in June, 1965, twelve Spiny-cheeked Honeyeaters died; their cries of agony in convulsions were so loud that even non-bird-conscious neighbours were perturbed! These birds come from some inland area to spend the winter in the milder bayside region; and from a maximum total of about 60, their numbers are now reduced to 25. In 1966, it was the turn of the Little Wattlebirds, and between May and July, 33 died; from a maximum of about 60 birds, only 15 now remain. This species is a local resident, and picks up the poison in this district; they are very keen on hawking for insects, particularly flying ants, and in the autumn when the ants swarm, I watch with horror as the birds catch them, for inevitably a spate of deaths will follow. White-plumed Honeyeaters were formerly a common resident species, and they nested in the garden. Each year four to five had died from pesticide, and at this time (July 1967) we are reduced to two which I sincerely hope are of opposite sexes.

Red Wattlebirds, being the largest and toughest, require a larger dose of poison before they die, and so in spite of several dying each winter, they are still reasonably common, and are indeed by far the most numerous honey-eater species now surviving.

The estimated total of birds feeding in the garden during the winter of 1967 now stands at 80. The reason for this decline is not destruction of habitat by the spread of the city, for little local change has occurred in the past five years, and the golf courses still remain (with extensive new plantings of eucalypts and other native shrubs thereon); the reason mainly lies in the slaughter of native birds by pesticides, and I estimate that at least 20 per cent of my honeyeaters die annually, between April and September from this cause. So far this year (July) in spite of the unusually mild winter, 26 birds of five species have died.

Since 1964, the bodies of a considerable number of honeyeaters have been supplied to the Fisheries and Wildlife Department, for analysis. The Department has reported that all bodies examined contained a very high concentration of Dieldrin; one sick White-plumed supplied to them, died after displaying symptoms which were considered to have been caused by organochlorine (pesticide) poisoning.

BIRDS DEFENDED

Barbara Salter does battle with the authors advocating chemicals for pest control on pages 215 and 216.

The basic fact in using these modern toxic sprays is that they do not solve the problem—they may temporarily alleviate it, but it is certain that the pest will return, with increased resistance, and in greater numbers (because its predators will have been wiped out); thus more, and stronger, sprays must be used, and the vicious circle becomes ever more vicious.

There is a mania among gardeners, even amongst native plant growers, to remove EVERY insect which appears on their trees and shrubs. WHY? The vast majority of insects are useful, so why destroy them in the effort to remove the small minority of pests? Every living thing is preyed on by some other living thing, therefore every insect has a vital part in the overall natural scheme.

The two methods given for the control of pests on eucalypts are exceedingly harmful. "Our old friend D.D.T." is, of course, deadly to insect, fish, bird, animal and man. Pests sprayed with it become bigger,

stronger, and more pestiferous, but birds who eat the sprayed insects are so affected that their eggs are infertile. Malathion is one of the most highly toxic organophosphorus compounds. Chlordane and Dieldrin are chlorinated hydrocarbons and are very highly toxic. Metasystox is a highly toxic organophosphorus compound. How anyone can use these substances is beyond my comprehension.

Mr. Frank Rowe, no doubt, uses Malathion and similar sprays in his garden, which would account for the Red Spider damage, the insect which normally keeps the Red Spider in check having been wiped out by his sprays. "I did my block and bought a large quantity of Rogor and sprayed the place inside out" . . . Of course, the immediate result is the death of ALL insects (as he implies, by saying that spiders etc. are coming back!), and of the birds and other creatures who eat these insects (but he hasn't bothered to observe this fact). He doesn't yet mention, or he is not yet aware of, the next move in this deadly game—the RETURN of his pests in even greater numbers, but he does refer to "the fact that destructive insects keep coming back to the same place" so one may draw the conclusion that he is a man dedicated to the use of sprays, and the hell with posterity.

PEST CONTROL OF EUCALYPTS, see page 215. The author writes his awareness of the harm done by the modern pesticides, upsetting of the balance of nature, etc.—and yet he then goes on to ADVOCATE the use of "frequent applications of DDT or Malathion dusts!" Of course, it is most probable that in England few birds are attracted to the Eucalypts as exotic plants. Here, the Eucalypt is the most important of all native plants in the balance of nature. What a variety of insects, of birds, and of native mammals, it feeds and houses! Left alone, it will withstand any "explosion" of any insect species which may, to the ignorant eye, appear to be harming it. Cover it with sprays, and you will be signing the death warrant, not only of all those insects, birds and mammals, but also of the Eucalypt. Hence the "explosions" in recent years, in our forests, of such insects as the Lerp, Phasmid etc.—which have followed on the introduction of widespread aerial spraying of pesticides.

PEST CONTROL BY CHEMICALS IF YOU MUST

Regarding the final paragraph on page 217 which refers to "safe" pesticides. Arsenate of lead sprayed on caterpillars can kill birds which eat those caterpillars, but at least it is not cumulative nor persistent. Why did he not mention Pyrethrum and Derris, which are harmless to all but pests? And the Dinitro compounds, which are of very low toxicity? A mixture of white oil and Bordeaux Powder will effectively deal with scale on Eucalypts, Correas, Leptospermums, etc.

INSECTS ARE USEFUL

Ants are useful, in removing rubbish and taking it underground where it will improve the soil—so why race for the Dieldrin every time you see an ant? Australian plants are part of the Australian natural world WHICH INCLUDES INSECTS: attack the insects, and you upset the balance of that whole world. In our ignorance, we condemn any creature of which we do not "approve", basing our judgment on superficial premises. Can we not attempt to encourage, rather, tolerance and an attempt to comprehend the whole complex natural world?

"Field List of Birds of Queensland's South-east Corner" by Robin Ellis.

Available from Robin Ellis, "Midyim", Orvieto Tce., Caloundra, Qld., 4551 for 25c plus 5c postage.

CHEIRANTHERA

A "CLIMBER" FOR SMALL GARDENS BY C. F. DAVIES

I found *Cheiranthra filifolia* growing in the Darling Ranges, W.A., up past Wooroloo. It is a climbing plant growing in fairly heavy soil. In my garden in sandy loam it is climbing all over some twigs to two feet high. It does not seem to grow above three feet high on bushes, but branches out. It is doing well in a fairly sunny position and flowers freely.



Photography by C. F. Davies.

CHEIRANTHERA FILIFOLIA

Cheiranthra linearis, the eastern "Finger-flower", is similar to the above western species except that the leaves are flattened, not terete as above, and there are several flowers per inflorescence. It is a small shrub with branches 6-12 ins. long.

THE GENUS CHEIRANTHERA—Notes supplied by R. D. Royce, Govt. Botanist, W.A.

Cheiranthra filifolia Turcz. is widely distributed in the southern half of Western Australia occurring as far north as the Murchison River and extending eastwards to Coolgardie and Norseman. It is a straggling plant and grows to a height of 4-5 feet in most soil types. The leaves are terete, up to two inches in length, and the flowers are usually clustered. A short-leaved form, the variety *brevifolia* (F. Muell.) Benth has been described from the Cranbrook-Mt. Barker district.

Cheiranthra parviflora Benth. differs from the more common species in having broad flat leaves and with flowers borne singly on long pedicels. It is of a similar straggling habit of growth to *C. filifolia* but is restricted to the sandy and gravelly soils of the western agricultural and coastal areas from Three Springs in the north to Busselton in the south.

Cheiranthra preissiana Putterl. closely resembles *C. parviflora* and is considered by some to be no more than a form of that species. The only difference between the two plants is the densely hairy leaves of *C. preissiana*. It is known only from the forest country to the west of the Albany railway line from York in the North to the Bowelling-Dwarda district in the south.

THE GENUS SOLLYA

A genus in the family Pittosporaceae with blue flowers similar to *Cheiranthra* but bell-shaped.

SOME NATIVE CLIMBERS—Further notes by A. E. Brooks.

The Australian Blue-bell (*Sollya fusiformis* syn. *S. heterophylla*) is still another member of the Pittosporum family. It will grow vigorously on an old tree stump or fence to a height of ten feet or more and has compact dark green foliage and small but attractive drooping clusters of flowers, which vary in colour from light to dark blue.

Of the other two species *S. parviflora* is a twining plant with only 1 to 3 flowers in each cluster but *S. erecta* is a small shrub and can be pruned to be a compact little bush.

SOLLYA FUSIFORMIS syn. S. HETEROPHYLLA

A note by Ross Doig, Turramurra, N.S.W.

This is one of the few natives to be tamed for a considerable length of time, appearing in some N.S.W. plant nurseries devoted to exotics. Yet little seems to be written about it under garden conditions and this is somewhat surprising. Herewith my experiences with this species.

Sollya is readily grown from seed which is set in great quantity. One of the sticky fruits alone must contain in excess of fifty seeds. Two years after the death of my only plant from Armillaria root rot small seedlings began appearing in various spots in the garden, until at least twenty separate plants had to be removed, a number potted up and several transferred to new positions. Cuttings strike readily, as there is an abundance of new growth at most times of the year.

As a garden subject *Sollya* can be thoroughly recommended for it is hardy in most soils, remains a very fresh green all the year and is attractive when in flower and later when the pendant fruits hang in clusters from leaf axils. It may be allowed to straggle as a ground cover without becoming too large, can be safely pruned to any shape one wishes and will not rise more than a foot in height from ground level. Or it can be encouraged to climb through other tall shrubs, for example the specimen I have allowed to climb into *Melaleuca armillaris* would be eight feet high and presenting a wall of foliage at least four feet across in three years of growth from seed, even after three fairly savage prunings with hedge clippers.

Mention above of Armillaria root rot would seem to indicate that in a humid climate (as for example Sydney) it is best not to plant this species to climb over a rotting stump where moisture is constant and fungi grow. A second stump which forms a basis for *Sollya* is in full sun, the soil is built up with sand and although moist, drainage is assured. No trouble has been experienced in two and a half years.

NATIVE LILAC

HARDENBERGIA VIOLACEA by Fred Hall

Distribution: All States except W.A.—Colour plate on page 224.

Flowering Period: July to November depending on climate.

Flower Colour: Lilac to blue-violet, pink and white.

Leaves: Ovate to lanceolate 2" to 4" long, dark green above, glaucous below.

Type of Growth: Twining under shrubs.

Soil Types: Acid to alkaline—light sand to heavy clay soil.

How Propagated: From seed.

This plant is tough, plant it where you will, there is hardly a place that it will not grow. It will take from full sun to shade and frosts or winds do not burn the plants. Planted against a fence, trellis or tree it will soon cover and form a screen, very useful for hiding the wood heap, etc.

Planted as a specimen it can be kept to a neat shrub 5 to 6 feet high by clipping back each year. What does it look like? An evergreen, carrying its dark green leaves throughout the year. The flowers are in racemes of up to 30 flowers, growing from the leaf axils and appearing from July till late October and early November. The pink and white varieties are very attractive as the blooms are more conspicuous among the dark foliage. These two forms are more shrubby than the blue variety, particularly the white form.

We grow the three forms at Tea Tree Gully, 12 miles N.E. of Adelaide at the foot of the ranges, where the soil is light sandy loam over clay, slightly acid. Rainfall is 24" a year mostly falling April to October, the summer being hot and dry. Some frost, mostly light to moderate is encountered without ill-effect. During the summer months gully winds batter the plants, without any harmful effects.

Hardenbergia growing naturally without summer water, seem to dry out and lose their dark green colour, sometimes appearing near dead, but with a good rain they soon regain their vigour. If garden plants are given a small amount of water during summer they remain healthy and vigorous. Plants grown from local seed and planted in the mid-north of S.A. in 15" rainfall country with alkaline soil are thriving.

PROPAGATION OF PEA FLOWERED PLANTS

Seed is sown in the spring, the seed being very hard needs to be treated by either one of the following 3 methods:—

- (1) Nicking with a knife or file.
- (2) Rubbing gently between 2 pieces of fine sand paper (Don't rub hard enough to rub the outer coat right off).
- (3) Placing in a cup and pouring hot water over seeds (The seed that swell can be planted immediately, the remainder being retreated).

Seed can be sown in pots, pans, or in the place where they are to grow. Seedlings need to be pricked out into individual containers or the open ground with as little root disturbance as possible, as too much root disturbance especially in large plants seems to give the plants a check that takes some time to overcome.

So if you want to grow something that is easy and long lasting, try some *Hardenbergias*.

HARDENBERGIA VIOLACEAE

A very hardy easily grown climber or ground cover plant. Reference is made to this plant on page 200 and a full description and details of its cultivation are given on page 223.



Block loaned by the South Australian Museum with the permission of A. M. Ashby.

A note from the N.S.W. Govt. Botanist to clarify naming this plant.

Hardenbergia violacea is a very polymorphic species according to Stearn in Journ. Bot., Brit. & Foreign, Vol. 78 (1940) 70-71, *Hardenbergia violacea* (Schreev.) Stearn is found in Tasmania, Victoria, New South Wales, South Australia and Queensland. *H. monophylla* (Vent.) Benth. is cited as a synonym. Stearn also stated that there are 2 colour-forms f. *alba* (with white flowers) and f. *rosea* (with pink flowers) in gardens.

EUCALYPTUS FICIFOLIA

by Dr. J. S. Beard, Director, Kings Park, Perth, W.A.

An account of this species was given in Vol. 2, No. 14 of this journal, when it was shown that trees were severely attacked by a canker disease when planted in Western Australia outside the natural range of the species. Work done by the Government Pathologist, Mr. Cass-Smith, had led to the conclusion that one tree in King's Park was probably naturally immune to the disease, but that this immunity was only passed on to progeny in a minute per cent of cases. Vegetative propagation was therefore indicated, but is extremely difficult in the genus *Eucalyptus*. The rooting of cuttings is normally impossible, but in 1963 it was decided to try tip-grafting of material of the reputedly disease-resistant tree onto stock of *E. calophylla*,

a closely related species.

This was attempted at King's Park by Mr. E. Wittwer on 48 plants in April-May 1963, and successful union was obtained in only 7 cases. These seven plants were grown on in the nursery and were planted out in the open in April 1965, when two died. The scion later died out in one other, leaving five plants of which at the time of writing three have grown to 8 ft. in height and are flowering with bril-



liant scarlet blooms (proof that it is the scion which is flowering). The one other has been broken but above the graft, so will grow up and flower also. The trees have tended to be somewhat too heavy in the crown and have had to be pruned.

THE GRAFTING TECHNIQUE

The technique employed was as follows, the work being done in April-May when the buds on the scion were still dormant. Well-grown spring sown seedlings of *E. calophylla* are decapitated about 6-8 inches above the lignotuber and split down for an inch from the top. The scions are taken from young (seasonal) firm wood and cut to leave only a few nodes (mostly only two); the leaf blades have to be cut off but the petioles are left attached. The base of the scion is cut wedge-shaped and inserted into the split. The graft is bound with raffia or polythene tape and sealed with grafting wax. The grafted plants need protection for the first 2-3 months and are best kept in an unheated glasshouse. Before planting out the trees must be well hardened off.

It can now be said after four years that the four surviving plants have been successfully grafted. There is no readily visible sign of the union and so far no sign of any disparity in the growth of stock and scion.

CREEPERS FROM THE NORTH

CREEPERS FOR SEASIDE—continued from page 199.

or for artistic display. The fern-like leaves are quite attractive but fold up at night. Though a slow starter in Bundaberg it climbs rampantly once it gets going. After soaking the seed, plant it where you want the plant to grow either in partial shade or full sun. This is the only native species in the genus *Abrus* belonging to the family *Papilionaceae*, *Leguminosae*.

Hoya australis is an excellent creeping plant for partial shade. It has succulent leaves and clusters of highly-scented white flowers. It grows so easily from cuttings that no preparation is needed, just break off a rooted piece of the plant and put it in the ground where you want it to grow. If it is grown over rocks in sunlight, the leaves become very leathery, and the flowers more numerous. If it is climbing in partial shade (i.e. up a tree) the flowers are less numerous but the young leaves are a most brilliant scarlet.

Carpobrotus glaucescens (Pigface). This is one of the most vigorous creepers I know, provided it has plenty of sunlight, it will not tolerate any shade. It has fleshy, triquetrous leaves of a greyish colour and cerise many-petalled flowers. The cuttings can be planted where they are to grow. Last season I broke off a piece, stuck it in the ground, and three weeks later it flowered.

Eustrephus latifolius (Wombat Vine). A very wiry-stemmed climber with small pink or white, fringed flowers and brilliant orange prints with black seeds. If grown in a hot, exposed position it becomes a small upright bush; if in shady moister places it is a scrambling plant. It grows easily from seed and flowers here on and off most of the year.

Glycine tabacina. A creeping blue-flowered pea, very hardy and grown easily from seed. The flowers, being small, need to be massed together to be seen to advantage. It flowers all the year.

Vitex trifolia is a strong woody stemmed plant with lavender flowering spikes from spring until winter, followed by black berries.

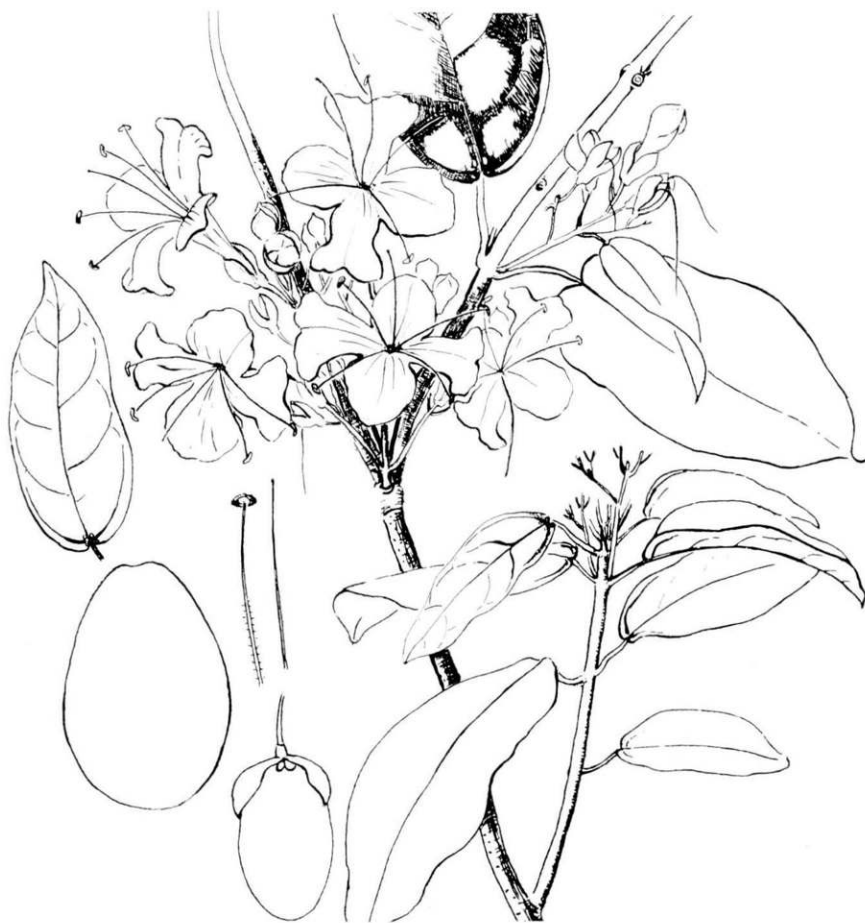
Vigna vexillata—(Cow Pea). This is a medium sized scramble with large pale mauve to purple pea flowers much like sweet peas without scent. It can withstand strong sea winds and a fair amount of drought. In its native state it flowers in summer and autumn.

Carpobrotus glaucescens and *Vitex trifolia* are particularly good for holding together sand dunes although they are a little too vigorous for the very small garden. Plants that are vigorous in some situations are often a considerable asset under other more vigorous situations. An even more vigorous plant if you are desperate is *Canavalia rosea*.

Canavalia rosea (Jack Bean of the Beaches). This vine has large pink pea flowers and big pods which can be eaten as a vegetable. It flowers from December until winter and will stand very harsh conditions. The seeds should be soaked before planting where they are to flower.

Geitoneplesium cymosium is a very attractive creeper with white flowers and black berries. It likes fairly rich soil and partial shade, for instance climbing up a not too thickly foliated tree. A reasonable amount of moisture in well drained soil is preferred. This is the only species, monotypic, of the genus belonging to the family *Philesiaceae*, *Liliaceae*.

Faradaya splendida is one of the most beautiful native creepers I have seen, being very vigorous and having great clusters of large white, scented flowers. It climbs up trees on river banks and on trees at the edge of rain forests on the foothills of mountains in North Qld. I have seen it quite near the sea but it would need warm humid conditions. This is the only Australian species in the genus belonging to the family Verbenaceae.



BOOK REVIEW

Colourful Trees by Harry Oakman

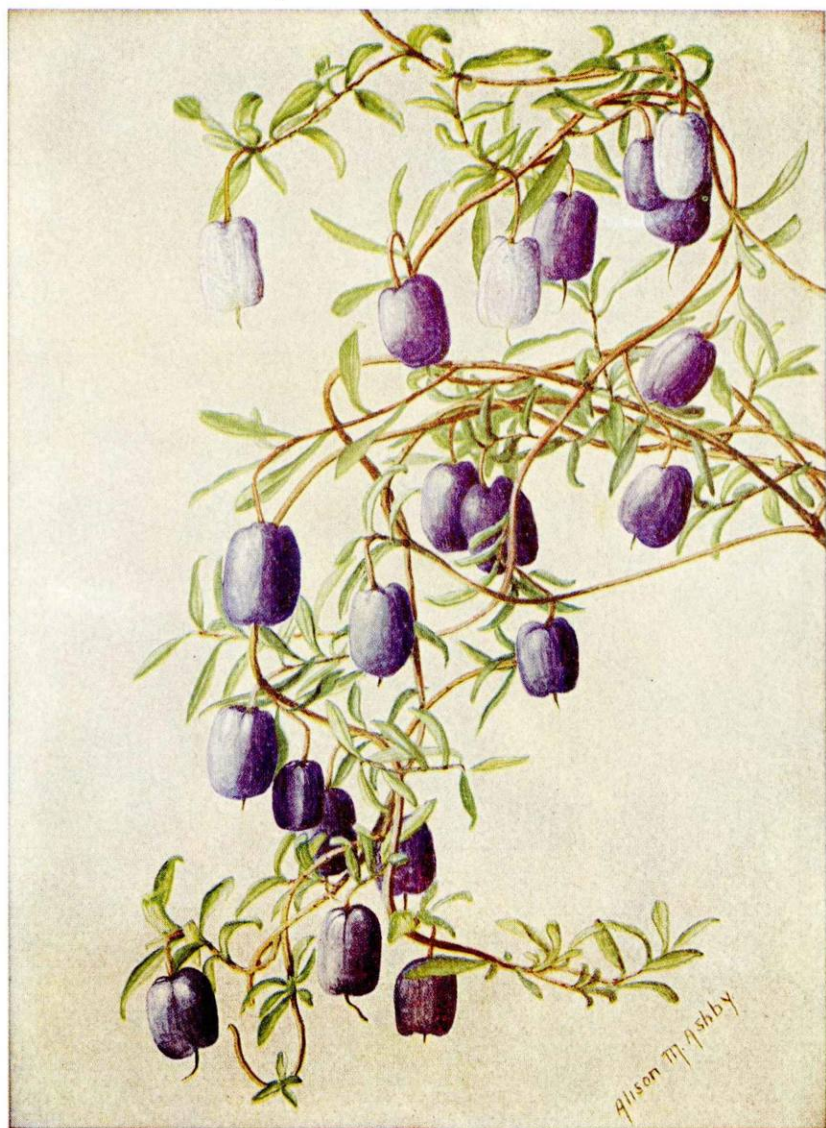
Price from your bookseller, \$12.00

Harry Oakman is well-known to readers of "Australian Plants" with the Street Tree series. In his career in various parts of Australia, at present he is Chief Landscape Architect with the National Capital Development Commission, Canberra, he has made a life study of trees and their growth requirements in all the temperate and sub-tropical regions of Australia. This wealth of experience and keen perception is displayed in colour with a clear understanding of what is required to be known by intending tree growers.

He has chosen 124 of the most colourful and decorative trees in the world, not just Australian natives although many are included, and presented them in full colour. One species is on each of the large 11" x 8½" pages with full colour plates of the tree and another of a close up of the flower. A unique feature also is that the trees are presented in the sequence of their display of splendour whether it be flowers, berries or foliage. Commencing with the trees that flower in August we progress through each month of the year with trees that will grace any garden. With really world-class presentation and a hard cover with coloured glossy wrapper, this 138 page book is a valuable guide to trees for landscaping.

SOME NATIVE CLIMBERS—continued from page 200.

BILLARDIERA: Many interesting and attractive creepers are members of the Pittosporum family. First to mind are "Apple-berries" (*Billardiera* species), which include Purple Apple-berry (*B. longiflora*), long yellow flowers and purple berries, and "Sweet Apple-berry" (*B. cymosa*), pink flowers and green berries. When I grew a plant of the last species to twine around the trunk of a "Grass-leaf Hakea" (*Hakea multineata*) it cut deeply into the trunk as the Hakea grew larger, a mistake others will wish to avoid. "The Common Apple-berry" (*Billardiera scandens*) with yellow tubular flowers and fruits shows some tendency to climb.



Blocks loaned by the South Australian Museum with the permission of Miss A. M. Ashby.

BILLARDIERA LONGIFLORA

KENNEDYA

The award for the most vigorous native climber must go to the "Black Bean" or "Black Kennedy" (*Kennedya nigricans*), which has very large leaves and unusual black and yellow flowers which do not appeal to everyone. It may cover a large area on a fence in a fairly open position.

Almost as vigorous, but with smaller leaves forming less compact foliage is the Dusky Coral Pea (*K. rubicunda*) of the eastern States. It is hardy and quick-growing, with dark red flowers, and can be used to grow on a tree trunk, or on a fence, where less vigorous climbers will not survive.

"The Running Postman" (*K. prostrata*) is a delightful plant for a rockery with its bright red flowers blotched with yellow for contrast. The W.A. variety has bigger leaves, and flowers which are not such a bright red.

"Coral Vine" (*K. coccinea*) from the jarrah forests of W.A., grows strongly and has beautiful clusters of red and orange flowers resembling those of *Chorizema*.



Blocks donated by N. B. Thomson.

KENNEDYA COCCINEA

MARIANTHUS

Marianthus erubescens from W.A. can be specially recommended for a position with morning sun as it has good foliage and attractive clusters of one inch long bells produced over a long flowering season. The flowers of my plant are more of a tangerine colour than red.

"The Orange Bell-climber" (*M. bignoneus*) of the Victorian Grampians and South Australia, is also seen in gardens and other species have definite possibilities for cultivation.

Other decorative climbers which must be mentioned include the "Red Passion-flower" (*Passiflora cinnabarina*), the "Treating Flame Pea" (*Chorizema diversifolium*), the "Wonga Vine" (*Pandorea pandorana*) and Clematis (*Clematis aristata*).

Last, for something unusual, there is the "Twining Silk-pod" (*Parsonia straminea*) of wet rain-forests in south-east Australia, with long, tapering, glossy leaves; short, tubular buff-coloured flowers and silky pods up to six or eight inches long, which are its most attractive feature.

Some of the plants mentioned are suitable for trailing over the ground as sand-binders or for ground cover. These include the "Dusky Coral Pea", "Twining Guinea Flower", "Black Bean" and "Purple Coral Pea."

KENNEDYA

As a result of reading the article written by Alf Gray in *Australian Plants* of September 1962 issue No. 12, where all species of *Kennedya* are fully described, I have been able to obtain seed of eight of the species and try them in various positions.—Ross Doig.

Kennedya rubicunda . . . natural to this area, it self sows freely, but does not persist in the heavy or light soils unless well treated as regards moisture and judicious pruning after each flowering season. It has also been my experience that this species is intolerant of prolonged bad drainage in winter. It persists longest where it can straggle and scramble in semi-shade. (The severest pruning—ripping out the plant and cutting back to exposed roots has resulted in new growth from the roots).

Kennedya eximia . . . enjoys really heavy soils and does not seem to mind a dry spot. It is slow growing and very easily kept under control, particularly in heavy soil in full sun where in two years it has a radius of little more than two feet. It is particularly copious in seeding and the flowers although of the *K. prostrata* type are very bright.

Kennedya prostrata (W.A. type), growth very poor in deep sand after the first two years but very satisfactory in shallow compact heavy loam where there is some shade at the centre of the plant.

Kennedya prostrata (N.S.W. type), is excellent in clayey compact soil, and even better under this condition when lightly mulched. Growing in the wild the parent plants in full sun and on compacted soil, devoid of mulch, had little vigour. After two years the stems nearest the main stem are devoid of leaves and controlled pruning would probably improve the plants appearance.

Kennedya nigricans . . . in heavy loam to twelve inches and semi-shade is rampant and requires heavy pruning to be kept in check. It will climb over anything within reach and would be very suitable for covering unsightly fences or out-houses. I have found that it must be kept well watered, particularly if heavy pruning is resorted to, otherwise die back of many stems occurs. (While on this subject most *Kennedya*s and *Hardenbergias* seem to become very twiggy after flowering, and many stems die completely).

Kennedya stirlingi* & *beckxiana . . . put in eight inches of sand over heavy compact loam have made little progress in six months and additional moisture has not been of assistance.

Kennedya procurrens . . . planted out for three months in medium loam has grown well.

Kennedya macrophylla . . . planted in heavy soil in full sunlight, and only occasionally watered has romped and in twelve months has covered a diameter of fifteen feet, flowering well at nine months. This *Kennedya* should be grown at once as its natural habitat is fast diminishing and it is now comparatively rare.

This genus is ideal for shallow or deep clay soils, will stand full sunlight or semi-shade, and can be used to cover a large or small area, either on the ground or as climbers and finally are very easy to propagate either from seed or cuttings.

Editor's Note: I do not like climbers but use many, particularly *Kennedya* as creepers for ground cover to keep the soil around the base of other plants cool and moist. There is a plant for every situation. *Kennedya rubicunda* is a pest and runs wild in good conditions but is very suitable for a hardy situation. *K. prostrata* is my favourite for a rockery or small garden as it does not grow wild, is not too leafy but the scarlet flowers occurring singly show up among other plants like spots of blood. *K. coccinea* is very showy, not vigorous and an excellent cover plant. It holds its flowers up in a ring shaped head, nicely above the foliage for inspection. *K. stirlingi* has also proved a good cover if kept in check and also shows its flowers well as racemes sticking up above the large leafy foliage.

PROPAGATION OF PEA-FLOWERED PLANTS

Propagation of *Kennedya* by Ross Doig.

Seed germinates well if pretreated, either by the boiling water and soaking method, or by the nicking of the testa coat method. Damp off is likely if care with soil mix is not taken and it is probably best to sow them in pots and keep them exposed to maximum air and sunlight, while watering remains the minimum for germination. All the above species have germinated freely.

Cuttings, not usually attempted with this genus, are surprisingly easy and with tip cuttings completely enclosed in polythene at least 90% results, within three months, can be expected. Top growth is very slow in the cutting box and rooting takes place well before new leaves form, so that it is a good idea to inspect cuttings at regular intervals even if no top growth has taken place. Subsequent growth in seven pound tins has proved very slow and it seems preferable to plant out directly into the ground even if shelter has to be provided.

MARIANTHUS

by Ross Doig, Turramurra, N.S.W.

Marianthus, *Billardiera*, *Pronaya*, *Cheiranthra* and *Sallya* are useful and attractive light climbers from W.A. Most of these will straggle as semi-prostrate shrubs giving good ground cover and in the process a cool root run for nearby shrubs. Most will stand full sun or are equally at home in a semi-shaded position.

As climbers the three *Marianthus* (*M. pictus*, *M. erubescens* and *M. ringens*) will, if given initial assistance, ascend tree trunks, or will unaided struggle up through shrubs to the light. Fortunately it has been my experience that in either case they do not become rampant, unlike some *Kennedya*s, and if after three or four years *M. pictus* does blot out its supporting shrub severe pruning will do no harm.

Marianthus pictus

My plant straggles through a stand of three tall *Hakea sericea* and planted as a seedling in April 1960, has flowered annually since 1961. It usually commences to bloom in late January and continues into the third week in July, a satisfactory blooming period for any plant. The flowers themselves are not large, approx. an inch across, but being borne in compact clusters make a brave creamy white show. Close inspection reveals the delicate purple striations, reaching down into the throat of each flower. After each flowering the shrub has been lightly pruned, but this year, owing to the large number of unproductive stems, which had been growing increasingly longer and barer of foliage and blooms, severe pruning was resorted to. The plant has responded by putting out a prodigious amount of new growth.

Seeds will germinate well, although for some reason, the plant described above has never set seed. Cuttings however strike readily and of the many I have given to members few have reported failure. Soil conditions under which the plant is growing is medium loam, not very deep, but quite friable for six inches, always moist and lightly mulched. A second plant is in a very compact loamy clay interspersed with ironstone rubble

with clay at six inches. It has taken three years to get going and has had only two flower clusters this current season, although at present (since heavy mulching with leaf mould) it is making strong new growth, both from the base and side shoots. To sum up—an ideal plant for that difficult spot under established trees.

Marianthus erubescens

Seed germinated readily in 4 to 6 weeks without treatment and two plants were put out in the ground, both at the base of tall straggly *Casuarinas*, which let broken sunlight through up to about 4 p.m. winter and summer. Soil conditions however differ, one plant being in a built up sandy area and receiving water from the emptying (daily) of a bird bath. This latter flowered profusely but was slow to grow, achieving a few stems 4 to 6 feet in length in three years, some at ground level and two ascending the *Casuarina*. The second plant is in shallow hardpan clay covered by two inches of fertile soil, with some mulch and has ascended its *Casuarina* to ten feet as a tangled mass of dark green foliage. In two years however, it has had only one flowerhead.

Marianthus ringens

As with the two species already described, seed will germinate untreated readily in from four to eight weeks in the open or under glasshouse conditions, and again as with the two species above no trouble with damping off has been experienced at the nursery stage.

I have only planted out a single specimen, and that in a difficult situation, namely, the base of an established *Syncarpia* sp. The soil is friable, good to twelve inches, drainage very rapid, and sunlight would be up to four hours daily. Growth has been very slow, approx. six stems 3 to 5 feet in two years, but flowering this season has been rewarding, beginning in July and continuing on into September (at least). Flowers are a pale, rather washed out orange, in structure closer to *M. erubescens* than *M. pictus*—one and half inches long, elongated corolla with open lobes, borne in a cluster of up to ten. The leaves are lanceolate, downy and a fresh yellow-green in hue. Perhaps with the combination of foliage and bloom the daintiest and most fragile in character of the three.

NATIVES ON HEAVY SOIL IN MONSOONAL TROPICS—continued from page 198.

From the following lists doubtful cases have been omitted. Local plants shown by *.

List of survivals (most of which continued growth during the wet):—

Banksia robur, *B. oblongifolia*; *Brachychiton acerifolia**; *Brassia actinophylla**; *Buckinghamia celestissima*.
*Callistemon viminalis**, *C. rigidus*, *C. citrinus*, *C. violaceus*, *C. brachyandrus*, *C. pinifolius*;
Callitrus rhomboidea; *Calothamnus quadrifidus*; *Casuarina littoralis**; *Clematis glycinoides**.
Eucalyptus macrocarpa, *E. erythronema*, *E. tetraptera*, *E. forrestiana*, *E. kruesiana*,
E. desmondensis, *E. lansdowneana*, *E. grossa* (a seedling was often partly under water),
E. erythrocorys, *E. pyriformis*, *E. eudesmioides*, *E. leucocylon rosea*, *E. ebbanoensis*.
Grevillea banksii, *G. pteridifolia**, *G. parallela* variety*, *G. parallela**, *G. glauca**,
*G. mimosoides**, *G. cayleyi*, *G. dryandrii**, *G. triternata*, *G. endlicheriana*, *G. dielsiana*, *G. pinnatifida**, *G. refracta*.
*Hakea perseaenana**, *H. florulenta*, *H. plurinervia**, *H. pycnoneura*, *H. gibbosa*, *H. adnata*, *H. crassifolia*, *H. laurina*, *H. leucoptera*; *Hibiscus rhodopetalus**; *Hymenosporum flavum**.
Leptospermum juniperinum, *L. persiciflorum*, *L. sphaerocarpum*, *L. woorenooran**.
Melaleuca elliptica, *M. minutifolia**, *M. viridiflora**, *M. decussata*, *M. depauperata*,
*M. bracteata**, *M. acuminata*, *M. steedmanii*, *M. lateritia*, *M. incana*, *M. hu-geli*, *M. leucadendron**.
*Melastoma polyanthum**.
Templetonia retusa.

List of casualties from wet conditons:—

Beaufortia elegans, *B. sparsa*; *Calythrix tetragona*; *Eucalyptus steedmanii*, *Grevillea thelemanniana*; *Isopogon dawsoni*, *I. duRoi*; *Kunzea pauciflora*, *K. recurva*; *Petrophila biloba*.

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HIBBERTIA AMPLEXICAULIS

To make a nice picture the photographer has gathered together a number of flower stems and as there are so many species of *Hibbertia*, positive identification has not been possible. To further complicate the task, the foliage of *Bossiaea ornata* has been added for relief. However the flowers of many species of *Hibbertia* are typified by those above and coupled with their long flowering period, these are ideal garden subjects.