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BANKSIA SCEPTRUM

SOME CULTIVATED BANKSIAS—Article commencing page 202, quote . . .

"*Banksia sceptrum*, although this specie can grow into a small tree it does not appear to be doing so in cultivation. It has an upright habit with short blunt leaves and terminal yellow flowers to 6" in the summer. It could be a useful shrub for hot conditions and rainfall of 15" but is also doing well in sandy soil with 30" rainfall."

GROWING WILDFLOWERS IN CLAY AREAS—A complete article.

TASMANIAN WILDFLOWERS—Gems for horticulture.

AUSTRALIAN ORCHIDS—Their cultivation.

PROSTRATE BANKSIA

by Alf Gray

Of all the 50 odd species in the genus, the four western prostrate banksias are probably the most intriguing to botanists and growers alike.

Banksia goodii of the Albany area has been cause for some concern because of threatened extinction, but it is so similar to *Banksia petiolaris* that the differences could be distributed to climatic influences. *B. goodii* was described by Robert Brown presumably when he and Peter Good, then foreman at Kew Gardens, were collecting at King George's Sound in 1830. It had not been recognised again for many years until the writer located it on the King River at Albany in January 1956. Except for greater development of spike and leaf plus a tendency to abandon the prostrate and to assume a more erect habit, in what was formerly densely wooded country, there is great similarity to the form of *B. Petiolaris* of the Stirling Range, 40 miles to the north. This is not to suggest that *B. goodii* should not be accepted as a distinct species. After all it commemorates Peter Good, by all accounts a very earnest and dedicated young man who did not survive long after reaching Botany Bay. See page 200 for colour plate.

Banksia petiolaris was named by von Mueller in 1864 from the Israelite Bay form which persists westwards nearly to Ravensthorpe and then occurs in a similar form westwards again to the Stirlings. It is confusing as to what is the species and what erect forms. It is not found beyond the foothills a few miles north of the Range but is quite common on the coastal plain to the east where the flower spikes are larger and the styles coarser than in the Stirlings form, and the leaves are covered densely with tomentum.

Banksia prostrata and *B. repens* have a wide range of distribution, growing in company with *B. goodii* in the King George's Sound area and also with *B. petiolaris* on the sand plains immediately surrounding the Stirlings and eastwards to Cape Arid if not Israelite Bay itself. They are also found west of the Stirlings, north to the Hill River and inland over the greater part of the South-west Province. The species show change in form, particularly of the flower spikes. The foliage tends to become hoary and tougher in the eastern forms due to the greater exposure of the plains. Even the flower colour changes from warm brown to rose red on the case of *B. repens* and to yellow in both *B. prostrata* and *B. petiolaris*. These species differ from other *Banksia* not only in habit but also in the follicles (spikes) except for *B. solandri* which significantly occurs on or near the summits of the Stirling Ranges.

As to what prostrate banksias may have in the way of appeal to the grower, the question would be best answered by observing a healthy specimen in full flower. They are attractive and unique, even when not in flower.

The group is easier to propagate and establish than the general run of banksia remembering that like the others they revel in light sandy soils and exposure to the sun. Each plant may require several feet of space when mature but since they will grow under shrubs or trees, prostrate banksia are easy to accommodate in almost any garden.

(For other articles on Banksia, see page no. 200)

WILDFLOWERS IN CLAY AREAS

AUSTRALIAN PLANTS ON THE KEILOR PLAINS

By C. L. WHEELER, Tullamarine Plant Farm, in conjunction with Mrs. R. Raid of Pascoe Vale, and Mr. C. Thomas, Thomas' Garden Constructions, Glenroy

Climatic & Soil Conditions

The modern traveller, motoring along the highways and other roads that traverse the 900 or more square miles of basalt plains to the north and west of Melbourne, usually referred to as the Keilor or Werribee Plains, might well be pardoned for believing that the possibility of discovering anything interesting in the way of animal, vegetable or mineral in the area would be extremely remote. Roughly defined as the area within a radius of approximately 30 miles from Melbourne from Pt. Wilson in the south-west through the eastern side of the You Yangs to Parwan, along Djerriwarrh Creek through Gisborne, Bolinda to Pretty Sally's Hill (about 1200 ft. above sea level), thence south through Wallan, Yan Yean and Morang to the Yarra River with outcrops of granite north of Broadmeadows and other rocky outcrops intruding from the north-west, the Keilor (or Werribee) plains have until the last 10-20 years been largely neglected by land developers despite their relative nearness to Melbourne.

Formed some 10,000 years ago by volcanic lava emanating from hills and fissures to the north and west obliterating most of the existing landscape, the otherwise featureless terrain is nevertheless intersected here and there by deep river gorges and studded with low hills along its north and west perimeters. Seen in the early sunlight of a calm winter morning with its course defined by ribbons of fog and its steep banks picked out in light and shade touched here and there by patches of frost, the Maribyrnong River at Keilor is a typical example of the beauty that can exist in even the most unlikely places if the eye and mind are receptive. A rock formation known as the "Organ Pipes" on the banks of Jackson's Creek is of wide geological interest and several homes of historic interest still exist in the area.

With a 20 inch rainfall most of which falls between winter and late spring, the heavy grey-brown clay tends to become waterlogged in low-lying areas during winter and spring and interlaced with deep cracks caused by shrinkage as the soil dries out in summer effectively discouraging the natural spread of deep rooting plants which cannot survive these conditions. Subjected to scorching northerly winds in summer, icy blasts from the same direction in winter, hot summer sun and an occasional devastating frost every few years, which often causes the loss of well developed plants that have stood several normally cold winters, most gardens on the Keilor Plains eventually would become like the rest of the general landscape where only the most rugged survive were it not for the incurable optimism of residents who manage to retain enough enthusiasm to replace lost plants.

Never floristically rich especially in woody species, and subject to continuous grazing by sheep and cattle over most of the last century, the fact that some 444 land species were recorded for the plains by Dr. Charles Sutton in 1916 will surprise many people familiar with the area.



MELALEUCA FULGENS—Payne's variety

Reprinted from "Australian Native Plants for Home Gardens" by A. E. Brooks, a book very well written and an excellent guide for the beginner. The author gives detailed advice from his wide experience principally in gardens in the Melbourne area although the recommendations for species to be planted will apply to home gardeners in most temperate areas. In a new edition this book is available from the Editor at \$4.50 plus 20 cents postage. As a guide to the presentation of the book the following description is reprinted from the book.

Melaleuca fulgens

Scarlet Honey-Myrtle, W.A.

Five feet, a fairly compact shrub with narrower grey-green leaves about an inch long, and a bounteous supply of spectacular red "bottle-brushes" which are certain to attract much attention. Payne's variety has even more outstanding flowers. Spring. Open position. Light soil. (*fulgens* = bright).

Garden Design & Construction

From the aesthetic point of view it is advisable to consider the colour and shape of plants in relation to their surroundings, ensuring that background plantings do not compete unduly with specimen plants and that an overall harmony of plants and surroundings is achieved whilst maintaining a variety of colour and texture with sufficient contrast of plants against buildings to show each to its best advantage.



Photography by Ron Hill

CORREA REFLEXA

Whilst it is often advisable to plant many Australian plants closely for mutual support against winds and to provide ground cover to reduce evaporation, care should be taken to ensure that large rampant growers are not associated too closely with lesser plants which will suffer as a result, remembering that it is easier to rectify an omission than to correct a mistake which may not become obvious for several years. A scale plan of the property on graph paper will be of considerable help in deciding what and where to plant.

TREES, CAREFULLY SELECTED, ARE VITAL

Of all that has been said and written about the virtues of making a garden, probably nothing is more important on the Keilor Plains than the need to improve living conditions, yet rarely do we see a garden designed with this in mind. The lack of foundation plantings and the unwise planting of large shrubs and trees too close to buildings or under power or telephone lines are the most common mistakes. Whilst we are all aware of the advantages of air conditioning inside our homes and often devote much time and money to this matter, we tend to forget the advantages of improving the climate in our outdoor areas. The effect of trees as providers of shade is well known and the right trees for these purposes under conditions like those on the Keilor Plains will often be found among the Acacias, Eucalypts, *Tristanias* and larger species of *Melaleucas*. Other factors detrimental to the environment are glare from road surfaces and buildings, dust and lack of privacy and here again the answer will be found in trees and shrubs. The ability of plants to absorb carbon dioxide from the atmosphere and emit oxygen thus purifying the air, and their ability to reduce the temperature of air passing through them are all matters worthy of consideration in landscape design. The effect of plants on weather has been studied in recent times and quite remarkable changes in temperature and humidity recorded by accurate scientific methods.

Gardening then, in the landscape sense, is not merely a hobby but an indication of good citizenship; a contribution to community living, and where Australian plants are cultivated, a worthwhile effort in nature conservation.

THE SOIL

To the occupant of a new home on the Keilor Plains probably the greatest problem in the establishment of a garden is the condition of the existing soil, which usually supports a heavy carpet of onion grass, a number of other weeds and is difficult to cultivate. Given time and interest however, much can be done to improve these conditions—the onion grass will soon disappear in cultivated areas and in lawns which are frequently cut and frequent spraying with a suitable weed killer will eventually remove it from other places. An article on soil improvement in this area was published in "Australian Plants" Sept., 1966. Briefly, this method consists of the application of a layer of 3 to 4 inches of black ash from coal burning boilers and a similar or larger amount of rotted organic matter both of which must be thoroughly worked into the top six inches of soil over a period of several weeks or more. In districts where this kind of ash is not available, it is possible that other granular material may be of use especially with the addition of gypsum (Calcium sulphate). The main points to be kept in mind are that the application of ash does nothing to improve the fertility of a soil and thorough cultivation and mixing are necessary to avoid pockets of ash which will be detrimental to germination and plant growth, and that considerable quantities of ash and organic matter are required to improve a heavy soil owing to the dominating effect of the clay particle. The addition of further organic material as a mulch or dug in where annual crops are grown will assist in keeping the soil in a friable condition. Our own garden beds which were treated in this way some years ago never set hard and may be dug and raked to a fine tilth without difficulty at any time of the year.

Editor's Note: The authors now proceed with a list of plants that have actually been grown successfully in the area. It is not my usual practice to publish a list such as this without including a description of each plant. In this case however, we are concerned here only with recording those plants that can be successfully grown. Most are commonly grown and widely known and have been adequately described with full details in cultivation in past issues.

RECOMMENDED PLANTS

In this section an attempt has been made to list some of the plants considered to be either consistently successful or worthy of further trial under conditions similar to those of the Keilor Plains, bearing in mind the requirement of good drainage in most cases, for protection from excessive heat and/or cold in a few others and the need to prevent wind damage by pruning, staking or planting for mutual protection as applicable. Many species not mentioned here have been unsuccessful or have not, to the writers' knowledge, yet been tried.

ACACIA—most species tried seem very adaptable, quick growing, frost and heat resistant, but some can become top heavy and easily blown over by wind. Suggestions are: *A. acinacea*, *A. baileyana*, *A. cultriformis*, *A. drummondii*, *A. floribunda*, *A. hakeoides*, *A. inophloia*, *A. longifolia*, *A. praviissima*, *A. podalyriaefolia*, *A. saligna*, *A. vestita*.

AGONIS—another adaptable genus, often slower growing than some Acacias and some species less winter hardy. *A. flexuosa* widely grown but frost tender when young. *A. juniperina*, *A. marginata*, *A. linearifolia* worthy of trial.

ALBIZZIA—*A. lophantha* is adaptable, fast growing and hardy.

ALYOGYNE (Cienfugosia)—*A. hakeaefolia*, *A. cuneiformis* both fast growing and need protection from frosts.

ANGOPHORA—*A. costata* seems just as easy as most of the Eucalypts.

ANIGOSANTHOS—variable in adaptability and not all reliable. *A. flavida*—particularly the red form—is recommended and is being used in industrial landscaping. *A. manglesii* suffers from disease and snails and often fails; *A. viridis*, *A. humilis*, *A. bicolor* seem to need a lot of attention for best results; *A. pulcherrima* and *A. rufa* have succeeded and are worthy of further trial.

ASTARTEA—*A. fascicularis* is adaptable and hardy.

ASTEROLASIA—*A. asteriscophora* seems to be unsuited to heavy soils which become too dry or too wet and is easily loosened in wind.

BAECKEA—most species adaptable and hardy. *B. ambigua*, *B. camphora*, *B. crenatifolia*, *B. heteranthera*, *B. ramosissima*, *B. virgata* all grow easily.

BAUERA—easy and quick needing summer moisture and some shade. *B. rubrooides*, *B. sessiliflora* both successful.

BEAUFORTIA—not the easiest of subjects. *B. sparsa* hardy and usually successful with summer watering; others need further trial.

BORONIA—perhaps more suited to container culture unless some shelter is provided. Often unreliable in hot dry conditions but worthy of trial. *B. filifolia* one of the easiest; *B. heterophylla*, *B. denticulata*, *B. megastigma*, *B. spathulata*, *B. elatior*, *B. crenulata*, *B. pilosa*, *B. serrulata* and others have been grown.

BRACHYCHITON—Adaptable and heat resistant but some slightly frost tender. *B. acerifolium*, *B. populneum* both suited for warm dry conditions.

BRACHYCOME—hardy and adaptable. *B. melanacarpa*, *B. multifida* easy.

BRACHYSEMA—adaptable and hardy. *B. lanceolatum*, *B. latifolium* both successful.

CALLICOMA—not well known. *C. serratifolia* somewhat frost tender when young but worthy of further trial.

CALLISTEMON—very adaptable and mostly hardy. Some species such as *C. montanus*, *C. formosus*, *C. viminalis* frost tender when young; others such as *C. brachyandrus*, *C. citrinus*, *C. phoeniceus*, *C. salignus*, *C. speciosus* and most of the hybrids easily grown.

CALLITRIS—mostly very resistant to heat and frost and suited to large properties. Some forms of *C. cupressiformis* suited to smaller gardens.

CALOCEPHALUS—*C. brownii* stands exposure to heat and wind and suits dry conditions.

CALOTHAMNUS—most species adaptable but not widely grown. *C. gilesii*, *C. quadrifolius* and possibly others frost tender when young.

CALYTRIX—mostly easy and hardy. *C. alpestris*, *C. sullivanii*, *C. tetragona* usually successful. Others under trial.

CASSIA—suited to warm dry situations, but winter hardy species include *C. artemisioides*, *C. australis*, *C. eremophila*, *C. sturtii*. Worth growing.

CASUARINA—mostly heat and frost resistant, suited to larger properties. *C. torulosa* most popular.

CHAMAELAUCIUM—*C. axillare*, *C. uncinatum*, *C. micranthum* easily grown in well drained sunny positions. *C. uncinatum* slightly frost tender.

CHORIZEMA—*C. cordatum*, *C. ilicifolium* both frost tender but succeed in protected positions; *C. diversifolium* appears harder; *C. dicksonii* worthy of trial.

Dwarf Banksias

Banksia prostrata, *B. repens* and *B. petiolaris* all have underground or semi-underground trunks with upright leaves and produce their flowers on the ends of underground branches and are not surrounded by leaves. This unusual flowering habit adds to their interest and makes them worth-while rockery or ground cover plants. All three are easy to raise from seed and hardy; open or semi-shade is suitable and good drainage is required.



Photography by F. W. Humphreys

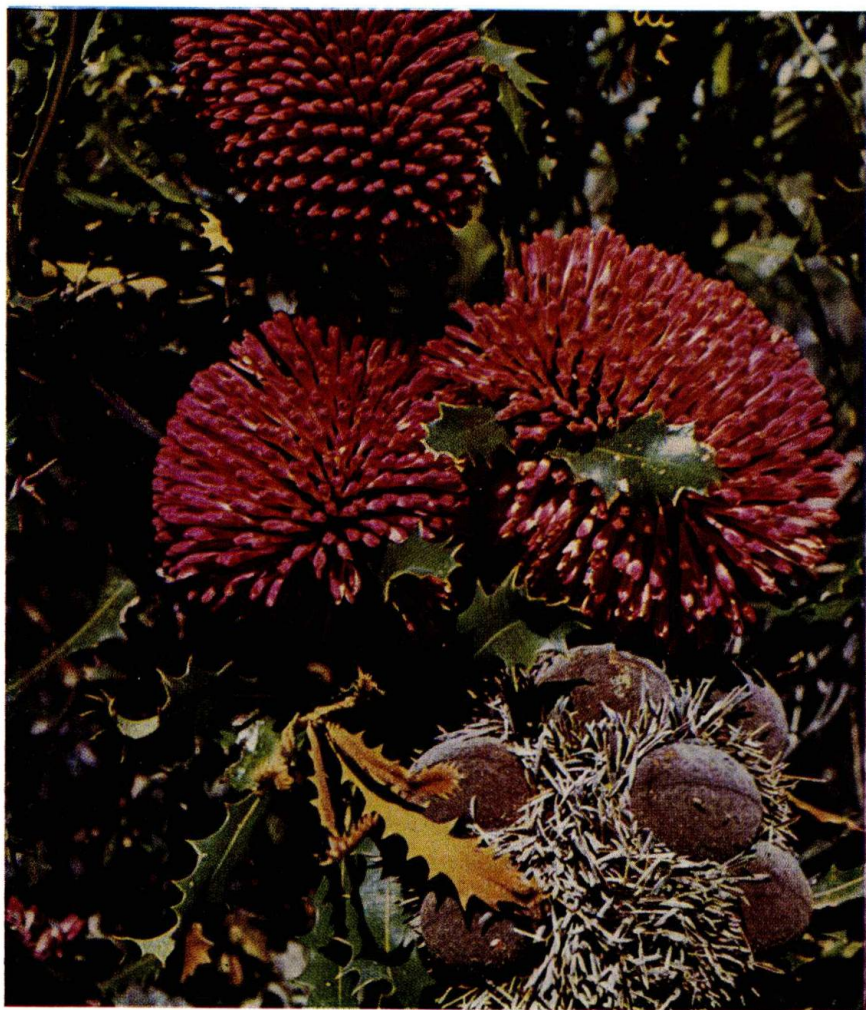
BANKSIA GOODII

Banksia goodii; not very much is known about the requirements of this *Banksia* in cultivation, but it will be up to growers to save it from extinction as the known number of plants left on the 'Kalgan Plain' in W.A. is very limited. It appears to be a slow grower in cultivation and differs from the other prostrate species in that the brownish flowers are surrounded by leaves.

Editor's Note: This description is part of the article "Some Cultivated Banksias" commencing on page no. 202. These *Banksia* are the subject of a full article, "Prostrate Banksias" on page 194.

Small Banksias

Most home gardeners have the space for only one Banksia tree but there are many Banksia that only grow to small or medium shrubs. These are available with leaves of the small lush green type of *Banksia ericifolia* (featured in colour in the last issue), or *B. nutans*, to the large attractive patterned leaves found in a wide range of Banksia, one of which is shown below.



BANKSIA CAYLEYI

Banksia cayleyi, has been grown fairly widely in cultivation and has proved to be adaptable to varying soil types. The pendant flower buds and flowers are bright red but not conspicuous as they are carried on short lateral branches within the bush which grows into a shapely shrub to a height of 5-6 ft.

SOME CULTIVATED BANKSIAS

by Ken Stuckey, Furner, South Australia

Banksia have proved fascinating and rewarding subjects for the garden. The many species provide a wide range of form and habit, leaf and flower, colour and shape. While the shaggy old "*Banksia* man" bush may be suitable for specimen and character in a landscape, others have now proved themselves as good garden shrubs.

Banksias can be considered as frost hardy, new young growth can be cut with frost but seldom does it kill a plant. *Banksias* make most of their growth during the summer when severe frosts are not likely to occur. *Banksias* from eastern Australia will benefit from summer watering while those from Western Australia are better without summer watering except seedlings planted out in the spring which may need periodic deep watering.

Banksias will benefit from judicious pruning, the best time is early spring before they start to make their growth. Do not be afraid to pick flower spikes from the spring flowering species such as the *B. speciosa* which soon makes fresh growth from below the cut.

Plant out *Banksias* into "clean" ground, that is, do not incorporate leaf mould, humus, etc. into the soil before planting as this tends to increase the possibility of fungus attack to the root system and is one of the main reasons for the sudden collapse and death of *Banksias*. Mulch can be placed around *Banksias* but always leave a clear area around the trunk.

Propagation

Over the years I have found it more satisfactory to propagate *Banksias* completely in the open. Early experience of planting seed and potting up in a glasshouse caused losses through damping off and production of unhealthy seedlings. Also I now prefer to plant seed directly into pots rather than seed pans or pots for potting up after germination and from a given number of seed the end result is a better percentage of healthy seedlings.

A slightly acid potting mixture with a pH of about 6.5 is best, and add a proportion of soil from under old *Banksias* if possible. Seed should be barely covered and then topped up with fine gravel to a depth of ¼" for large seeded species and slightly less for the small seeded species. If grown in seed boxes they must be potted before the first true leaves start to appear. Freshly potted seedlings will require shade for two or three weeks but still allow for free movement of air.

Seedlings sometimes show signs of chlorosis which can usually be cured with applications of iron chelate at three weekly intervals. Use as directed or a 5c coin full per pot and watered in, is sufficient. Applications of a complete fertiliser can also be safely used, but not to excess.

Recommended *Banksia* for the Garden

The results of my experience in the cultivation of many species of *Banksia* are given as follows:

Dwarf *Banksias*—see page 200.

Medium Shrub *Banksias*

Banksia violacea, an upright, shapely shrub 2-3 feet with ¾" almost terete leaves and the flowers being terminal, is quite showy. The globular violet flowers deepen to almost black when mature. Well drained, open situation is best, with slightly acid soil.

Banksia baueri, "Woolly Banksia", is easy to propagate and appears hardy and adaptable to varying soil types provided there is good drainage. The large woolly flowers are very striking, the form from the Stirling area is greyish while that from East Mt. Barren is a bright tan. It makes a shapely shrub to a height of about 4 ft.

Banksia burdetti, one of the showiest of the shrub types with bright orange terminal flowers and appears to grow to 5-6 ft. in cultivation in sandy soil. This specie has the possibility of doing well in the sandy mallee areas of eastern Australia.

Banksia candolleana, is a spreading shrub to about 4 ft. high and appears to be a slow grower in cultivation. The long serrated leaves are attractive also the peculiar fruit which consists of one, two or three very large seed capsules in a small head. It requires an open, full sun situation, sand, sandy loam and well drained.

Banksia caleyii—see page 201.

Banksia dryandroides, a spreading shrub notable more for its fine dryandra-like foliage than the flowers which are carried on short lateral branches, are yellow and globular. This specie has done well on heavy loam, in fact better than on light sandy soils.

Banksia loricata—see page 204.

Banksia lehmanniana, an open upright shrub that has been grown in cultivation fairly successfully in varying soil types and situations. The flowers, up to 8", are pendant and yellow on short lateral branches.

Banksia media, probably the most successful W.A. Banksia to be cultivated in the eastern states. It is easy to raise from seed and establish and has proved to be tolerant of various soil types and pH values. The large (6"-10") flower spikes are terminal on short lateral branches. One specimen I have is now 15 years old and still going strong.

Banksia meisneri, a spreading straggly shrub of 3 ft., with small, almost terete, $\frac{1}{4}$ " leaves, a most un-Banksia like shrub. The roundish, yellow flowers $1\frac{1}{2}$ " are on lateral branches and the fertile flower spikes develop into spherical heads of 2" or more. It appears to thrive on well drained sandy soil and flowers prolifically when 3-4 years old.

Banksia nutans, the "Nodding Banksia", is a shrub about 3 ft. with dainty, nodding flowers $1\frac{1}{2}$ -2" and short leaves with recurved margins that make them almost terete. The young flowers are tinged pink and cream, turning yellow when mature. Slightly acid, sandy soil type is best.

Banksia ornata, a Victorian and S.A. specie that inhabits the deep sandy ridges and extends from the 12" to 29" rainfall belt. This is another example of our flora indicating fairly accurately the soil type upon which it grows and in this case it is usually deep "hungry" sand.

A shapely shrub of 5-6 ft. with terminal, roundish oblong flowers. The young flowers are pale creamy grey turning pale yellow when mature, but there are slight variations in colour forms.

There appears to be some difficulty in establishing this specie in cultivation. Slightly acid, well drained sandy soil would be best.

Banksia praemorsa, a shapely shrub to about 6 ft., the flowers are terminal on short lateral branches and often 8" to 10" long and sometimes longer. Early growers were often misguided in planting *B. praemorsa* seed which turned out to be *B. media*, evidently a mistake by seed collectors—there are similarities in shape of shrub, leaves and flowering habit.

This Banksia could do well in coastal areas and will withstand salt winds and high rainfall but with good drainage.

Banksia pilostylis, a *Banksia* from 12-15" rainfall area, with upright habit and pale yellow terminal flowers. It has not been grown long enough in cultivation to be specific as to requirements but like most W.A. *Banksias* requires well drained situations and open sunny aspect.

One specimen I have is three years old and has five flowers.

Banksia quercifolia, is one of the hardiest in cultivation and can be grown in semi-shade to full sun. The cultivated specimens I have seen all have an upright habit of growth to 10 ft. and flower freely, rather small, oblong flowers, greyish tan when young and a dull tan when mature. Reference books quote it as being "scarlet" and "orange" but I have not seen flowers these colours in cultivation or in its native habitat. It has been grown in heavy clay-loam to light sand.



Photography by the author, Ken Stuckey, of a *Banksia* growing in his garden.

BANKSIA LARICINA

Banksia laricina, a rounded, slightly straggly shrub with short needle-like leaves. Comparatively easy to establish and hardy, it will start flowering at three years and from then on flowers freely. The small, ovoid, yellow flowers are mostly on lateral branches but the striking feature of this *Banksia* is the development of the seed cone after fertilisation, the cone remains

(Continued on page 222)

BANKSIA IN WAGGA

by Alan Logan, Wagga Wagga, N.S.W.

Banksia occidentalis has proved satisfactory here in a 34 in. rainfall with winter frosts down to 15 degrees. It is growing on an open, exposed westerly slope, with a fall of about 1 in 8, in heavy clay loam of which the subsoil would be quite waterlogged during a wet winter. The shrub was planted in mid-August 1965 when nine inches high, and was covered till frosts were over. The site had been prepared by digging into the top 8-10 inches of loam, two to three bucketsfull of the loose gravel, ranging in size from dust to one inch diameter pebbles, which builds up on the side of dirt roads. The idea being an attempt to provide a mound of well drained porous material, which would keep the base of the plant and surface roots from becoming waterlogged.



Photography by Ken Stuckey, of a *Banksia* growing in his garden.

BANKSIA OCCIDENTALIS

(Continued on page no. 221)

DRACOPHYLLUM LABILL.

by Betsy R. Jackes

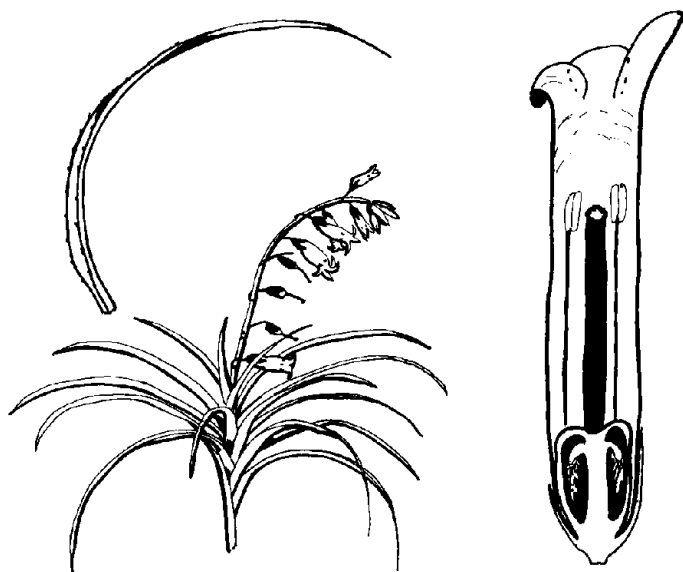
(A series of articles each on a genus in the plant family *Epacridaceae*—The Heaths)

This genus is found in the eastern states of Australia, as well as in New Zealand and New Caledonia. The West Australian genus *Sphenotoma* is sometimes regarded as a subgenus, however, it does form a very natural group, differing from the eastern species in quite a few respects.

The patterns of stomatal distribution are distinctive; in addition, the inflorescence of *Dracophyllum* is a compound raceme or panicle with very deciduous bracts, longitudinal folds are not present at the base of the corolla-lobes; in contrast the *Sphenotoma* inflorescence is a simple spike or head with persistent bracts, and the longitudinal folds almost enclose the mouth of the corolla-tube.

The generic name "Dragon Leaf" refers to the likeness of the leaves to those of the dragon plant *Dracaena*. The long, narrow leaves which are crowded towards the ends of branches give this genus the appearance of a monocotyledon.

Shrubs or small trees, the leaves and leaf-sheaths fall off leaving prominent annular scars. The corolla-tube which does not circumsciss, may be cylindrical or almost campanulate with five spreading imbricate lobes.



Dracophyllum secundum R.Br.

Leaf full-size; part of plant 1/2 size and flower, full size x7.

In New Zealand, hybrids have been recorded between a number of species, it is possible that this has also occurred in Australia.

KEY TO THE SPECIES

- | | | |
|---|-------------------------|---|
| A. Small closely appressed shrub; inflorescence solitary | 1. <i>D. minimum</i> | B |
| Erect plants; inflorescence a panicle | | |
| B. Panicle secund | 2. <i>D. secundum</i> | C |
| Panicle not secund | | |
| C. Leaves 15-90 cm.; corolla-tube almost equal in length to the calyx | 3. <i>D. milliganii</i> | |
| Leaves 30-45 cm.; corolla-tube 3-4 times length of calyx | 4. <i>D. sayeri</i> | |

NOTES ON THE SPECIES

1. *Dracophyllum minimum* F. Muell.

A small Tasmanian cushion plant growing above altitudes of 4,000 ft. in alpine areas where snow lies for several months of the year. The solitary white flowers terminate the branches, surrounded by leaves which are as long as the calyx. See page no. 225 for a full colour plate.

2. *Dracophyllum secundum* R.Br.

An erect or procumbent shrub up to 1 m. high, growing in N.S.W. The white or pink flowers are arranged in a one-sided terminal panicle or raceme.

3. *Dracophyllum milliganii* Hook. f.

A tall moderately branched shrub up to 4 m. high, with large leaves (15-90 cm. long) crowded at the top. Panicles up to 40 cm. long bearing numerous white or pinkish flowers in which the staminal filaments are free. Endemic to Tasmania, where it favours wet places in mountain gullies and exposed slopes up to altitudes of about 4,000 feet.

4. *Dracophyllum sayeri* F. Muell.

Similar in habit to *D. milliganii*, this species occurs on the summits of the Bellenden-Ker Range in North Queensland. Two varieties exist; var. *normale* Bail., which is a more or less erect plant with a white corolla-tube and rose-coloured corolla-lobes; var. *reflexum* Bail., which has all white flowers, the corolla-lobes of which are much reflexed.

DRACOPHYLLUM OF TASMANIA

A series on the wildflowers of Tasmania by A. M. GRAY

Two species of this genus occur in Tasmania, both are endemic, one a small shrub or rarely a small tree, the other a "cushion plant", never more than 4" to 6" high. Altogether the genus comprises about 26 species, confined to Australia, N.Z. and the islands of the S.W. Pacific.

1. *D. milliganii*—a shrub or small tree, flowers in panicles or racemes.
2. *D. minimum*—a cushion plant, flowers solitary.

Both are plants of the S., S.W., and western mountains of Tasmania, most common on the acid quartzites of these regions.



Dracophyllum milliganii Hook. f.—Shown above in colour.

A prostrate shrub or small tree 1' to 10' high and usually unbranched. Leaves crowded and bunched into crowns at the ends of the main branches; very similar in outline and arrangement to those of *Richea pandanifolia*; base broad and completely sheathing, imbricate, blade narrow-linear, lanceolate

and tapering into a long, fine point which is leathery or semi-rigid but not sharp or pungent. The leaf is often recurved and sometimes strongly coiled, especially towards the apex. Margins minutely serrulate, prominent leaf scars mark the stems after the leaves die and fall.

Inflorescence a terminal panicle or raceme, branched, crowded or open, bracts persisting until the flowers open, bases broad with the apex tapering abruptly to a long point which becomes shorter towards the top of the inflorescence. Flowers shortly stalked, subtended by small, narrow bracts. Sepals about $\frac{1}{8}$ " long, lanceolate or bluntly oblanceolate, similar in substance to the "petals", concave or more or less keeled. Corolla tubular, cylindrical or campanulate and separating, at the apex, into 5 distinct lobes which are shorter than the tube. The tube as long as the sepals and sometimes more or less constricted at the throat. The lobes are spreading or recurved, the flowers white or a delicate pink. Stamens arising from the receptacle, anthers just reaching or slightly below the throat of the tube. Style shorter than the corolla tube and inserted in a small depression on the top of the ovary. Fruit a five-celled capsule, dehiscent, many seeds in each cell.

This beautiful plant is most common on the quartzite mountains of the west and south-west coasts, usually in damp gullies and the sides of ridges from sea-level to about 4000'. The pink forms intermingling with the white make a delightful display on the mountain tops and ridges, the flowers resemble dainty little bells, somewhat nodding and of a delicate texture. The capsules are fairly easily collected and the seed is treated exactly as for *Richea* spp.

In the garden, little attention other than watering is required. It should however be planted in a position where the soil has a fairly high "acid" reading, and protected from only the hottest sun and drying winds.

***Dracophyllum minimum* F. Muell.**

A plant of the higher mountains, and not as particular as to the type of soil as the former species. It grows among other species of "cushion moss" and if not in flower it is very difficult to differentiate between them. The typical habit of the plant is to grow as a hard, compact mound, so hard that it is possible to stand upon it without leaving an impression. *Dracophyllum minimum* is profusely branched, the branches tightly packed together, erect. Leaves closely imbricate, $\frac{1}{8}$ " to $\frac{1}{4}$ " long with a broad, sheathing base, as broad as the leaf is long, the blade is narrow lanceolate to lanceolate, slightly concave, thick, rigid and leathery, apex acute with a hard point, but not pungent. See page No. 225 for a full colour plate.

Flowers borne at the ends of the stems, solitary, sessile and surrounded by the leaves. Calyx segments narrowly lanceolate, $\pm \frac{1}{8}$ " long. Corolla white, tubular, broadly cylindrical or campanulate and nearly as long as the calyx. Lobes a little shorter than the tube, spreading, slightly keeled at the base on the outer surface. Stamens 5, filaments joined to the lower portion of the corolla, shorter than the tube. Style half as long as the tube, stigma small.

Fruit a 5-celled capsule, fleshy and reddish when young but drying hard and brownish at maturity. Seeds numerous.

THE HEATH FAMILY—EPACRIDACEAE

This series of articles has described many generic groups of Epacrids in past issues all of which make ideal garden subjects. In the next issue it is proposed to describe the West Australian genus *Sphenotoma*. I do not have any colour slides of plants in this genus or of the following: *Brachyloma*, *Coleanthera*, *Conostevium*, *Cosmetia*, *Leucopogon*, *Lysinema*, *Monotoca*, *Needhamia*. Please help—Editor.

A SAND BED

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

Much attention has been devoted in past issues to the rockery method of growing the smaller native plants, and certainly the juxtaposition of weathered stone and wildflowers is aesthetically pleasing and practical culturally.

There is however another method which is equally satisfactory and may in certain circumstances, e.g. where a succession of levels demand several long horizontal beds, be preferable to the rockery. I refer to what I call a "Sand Bed", a method forced upon me by the presence (after the builders left) of a raw clay bank some fifty feet long, with an average slope of one in four and of a width to prevent making one horizontal bed.

At first a sprinkling of loam and sand was attempted as a basis for planting and with the pocketing of natural sandstone both as informal walling and plant protection trials proceeded for two years. Difficulties were experienced in winter with poor drainage and excessive moisture build up and failure completed in summer through to rapid drying out of moisture. Under these conditions even the hardiest plants succumbed within two years, and I was led to adopt the following corrective measures.

A brick retaining wall two feet high, plentifully supplied with weep holes at the base was constructed, along the contour, and behind it was thrown building rubble and stones to provide drainage at the lower level. Several tons of Sydney bush sand (broken down sandstone with a proportion of organic matter) provided the necessary soil to give a bed some thirty feet long and varying in width from six to nine feet and in depth from one to two feet. This was compacted by rain and watering for a season before planting began.

No losses have been experienced with the following—*Anigosanthos pulcherrima*, *A. rufa*, *A. bicolor*, *A. manglesi*, *A. viridis* and *A. humilis*; *Acacia baueri*; *Thysanotus multiflorus* and *T. tuberosus*; *Calotis cuneata*; *Brachysema aphyllum*; *Epacris pulchella*; *Dodonaea boroniaefolia*; *Pimelea (glaucous ex Warrumbungles)*; *Blandfordia nobilis*; *Bossiaea heterophylla* and *B. scolopendria*; *Prostanthera denticulata*; two *Leucopogon* spp.; *Styphelia triflora*; *Isotoma axillaris*; two *Senecio* spp.; *Baeckea camphorosmae*; *Phebalium wombeyi* and *P. glandulosum*. Flourishing particularly well are five species of Western Australian *Conostylis* which have not only made very good growth, but have, in the case of two species, *C. setosa* and *C. involucrata*, flowered for three seasons.

Losses have occurred with the shallower rooted plants for example *Leschenaultia biloba*, *L. formosa* and *L. macrantha*; *Platytheca verticillata* and *Hibbertia stellaris*, despite partial shelter from the taller plants.

The "Sand Bed" is in full sun, exposed to the wind from all directions except the south which is protected by a low Passionfruit vine for the full length of the bed. Watering is carried out by sprinkler and forty minutes is enough to saturate the total depth. Surface drying out has to be watched carefully if small shallow rooted plants are to be grown without the protection of rocks, or various forms of mulch, as in dry periods the soil temperature rises very high.

It might be pertinent to add that a somewhat similar method, on a much larger scale has been adopted by Native Plant Nurseryman, Sid Cadwell

Editor's Note: Our last issue described plants of the Sydney Sandstone areas and the cultivation of wildflowers in Sydney. Sydney also has extensive clay areas and these articles are included to guide all home gardeners who are trying to grow the more difficult plants in heavy clay areas.

of Sydney outlying suburb, Annangrove. He has converted an orchard on poor yellow gravelly loam to a native garden by building large beds with selected light soils directly on the ground, planting without compacting but watering consistently. His success with a wide range of genera, particularly the dry area *Grevilleas* from W.A., has been almost unbelievable—rapidity of growth, and quality of flowering of an exceptionally wide range of natives gives encouragement to those whose soil profiles do not lend themselves to rockery practice, as for example heavy badly drained soil or compact badly aerated soils, or where for various reasons it is better to build up rather than dig and modify by usually lengthy processes.

Clay in Built-up Beds

by Ross Doig

As heavy soils and their treatment are in the air at the moment, I should like to place on record an experience of the positive benefit of clay, which may be of interest to those who are cursed with a super abundance of this untractable material.

An area of heavy shallow soil required building up before natives could be planted and in the process of making use of what soil was available, I incorporated a proportion of clay. The mix comprised Sydney bush sand, medium loam and some rotted vegetable matter, plus clay to the extent of fifteen per cent of the total volume. The clay used had weathered well and was easily broken down (dry) to a reasonably fine texture, as it had been used in thin layers as part of a compost heap, with successive layers of weeds. Broken up with a shovel the mixture was included in the built-up bed.

In eighteen months the growth of plants has been superior to that achieved in heavy shallow loam, in beds built up with bush sand and/or typical garden loam, and gravel-leaf mould mixtures.

Not enough plants can be fitted in to fully test the success or otherwise of this soil mix but the following species have flourished in eight inches of this mixture (topped with three inches of sandy virgin top soil)—*Prostanthera incisa*, *Grevillea ericifolia*, *G. bipinnatifida*, *Isopogon anemonifolius*, *Thysanotus* sp. from inland N.S.W., *Boronia megastigma*, *Goodenia* sp., from southern N.S.W. highlands.

Planting is close, all plants are compact, and in full sun. Watering required is less than for beds which do not contain clay and have been similarly built-up throughout the garden. Watering is not required in winter and waterlogging is not a problem. No staking has been required despite full exposure to wind. Success achieved would seem to indicate that the oft repeated maxim of leave the clay where it is, at the bottom, is not necessarily always correct.

THE CLAY SOILS OF N.S.W.

Submitted by T. H. Johns, Chief Chemist, Division of Science Services,
Dept. of Agriculture, N.S.W.

There are four main sources of clay soils in N.S.W.

1. The slates and shales such as the shales of the Wianamatta Group of the Sydney district.
2. The igneous rocks such as the red basalt soils at Lismore and other places on the coast and tablelands.

3. The very large areas of wind deposited clays in the south and west of the State.
4. The very extensive deposits of alluvial material stretching westwards from the slopes of the Great Dividing Range.

Granites, sandstones, etc. normally give rise to well drained soils with varying proportions of clay depending on the age of the soil and the mixing of the granitic parent material with other fine external material.

Of the factors influencing the development of heavy clay soils, age, as mentioned above, and slope are probably the most important: the youngest most freely draining soils occur on the steeper slopes.

The clay soils themselves can be roughly divided into three classes.

1. The acid soils of the coastal belt (excluding basalt soils).
2. The soils developed on basalt and associated alluvials.
3. The saline and or alkaline clays of the West.

Of the acid coastal soils, those developed on the Wianamatta Shale could be said to be typical. They are a form of podzolic having a dense, bleached surface horizon overlying a heavy yellow or red clay sub soil.

Those soils developed on basalt are friable in nature and usually consist of a brown to red light clay which is freely draining. The alluvials derived from these basic rocks give rise to heavy, dark grey to black self-mulching clays. Typical of these are the plains of the North West.

The saline soils are similar to the coastal soils in physical character but have an alkaline reaction, sometimes with a pH exceeding 9.5 and they frequently contain toxic quantities of salt in the sub soil which could rise to the surface if mishandled under irrigation.

Pebbles & Screenings v. Shavings as a Mulch

by W. M. Martin, Clarinda, Victoria

Pebbles have been very popular as a surface material in Melbourne gardens for many years, principally because they look very attractive; and for the belief held that they eliminated weeding. Although I used them myself when requested, I felt misgivings about their ultimate benefit.

It seems now that my misgivings were justified. Where an undercovering of polythene was used, plants were dying either through excess water or no water, and I suspect a shortage of food supplies. A great deal of Melbourne is in the coastal sand belt. When the small amount of humus is used, how is this renewed when the surface is covered? How does the soil population survive with the shortage of air supply? Healthy bacteria are essential to the life of the plants; and the plant roots require adequate air for respiration, and open soil surface seems essential.

Where no polythene is used, the pebbles soon acquire a heavy growth of bent and couch grasses. Removing this requires a great deal of time and expense—far more than natural surface.

I have found that a 2" or 3" shaving mulch to be excellent. Although it looks artificial for a few months, it then settles down to a more compacted and natural looking surface. Small plants require some nitrogen to combat the temporary shortage caused by rotting; but this is a small problem. Although many weeds will break through or germinate; they are easily removed. Couch and creeping paspalum are easily pulled out and soon quit trying. Even the flat weeds are easily pulled with their tap-roots intact.

PLANTS FOR CULTIVATION ON THE CLAY KEILOR PLAINS—cont. from page 199

CORREA—*C. alba*, *C. backhousiana*, *C. baeuerlenii*, *C. decumbens*, *C. 'Mannii'*, *C. pulchella*, *C. reflexa*, *C. schlechtendalii* present no difficulties with ample summer moisture.

CROWEA—*C. exalata*, *C. saligna* sometimes successful but like *Boronia*s often temperamental. Need shade and summer moisture.

DAMPIERA—*D. hederacea*, *D. linearis* usually successful.

DARWINIA—*D. citriodora* frost tender but usually successful with protection. Other species have been grown and need further trial.

DIPLOLAENA—*D. grandiflora* rather temperamental and attractive to snails.

DODONAEA—*D. viscosa* easy; others need further trial.

DRYANDRA—*D. formosa* grows well with good drainage but often unreliable.

ELAEOCARPUS—*E. reticulatus* under trial.

EPACRIS—*E. longiflora* grows well. Other species under trial.

EREMAEA—*E. beaufortioides*, *E. violacea* have succeeded.

EREMOPHILA—*E. maculata* very easy. Others under trial.

ERIOSTEMON—*E. myoporoides* hardy and easy; *E. verrucosus* usually successful.

EUCALYPTUS—many species introduced and many yet to be assessed. *E. caesia*, *E. torquata*, *E. forrestiana*, *E. spathulata*, *E. leucoxylon*, *E. globulus*, *E. tetragona*, *E. ficifolia*, *E. cladocalyx*, *E. lehmannii*, *E. nicholii* are amongst the most popular, but most of the south-eastern species and even many West Australian species would be worth trying in suitable locations. Silver leaved species tend to be affected by caterpillars and are best avoided.

EUGENIA—rather frost tender in the early stages. *E. myrtifolia*, *E. smithii* common in older built-up areas less subject to frost damage.

EUTAXIA—*E. obovata* easily grown with frost protection.

GOSSYPIUM—*G. sturtianum*. Seems less frost tender than would be expected. Well worth trying in a warm protected position.

GREVILLEA—probably the best genus for well drained sunny situations. Numerous species and hybrids introduced with success. *G. robusta*, *G. banksii* frost tender in young stage; *G. longistylis*, *G. tripartita*, *G. paniculata*, *G. brevicauspis*, *G. lavandulacea*, *G. alpina*, *G. juniperina*, *G. pinaster*, *G. longifolia*, *G. hookeriana* and many hybrids well worth growing.

HAKEA—another genus for well-drained sunny positions. *H. laurina*, *H. saligna*, *H. suaveolens*, *H. trifurcata*, *H. purpurea*, *H. elliptica*, *H. petiolaris*, *H. victoriae* all succeed.

HARDENBERGIA—good climbers or ground creepers for sunny positions. *H. comptoniana* is frost tender; *H. monophylla* hardier.

HIBBERTIA—*H. obcuneata*, *H. scandens*, *H. stellaris* seem to dislike dryness; *H. scandens* (*volubilis*), slightly frost tender when young, all easily grown.

HIBISCUS—*H. huegelii* probably the hardiest but most species frost tender, otherwise easily grown in warm protected situation.

HOMALANTHUS—*H. populifolius* easily grown but very frost tender.

HOVEA—*H. lanceolata* probably the easiest; others less reliable.

HYMENOSPORUM—*H. flavum* slightly frost tender but recovers well. Easily grown.

HYPOCALYMMMA—*H. angustifolium*, *H. cordifolium*, easy and hardy; others more difficult; *H. robustum*, *H. puniceum* have been grown.

INDIGOFERA—*I. australis* easy and hardy.

ISOPOGON—*I. buxifolius*, *I. cuneatus*, *I. dubius*, *I. formosus*, *I. latifolius* have all grown well but have been short lived in many cases.

KENNEDYA—*K. nigricans*, *K. rubicunda* have proved rampant growers but have been damaged by very severe frosts; *K. coccinea*, *K. prostrata* have done well as ground covers; *K. eximia*, *K. bezziana*, *K. macrophylla* under trial.

KUNZEA—*K. baxteri* grows well with summer moisture but small plants frost tender, *K. parvifolia*, *K. capitata*, *K. sericea*, *K. recurva* seem hardier.

LAMBERTIA—*L. formosa*, *L. ericifolia* have been grown but have not proved always reliable.

LEPTOSPERMUM—*L. petersonii* (*citriodora*), *L. rotundifolium*, *L. nitidum*, and various hybrids grow well under normal conditions but many of the hybrids do not stand up well to dry conditions.

LESCHENAULTIA—*L. biloba* probably the easiest but dislikes wet soils, wind, frost. Other species have been grown but don't succeed everywhere.

MELALEUCA—a genus containing many species very suitable to areas such as this. *M. filifolia*, *M. diosmifolia*, *M. leucadendron*, *M. megacephala*, *M. nesophila*, *M. hypericifolia*, *M. radula* and possibly a few others rather frost tender when

small, *M. diosmifolia* even when large; *M. armillaris*, *M. lanceolata* (*pubescens*), *M. incana*, *M. polygaloides*, *M. deltoidea*, *M. fulgens*, *M. squarrosa*, *M. nodosa*, *M. macronycha* (*longicoma*), *M. erubescens*, *M. decussata*, *M. elliptica*, *M. huegelii*, *M. lateritia*, *M. linariifolia*, *M. micromera*, *M. platycalyx*, *A. steedmanii*, *M. sryphelioides*, *M. tenella*, *M. thymifolia*, *M. wilsonii* grow freely and are recommended for open positions as background shrubbery, hedges or windbreaks; others are under trial.

MELIA—*M. azedarach* is a useful shade tree for hot positions; a dwarf form of 3-4 ft. has also been grown successfully.

MICROMYRTUS—*M. ciliatus* grows easily on rockeries and drained sites.

MYOPORUM—*M. insulare* grows well but is being superseded by *Melaleucas*, *Hakeas*, *Eucalypts*, *Acacias*, etc. in this area; *M. debile*, *M. humile*, *M. floribundum* present no problems.

OLEARIA—*O. phlogopappa* very easy; others should be equally so.

OXYLOBIUM—*O. lanceolatum*, *O. tricuspidatum* both easy.

PETROPHILE—*P. biloba* has succeeded; one or two unidentified species are doing well.

PHEBALIUM—*P. glandulosum*, *P. ozothamnoides* seem satisfactory on well drained sites; others under trial.

PIMELEA—*P. ferruginea* probably the most suitable; others not widely grown. *P. physodes* grew well for several years.

PITTOSPORUM—*P. undulatum* very easy; *P. rhombifolium*, *P. phylliraeoides*, *P. bicolor* under trial.

PODOCARPUS—*P. lawrencei* (*alpinus*) easily grown, a good tub specimen.

PROSTANTHERA—*P. aspalathoides*, *P. cuneata*, *P. baxteri*, *P. ovalifolia*, *P. rotundifolia*, *P. sieberi* and several hybrids easy and quick with summer moisture; *P. ovalifolia* appears the most frost tender but established plants are not usually damaged; 'Rhylestone' and others under trial.

PSORALEA—*P. adscendens* appears a useful ground cover.

PULTENAEA—*P. pedunculata*, *P. weindorferi* and others under trial.

REGELIA—*R. ciliata*, *R. inops*, *R. velutina* grow well; *R. velutina* frost tender but established plants recover and well worth planting as a specimen.

SCAEVOLA—*S. striata* does well with some shade and frost protection.

SCHOLTZIA—*S. oligandra* has done well in a dry position.

STENOCARPUS—*S. sinuatus*—rather slow in open positions, may do better elsewhere.

TEMPLETONIA—*T. retusa* grows well in warm, dry positions, recommended for winter flowering.

THRYPTOMENE—*T. calycina* grows well sometimes but not always reliable; 'Paynei' easily grown but frost tender, *T. saxicola* good for rockeries; *T. baeckeacea* a "must" for collectors.

TRISTANIA—*T. conferta* is frost tender when young but one of the best evergreen shade and street trees in this district with reasonable summer moisture; *T. laurina* is less frost tender.

VERTICORDIA—*V. plumosa* appears reasonably suitable; others not for the average garden.

WESTRINGIA—*W. glabra*, *W. rosmariniformis*, 'Poorinda Ann' have succeeded.

ZIERIA—*Z. cytisioides* seems suitable and hardy.

CONCLUSION & SUMMARY:

There is room for the introduction of many more Australian plants in districts similar to the Keilor Plains and basic plantings should include *Acacias*, *Eucalypts*, *Grevilleas* and *Melaleucas* selected according to the size of the area and it is hoped that the foregoing will prove helpful to those in this and similar localities in selecting their plants bearing in mind that many rare lines are always in short supply and that new introductions are constantly being made.

Owing to the impossibility of thoroughly surveying even a small section of the gardens in the Tullamarine, Pascoe Vale, Glenroy, Keilor and Broadmeadows districts, without considering the whole of the Keilor plains, many species have no doubt been overlooked. To such plants and to those who grow them we tender our sincere apologies. However, whilst we are always interested to hear of successes (and failures), we cannot for several good reasons maintain such records and would therefore suggest that this information be passed on to the S.G.A.P. whose Recording Officer will make good use of the information.

AUSTRALIAN INDIGENOUS ORCHIDS

An introduction to the book by the author, A. W. Dockrill. This large 825 page book is available from the Editor for \$18.00 plus \$1.00 postage.

"Australian Indigenous Orchids" has been prepared primarily for taxonomic botanists and field naturalists but it should prove useful to orchid lovers and horticulturalists as an aid in identifying some of their plants. I hope it will also have an appeal to those who simply have a love of the Australian flora. The brief notes on distribution and habitat accompanying each description provide pointers to individual requirements. A paragraph in non-technical language for those readers who have not had botanical training also accompanies each description. Cultural notes have not been given as already there are numerous books and periodicals catering for this aspect of the subject with a great diversity of proposed methods.

The original descriptions of Australia's orchids have appeared in numerous periodicals and books published in many countries of the world. A few descriptions were published as early as the late eighteenth century, most during the nineteenth century, but many, including quite a number of tropical species, have been published this century since Bailey's "Queensland Flora" in 1902. Copies of some of the works in which the early descriptions were published are now extremely rare and gaining access to them is difficult. Many of these descriptions are inadequate by today's standards (though adequate at the time when few species were known), for not only are they too brief but are unaccompanied by illustrations in detail. At the present time, when many more species are known and the average reader much more discriminating, descriptions in far greater detail are required.

Several works dealing with the orchids of the whole of Australia have been produced but all except that of Nicholls mentioned later in this paragraph have been out of print for many years. "Prodromus Florae Novae Hollandiae et Insulae van Diemen", by R. Brown, was published in 1810 and contained a few lines of description of all the Australian orchids known to Brown. Baron Sir Ferdinand von Mueller was responsible for eleven parts of "Fragmenta Phytographiae Australiae" between 1858 and 1882 and these contained descriptions of Australian orchids. J. Lindley, between 1830 and 1840, produced "The Genera and Species of Orchidaceous Plants" which included a few lines of description of the species known to Lindley. In 1873 G. Bentham, in conjunction with F. von Mueller, produced vol. 6 of "Flora Australiensis" which dealt, in part, with orchids. A more elaborate and beautifully illustrated (in life size and natural colour) work, "Australian Orchids", was undertaken by R. D. FitzGerald, who, unfortunately, died before the work was published in its entirety, and only two volumes containing in all 12 parts were published between 1875 and 1893. W. H. Nicholls, in "Orchids of Australia", undertook a similar task to that of FitzGerald but he also died before all of the work was published and only 4 parts of the proposed 25 (which were to contain about 450 illustrations) were printed between 1951 and 1958. However the whole of Nicholls' work has now been published in one volume. See page 218 of this issue of *Australian Plants*.

A number of works on the orchids of a particular state have been published, the most important being: for Tasmania, vol. 2 of "Flora Tasmaniae" by Sir Joseph D. Hooker in 1860 and "Native Orchids of Tasmania" by M. J. Firth in 1965; for Western Australia, "Western Australian Orchids" by Emily H. Pelloe in 1930, "Orchids of the West" by Rica Erickson in 1951

and "Orchids of Western Australia" by A. S. George in 1969; for South Australia, part 1 of Black's "Flora of South Australia" in 1922, with the orchid section by R. S. Rogers (in a second edition the orchid section was revised to a minor extent by W. H. Nicholls); for Victoria, "The Orchids of Victoria" by E. E. Pescott in 1928, an account very little different from that of Pescott by A. J. Ewart in "The Flora of Victoria" in 1930 and much more recently, the orchid section in vol. 1 of "A Handbook to the Plants in Victoria" by J. H. Willis in 1962; for New South Wales, two works by H. M. R. Rupp, "Guide to the Orchids of New South Wales" in 1930 and "The Orchids of New South Wales" in 1943; for Queensland, in part 5 of "The Queensland Flora" by F. M. Bailey in 1902.

As this volume is mainly concerned with northern Australia, principally the north-eastern sector, a few words about that region might be pertinent. The rainfall throughout is decidedly seasonal with a definite dry period between June and November (subject to variation). The coastal strip, nearby ranges and the Great Dividing Range enjoy a higher rainfall than the western slopes and western plains, in which latter two areas very few orchids occur. The coastal strip and ranges between the Fitzroy River and Burdekin River have only pockets of rain forest surrounded by extensive tracts of open hardwood forests, and orchids occur in moderate concentration. The area between and including the Paluma Range and the Endeavour River, where there are several plateaux within the highland mass, enjoys a higher rainfall than any other area of the region, and extensive areas of rain forest originally occurred on the coastal plain as well as on the ranges. Unfortunately those of the former have, in all but a few cases, been cleared for agricultural etc. purposes and serious inroads are being made into the latter. The greatest concentration of orchids of the whole region occurs in this area, the whole of which is a flora and fauna reserve. In addition to the typical tropical species, a number of species of typical Australian terrestrial genera, such as *Pterostylis*, *Diuris*, *Caladenia* and *Thelymitra* occur in pockets of open forest on the higher ranges. Very little botanising has been carried out in Cape York Peninsula north of the Endeavour River, the entire Northern Territory and north of Western Australia and it is probable that a considerable number of unrecorded and new species will be found in these areas when access to them improves.

ERRATA

With all the thousands of words in such a large book it is inevitable that a few words should have sneaked through the battery of checkers used. The following have been reported. This is one book that will never get outdated as new items and revisions will appear from time to time in "Australian Plants".

Plate 25—*Sarcochilus falcatus* should be *Sarcochilus falcatus*.

Page 720—*Sarcochilus hartmannii* should be *Sarcochilus hartmannii*.

Preservation and Orchids

It is fitting that an appeal for conservation be made in this introduction. Since most of the epiphytic and many of the typically tropical terrestrial orchids only exist in or near rain forests, it is obvious that if these species are to survive to provide objects for study, interest and delight for our future generations, some rain forests must be preserved in a completely virgin condition. Unfortunately all but a very few small pockets of coastal rain forest remain in Australia, most of formerly vast tracts have been cleared for agricultural or pastoral purposes or for human habitation. Serious inroads into the rain forests of the tablelands and ranges are also being made for the same reasons and by bush fires and, regrettably, by modern methods of forest logging with the use of chain-saws, bulldozers and tractors. Consequently it is imperative that as much rain forest and contiguous open forest, under as wide a variety of situations as possible, be preserved in extensive inviolable reserves before it is too late, as these forests cannot be satisfactorily regenerated. Many species of orchids can thrive under a variety of conditions and their survival for many years to come, under both natural conditions and in cultivation, seems assured. On the other hand, throughout eastern Australia, particularly in and around ranges, numerous micro-climates of an extremely localised type, at critical altitude limits, occur (many of us are familiar with the very simple instances of "rain shadows" on the western side of mountains and the cooling effect of down-draughts of air in mountain gullies) and frequently those of a similar type are widely separated. However, each type encourages the development of a critical habitat for specialised plants and to remove plants from these localities nearly always causes their death as it is impossible to simulate their requirements, especially the varied requirements of a number of plants from different localities, in one plant house. Repeated burning off in open forests by bush fires, started deliberately by some pastoralists and incendiaries, and continuous close grazing by stock, is changing the environment for native flora and fauna. Although a number of terrestrial orchids can stand being repeatedly burnt over, many cannot and even the former are usually not able to survive when trees are burnt down or felled to any great extent (except in the case of grassland orchids such as some species of *Diuris* etc.).

In past years, especially during the last two decades, a wholesale and usually illegal plunder of orchids from the bush, by both professionals and amateurs, has been carried on (locality records have been purposely omitted from the present work as these could be used as an aid to the activities of the plunderers) and it is unlikely that more than a very small percentage of the plants taken have survived for more than a couple of years. If our orchids are to survive for posterity, indiscriminate collecting will have to cease. The rate of regeneration of most orchids is extremely slow and already orchids are exceedingly rare or absent from some areas where formerly they occurred in thousands. An appeal is therefore made to those with the necessary knowledge and facilities to attempt to raise plants of as many species as possible from seed and ascertain their requirements under cultivation so that these plants can be enjoyed by horticulturalists without further depleting the plants in the bush. An appeal is also made to horticulturalists to ensure that their purchases are nursery-raised seedlings.

Editor's Note: It was proposed to present *Dendrobium stuartii* in this issue but I could not get a suitable colour slide. Who can help? I want to illustrate all orchids in full colour.

PRESERVATION OF OUR NATURAL HERITAGE

Must we continue to exploit our natural surroundings for our immediate short term gain and leave spoiled and scared landscape for future generations. There has to be a solution between the two extremes. We must mine the Hammersleys but no TRUE HONOURABLE AUSTRALIAN could ever condone any action that would endanger the barrier reef. Midway between these extremes would be the mining of our coastal beaches. This must continue but with two provisions, (a) Certain areas must not be touched because of certain ecological factors and (b) the government must include a surcharge on the lease for the restoration of the areas AFTER the present restoration practices of the Companies have had time to establish a viable community. Nature must be helped by replanting and restocking. All developmental schemes should be considered on this basis but please, honourable gentlemen responsible for our government, remember that features such as the Colong Caves of N.S.W. can never be restored.

National Parks are vital to our future. The few that exist are mentioned below. We are not asking that this great country of ours not be developed, only that a very small part of it may be preserved for the future by establishing more parks properly located, and adequately financed for proper management. Mr. Premier and Minister for State Development of Queensland, surely it must be obvious that a large National Park in the Cooloola area is essential for the planned development of Queensland just as much as you need the smelters at Gladstone.

AUSTRALIA'S NATIONAL PARKS

"AUSTRALIA'S NATIONAL PARKS" by M. K. Morcombe Price \$9.95 plus 80c postage
A grand book with large pages in clear beautiful full colour. Michael Morcombe introduces the national parks and nature reserves of the Australian continent not only as seen by his camera (and his photography is magnificent) but as he saw and felt the atmosphere, the grandeur or beauty of them. He colours his impressions with legends of the past, aboriginal tales and descriptions of the landscape, flora and fauna. He describes 22 parks on the eastern fringe of the continent, 31 across the far north, 16 in Western Australia and 25 in the south. The most impressive part of the presentation is the colourful scenes in large plates 10" x 9". Although all these parks are adequately described, those further from the large cities, are more carefully presented so that those who are not fortunate enough to ever take a trip to see their native Australia, can enjoy the journey in this book.

There are many more smaller parks throughout Australia. These are listed in a section at the rear, 112 in the eastern region, 21 in the centre, 72 across the north, 72 in the west and 180 across the southern regions of the continent. In this section the size, locality and access, the topography, vegetation types, features of interest and activities, accommodation and recommended season to visit, is given.

BOOK REVIEWS

"COLLECTING SPECIMENS" by John Chlld Price \$1.50 plus 10c postage

Another fine little book on nature in the "Periwinkle" series. The marvels of animal life are not all on the remote jungles or on high peaks. In cold truth the plant and animal life of a suburban garden is richer and more varied. The animals are smaller, perhaps, but no less interesting. This book simply describes how you may study this world around us and its scope may be judged from the chapter headings—1. Collecting Land Animals; 2. Collecting Water Animals; 3. Keeping Alive: Land Animals; 4. Keeping Alive: Water Animals; 5. Animals: Preservation and Storage; 6. Plants; 7. Rocks & Minerals; 8. Photography, etc.

"COMMON CITY BIRDS" by Graeme Chapman Price \$1.50 plus 10c postage

Another in the "Periwinkle" series this fine little book has been written to help those who have little knowledge of our birds to identify most of the common species which are often seen day by day. The notes accompanying the colour photos (there are 60) describe the birds, their habitat and characteristic actions such as flight, song and feeding habits. Chapters 1, 2, 3, 5 are included for those who wish to learn a few basic facts about birds in general.

"Periwinkle" Books—Other similar books are available from Editor, "Australian Plants" as described on page 169 of the last issue but the price is now \$1.50 plus 10c postage for each.

BOOKS—All books reviewed are available from 860 Henry Lawson Drive, Picnic Point, N.S.W. 2213.

ORCHIDS OF AUSTRALIA

W. H. Nicholls was regarded as an authority on the orchids of Southern Australia in the period 1927-51 and his life's work in this field is recorded on 476 colour paintings. These are now available as a large book under the above title together with 224 pages of supplementary information. There is very little overlapping of this book with "Australian Indigenous Orchids" by A. W. Dockrill (which of course is a more up-to-date work) as Dockrill's book covers all the Australian epiphytic orchids but only those terrestrial orchids found in the northern areas of Australia. Nicholls' book presents a large portion of the remainder, the terrestrial orchids of southern Australia.

The large colour plates 12" x 8" allow the plants and flowers to be shown in full colour at natural size with detailed inserts making identification by the inexperienced much easier. This has no doubt influenced the cost of the book but for the keen orchid observer it is good value. Available from The Editor, 860 Henry Lawson Drive, Picnic Point, N.S.W. 2213 at \$30.00 plus \$1.00 postage.

The *Pterostylis* Genus on the Mid-North Coast of N.S.W.

by Felicity and Keith Holmes, Kempsey, N.S.W.

In both species and individuals the *Pterostylis* genus is the most numerous in this area, which covers the coastal strip of N.S.W. from 200 to 350 miles north of Sydney. The following is a list of species observed.

SINGLE FLOWERED SPECIES THAT GROW IN COLONIES

The first group of greenhoods have a single flower on a stem arising from a rosette of leaves. They grow in colonies and flourish in pots containing a well drained mixture of coarse sand and leaf mould. They soon multiply.

Pterostylis nutans, "Nodding Greenhood". Very common and occurring in large colonies from sea level to an elevation of 3,000 ft. Grows in moist situations with east to south aspect. Easily recognised by its inclined flower.

Flowering period: April-September.

Pterostylis nutans* var. *hispidula. This variety is common in the granite country of the Carrai Plateau about 50 miles west of Kempsey. It is not particular about soil requirements as colonies are found in the hard soil of a dry sclerophyll bloodwood and peppermint forest as well as the moist leaf mould on the heavily shaded banks of creeks. It is a more slender plant than *P. nutans* with a smaller flower that is not so inclined. The labellum is often hispid and the leaves of the rosette are smaller and closer to the stem. Flowers January to March.

Pterostylis curta, "Blunt Greenhood". Not as common or widespread as *P. nutans* but grows under similar conditions and sometimes the two species occur together. In the springtime, the Pee Dee Cutting on the Kempsey-Armidale Road, for hundreds of yards is covered with thousands of both species growing and flowering together. The tip of the labellum of *P. curta* has a characteristic sideways twist. Flowers June to September.

Pterostylis hildae, "Hilda's Greenhood". Sparsely distributed and grows in small colonies in moist shady places. We have found it at Smokey Cape within yards of the sea in a blackbutt forest and near Wauchope growing in total shade in the thick litter of the floor of a rainforest, as well as other places. The flower is similar to *P. curta* but without the twisted labellum and there are usually two leaves in the basal rosette. Flowers August-October.

Pterostylis ophioglossa, "Snake's Tongue Greenhood". So called because of the forked tip of the labellum. It grows in colonies in the Blackbutt-Tallwood-Bloodwood-Mahogany forests of the ridge country along the coast. Common near the Pacific Highway in the Cooperabung Mt. area between Telegraph Point and Kempsey. The blunt flowers have deflexed tips and often striated with red lines or completely green. Flowers April to July.

Pterostylis acuminata, "Sharp Greenhood". This is a very common species around Sydney but appears to be rare in this area. We have found only one small colony in a wattle thicket on limestone at an elevation of 1500 ft. near Willi Willi west of Kempsey. Flowers in Autumn.

Pterostylis pedunculata, "Little Red Riding Hoods". This is the *Pterostylis* with the "Twiggy look". A very slender stem rises from a rosette of leaves with undulate margins and conspicuous veining and is topped with a small red-brown flower about one half of an inch long. Grows in moist conditions e.g. in coastal paperbark scrubs and in tallow-wood forests with a southerly aspect. Flowers in spring.

Pterostylis baptistii, "The King of the Greenhoods". This is the giant of the greenhoods. The galea often attains a length of three inches. They like moist conditions. One spectacular colony on the Lower Macleay swamplands contains thousands of plants spread over a couple of acres and growing in sphagnum moss in a dense paperbark forest.

OTHER SPECIES MORE DIFFICULT TO GROW

The following species are less common and do not occur in large colonies. Most of them do not have the encircling rosette of leaves and most have stem leaves. Our experience has shown that these species do not transplant easily and they rarely survive in cultivation.

Pterostylis grandiflora, "Superb Greenhood". This is one of the most beautiful of the greenhoods. The rosette of leaves is usually absent at flowering time, but there are several stem leaves. The galea is erect for about half of its length then curves over horizontally. The rich red-brown petals expand into a broad hood giving the flower the appearance of a cobra. *P. grandiflora* is not a plentiful species but it will usually be found in dense shade in gullies. It flowers in winter.

Pterostylis obtusa, "Blunt-tongued Greenhood". This species also likes the moist gullies but requires less shade than *P. grandiflora*. The rosette is separate from the flowering stem which has several stem leaves. The galea, about one inch in length, is bright green, the lower sepals are conjoined for about half their length and form a protruding porch with the tip of the labellum just visible over the top. Flowers April to June.

Pterostylis decurva, "Summer Greenhood". This species is similar to *P. obtusa* but is more robust. The stem leaves are sometimes reduced to bracts. The dorsal sepal curves through 180° and ends in a long decurved point. This species grows in very wet conditions in moss along the banks of creeks at an altitude of about 3000 ft. It is common along the creeks of the granite belt on the Carrai Plateau. Flowers January to March.

Pterostylis parviflora, "The Baby Greenhood". This is a variable species. The form from this area grows to 12 inches high with 4 to 10 tiny red flowers up the stem. Each flower is only about $\frac{3}{8}$ inch long. The rosette, containing numerous leaves is detached from the flowering stem and is usually withered at flowering time. This species grows in poor soil in dry sclerophyll forests. Flowers in late summer and autumn.

Pterostylis longifolia, "The Leafy Greenhood". This is a variable species depending on where it grows. In hard gravel on dry ridges, the stem with several stem leaves is often only a few inches high with 2 to 3 terminal flowers. But in moist shady conditions the plants will grow to three feet tall with a dozen flowers. Sometimes these plants will flower for three months as the flowers open one after the other. When the last flower is out, the seeds of the first are often mature. This species is different to the preceding ones in that the lateral sepals hang below the galea. The black labellum opens down onto the lower sepals. It is slightly hairy and extremely irritable and when touched will spring up into the galea.

Pterostylis mutica, "Midget Greenhood". The tall slender form of this species occurs rarely in grasslands and open forest country in this area. The numerous lanceolate leaves of the rosette are green at flowering time. The stem has several sheathing bracts and the tiny green flowers spread up the stem in a loose spiral spike. The labellum of this form has a black appendage and is very irritable. Flowers in spring.

EUCALYPTS

One of two exciting books described below and available from the Editor, 860 Henry Lawson Drive, Picnic Point, N.S.W.

"EUCALYPTS" by Stan Kelly, C. M. Chippendale & R. D. Johnston—Price \$12.00 plus 40c postage

The feature of this book is the 250 pages of full colour plates, one species per page, prepared from detailed accurate water colour paintings by Stan Kelly. This represents twenty-five years work and play by a much travelled bush lover with a special interest in eucalypts. There are hundreds of species of *Eucalypts* and for all but the botanical trained, their identification is largely a mystery. Now we have the opportunity to compare our specimens with a full size large full colour plate and it is most unlikely that it will not be one of the 250 illustrated.

The text comprises brief descriptions of the habitat and main characteristics of each species illustrated, together with their scientific and popular names and notes on cultivation. Real value for the price and the only worthwhile book on Eucalypts for the layman.

"WEST AUSTRALIAN NATIVE PLANTS IN CULTIVATION" by A. R. Fairall.

This book will be priced at \$10.50 but for all orders received prior to the publication date of 20-3-70, our readers may take advantage of a special pre-publication price of \$8.95 plus 50c postage.

Arthur Fairall is Superintendent of King's Park. I spent some time with Arthur and was particularly impressed with his practical approach to the problems of cultivation of the W.A. wildflowers in the garden. A 264 page book with 104 colour plates is good value for the price quoted these days. Of infinite value however is the carefully considered advice by this expert. 650 of the choicest West Australian wildflowers are described with details of their cultivation. His hints on propagation will be of special value but his advice on essential garden practice could be the real climax of the book. This could be the best wildflower gardening book of the year. Next issue I shall give further details but I am basing this review and recommendation on the competence of the author.

BANKSIA IN WAGGA—continued from page 205

So far it has been completely disease and insect free, but chlorosis, at times, appears in late Winter or early Spring when usually one application of Iron Chelates is enough to correct this. The plant flowers January to March, the early flower spikes, measuring 2-3 inches diameter and up to 5 inches in length, usually are a pale amber colour, but as flowers age and later flowers open, the styles become a deep pink shade giving the spikes an attractive two-tone colouring.

The fine, feathery dark green foliage also makes this an attractive shrub when not in flower, but tends to hide the spikes at flowering time, the only minor fault that I can find with the plant. After flowering, I have removed all dead flower spikes.

B. occidentalis makes new growth in Spring, and again after flowering, however the Autumn growth is usually cut by frosts but this is not detrimental to the plant, having a self pruning effect which keeps the shrub bushy. At present it is approximately six feet high by four feet in diameter. Depending on rainfall, I have found that one good soaking a month in summer is beneficial; let the hose trickle around base for 24 hours. I presume from the above observation that the plant requires a constant sub-soil moisture level.

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SOME CULTIVATED BANKSIA—continued from page 204

green and grows to 2½-3" across during the next twelve months, the seed capsules are very prominent and striking; hence the name "Rose Cone Banksia".

Banksia solandri, an attractive open shrub 6-8' with large coarsely serrated leaves. It has soft velvety brown terminal flowers; here again reference books call it "orange" and "dull purple". It can be grown in well drained heavy loam to sand, in open or semi-shaded positions.

Banksia sceptrum, although this specie can grow into a small tree it does not appear to be doing so in cultivation. It has an upright habit with short blunt leaves and terminal yellow flowers to 6" in the summer. It could be a useful shrub for hot conditions and rainfall of 15" but is also doing well in sandy soil with 30" rainfall.

Banksia speciosa, the "Showy Banksia" and a specie that has every chance of being successful in the eastern states. In cultivation it develops into a large shrub of 10-12 ft., with attractive long serrated leaves and yellow terminal flowers. The flower buds in the late spring are a lovely velvety white. It requires a rainfall of 20" and over, well drained open soil types. This Banksia is also used as a soil type indicator in the Esperance district of W.A. and is found in the deeper, elevated sands.

Banksia baxteri, can develop into a large shrub of 10 ft. with deeply serrated leaves with blunt ends that look as though they have been cut off. The flowers are globular, set in a rosette of leaves, pale yellow-green when young, yellow when mature and very attractive. Requires 20" rainfall or better and good drainage. Flowers in summer.

Banksia sphaerocarpa, has a very wide distribution in W.A. and also many forms, consequently it should be adaptable to conditions in the eastern states and reports from various growers showing this to be so. It forms a rounded shrub to 5 ft. with fine "pine-like" foliage, the flowers are sometimes not conspicuous, other forms can be showy, as they are on short lateral branches, usually within the shrub. The roundish flowers are often pinkish in bud, turning yellow on maturity.

Banksia tricuspis, somewhat similar to *B. sphaerocarpa* only more upright and open in growth habit. The flower spikes are also open and spidery and more oblong, becoming a bright, clear yellow when mature. It is slow growing in sandy conditions and could do better on a gravelly loam.

Banksia ashbyi, a medium to large shrub with long deeply serrated leaves and terminal orange flowers very much like *B. prionotes*. A shrub for warm, well drained situations.

Banksia attenuata, this can grow into small tree proportions but as far as I know it has only attained shrub size in cultivation and should be adaptable, as it has a wide distribution in W.A. The terminal lemon-yellow flowers are bright and attractive.

Large Shrubs and Trees

Banksia brownii, sometimes a low shrub of 2-3 ft. but can be upright to over 15 ft. The 3" leaves are finely pinnate and ½" wide and soft to handle, differing from most Banksia leaves which are stiff and hard. The bud for the flower spike forms on the tip of the previous years growth but before the flower spike develops several new branches grow out from below the bud so that the 6" deep red flowers are usually surrounded by these new branches. It needs over 20" rainfall.

Banksia coccinea, the "Scarlet Bankia", is often only 7-8 ft. but can develop into a small tree of 15 ft. It is so well known it needs no description and is considered by most people to be the most outstanding *Banksia* flower.

This specie seems to like company and I suggest they should be planted in a clump only 3 ft. apart. They require a 28" rainfall or better.

Banksia spinulosa (B. *collina*), from the eastern states does not occur in S.A. It grows but does not thrive in the sandy soils of the "South East" of S.A. However it appears to do well in the Adelaide hills.

Banksia ericifolia, another eastern states specie does well in many localities in S.A. The volcanic soils of Mt. Gambier, elevated acid sands (with watering), wet sand-over clay and Adelaide hills, etc.

Banksia grandis, a shapely, upright tree with large dark green deeply cut leaves. The large, 12" or more yellow flower spike is terminal and quite showy. This specie is one that could be more widely grown with a good chance of success, it is reported to be doing well on "terra-rosa" soils, heavy loam over limestone, sand and a loam gravel shale complex.

Banksia ilicifolia, there is not much experience to report on this tree in cultivation except that it is low growing in sand and could do better with better conditions. It can be a shapely tree with a rounded crown and has small yellow or red flowers set in a rosette of leaves.

Banksia marginata, of south eastern Australia is the most versatile *Banksia* in regards to soil and moisture requirements. It thrives in waterlogged to dry, shallow soil conditions, from very alkaline to acid soil types.

Banksia menziesii can be a shrub or tree to 28 ft. I do not know of any that have reached tree proportions in cultivation but if required it can be kept within bounds by pruning. The pink to red flowers are terminal and very striking. In sand it is slow growing but by reports it is growing better in heavier, well drained soil types.

Banksia occidentalis is the fastest growing *Banksia* of all to about 18 ft., upright habit, long narrow leaves with only a few serrations. The flower spikes are 5"-6" long, bright red and mostly terminal. It is a magnificent sight looking into the sunlight streaming through the shrub and lighting up the red flowers. It is one W.A. specie that appears to thrive on extra watering without harm and its natural habitat is in damp situations.

Banksia prionotes has a wide distribution in W.A. which again indicates successful cultivation in the eastern states, and this is proving to be the case, as it is growing in alkaline loam, heavy textured soil over limestone, deep acid sands and other situations. The large orange flower spikes are well known as they are commonly sold by florists as the "Orange Bankia". It will grow into a tree of over 20 ft. but can be kept to shrub.

Banksia serrata and *B. integrifolia* of the east do not occur naturally in S.A. but have been established successfully here.

"THE EVOLUTION AND CLASSIFICATION OF LOWERING PLANTS"—Price \$8.50 plus 50c post.

Written by Arthur Cronquist, senior curator of the New York Botanical Garden, this 400 page book is produced as a serious work for students and practising botanists. The author obviously has had considerable practical experience and contact with the public as even I can follow it and find it interesting. The first section of the book studies the evolution of flowering plants to their present form. The greater part of the book is devoted to the presentation of a new and comprehensive system of grouping of the families of flowering plants on a world-wide basis, into orders based on wide similarities of the plants, and not on obscure botanical features such as a minute part of the flower. The simple keys given to group the plant families of the world are intended as a guide only to related plants. John Hutchinson's "Families of Flowering Plants" is still retained for the systematic botanist who needs a workable but necessarily artificial and repetitive set of keys to the families but this book will be of infinite value to the botanist-horticulturalist. —Editor. Available from Editor, "Australian Plants", 860 Henry Lawson Drive, Picnic Point, N.S.W. 2213.

TASMANIAN CUSHION PLANTS

A series on the "Wildflowers of Tasmania" by A. M. GRAY

The "cushion plants" are a very interesting group of plants occurring chiefly in sub-Antarctic regions. These plants are representatives of the families *Compositae*, *Stylidiaceae*, *Donatiaceae* and *Epacridaceae*. Their distribution in the sub-Antarctic regions includes New Zealand, far South America, Falkland Islands, etc. and Tasmania.

Their habit of growth is of much interest, they are densely compacted plants forming hard "cushion"-like mounds from 1'-3' in dia. and in many cases so hard that a person standing on them leaves no impression. The leaves on all species are closely imbricate, the branches growing very closely together and with thick, fleshy adventitious roots growing among the branches, helping to consolidate the "cushions". Very often a number of different species grow together and coalesce. When not in flower identification is very difficult as the overall growth-habits, leaf shapes, etc. are very similar. The only species which can reasonably be identified when not in flower is *Pterygopappus lawrencii* on account of the colour of the leaves, these being sage green instead of the usual bright green of the other species.

COMPOSITAE—Cushion Plants

The two representatives of the *Compositae* family found in Tasmania are endemic, they are *Abrotanella forsteroides* and *Pterygopappus lawrencii*. The genus *Abrotanella* includes about 20 species found in sub-Antarctic South America, Falkland Islands, New Zealand and the mountain regions of Australia. The two Tasmanian sp., *A. forsteroides* and *A. scapigera* are endemic in this state. *A. scapigera* is a dwarf herb, not forming a "cushion". There are also some species found on the mainland mountains.

Abrotanella forsteroides (Hook. f.) Benth.

A very densely compacted perennial plant, sparingly branched. The leaves are erect and closely imbricate about $\frac{1}{4}$ " long and just as broad with sheathing bases, bright green, very thick, apex acuminate. The older leaves are persistent and though dead add to the solidity of the plant, many adventitious roots penetrate between the stems. Flowers very small, solitary at the ends of the branches. Phyllaries 4-5, erect and shorter than the florets and leaves. Florets 3 or 4, white, the inner ones pistillate and the outer ones staminate. Achenes small and 4-angled. Found on most Tasmanian mountains. More widely occurring than other cushion plant species.

Pterygopappus lawrencii Hook. f.

A single genus with one species found only in Tasmania. This is a very densely compacted perennial herb, much branched, the lower branches covered with the dead persistent leaves, adventitious roots growing between the branches. The leaves differ from other cushion plants by having the leaves a sage green colour instead of bright green. Leaves broadly obovate with the apex acuminate and about $\frac{1}{2}$ " long, both surfaces with a transverse band of long hairs. Those on the upper surface densely crowded and conspicuous. Flowers solitary on elongating peduncles, white in colour and quite small.

DONATIACEAE—Cushion Plant

The cushion plant species *Donatia novae-zelandiae* is described under an article "The Family Donatiaceae", page 226.

EPACRIDACEAE—Cushion Plant***Dracophyllum minimum* Hook. f.**

This plant is also very alike vegetatively to the other cushion species. The leaves have a sheathing base almost as long as the blade which is $\frac{1}{8}$ "– $\frac{1}{4}$ " long, narrow-lanceolate, rigid and slightly concave, apex acute with a hard point, margin very slightly scaperulous, closely imbricate and persistent. For a fuller description see the article on the genus *Dracophyllum*.

Dracophyllum minimum is closely related to *D. muscoides*, which is found in New Zealand.



Photography by A. M. Gray

DRACOPHYLLUM MINIMUM**STYLIDIACEAE—Cushion Plant*****Phyllacne colensoi***

This cushion plant belongs in the family Stylidiaceae. There are about 4 species of *Phyllacne*—3 in South America and New Zealand and one in Tasmania, which is also found in New Zealand.

A very densely tufted perennial plant very similar in vegetative details to the other species of "cushion" plants. The leaves are very crowded, persistent about $\frac{1}{8}$ " long, the tips sometimes yellowish brown and having a

small pore just below the apex on the upper side. Flowers solitary on very short peduncles about $\frac{1}{4}$ " dia. Petals 5-6 rounded or irregularly notched. Stigmas and anthers on a common column. Anthers 2, purplish, surmounted by the 2 stigma lobes. Fruit a small capsule.

Editor's Note: The family *Stylidiaceae* includes those fascinating little plants *Stylidium* or "trigger" plants. Previous issues have described these plants and for those really interested the very entertaining book "Trigger Plants" by Rica Erickson is available from the editor for \$4.00 plus 20c postage.

CULTIVATION OF CUSHION PLANTS

All the Tasmanian cushion plants are found at altitudes of, or above 2500'-3000', usually on alpine moorlands or on scree slopes in damp poorly drained situations, often where snow persists for most of the year. They form "seed beds" for a host of other alpine plants, e.g. *Drosera*, *Sprengelia*, *Epacris*, etc.

I have tried growing all the species of cushion plants, from seeds and lifted clumps of plants but the seeds are very unreliable and can be discounted as a successful method of propagation. Lifted clumps, though well supplied with roots, suffer unaccountable die-off—cuttings are impractical. Occasionally I have had some successes but the plants are extremely slow-growing and it will be years before they begin to take the typical "cushion" form. I know of no other person who has tried to grow cushion plants!

THE FAMILY DONATIACEAE

by A. M. Gray

The family *Donatiaceae* consists of one genus with two species, *Donatia fascicularis*—found in the extreme south of South America and *Donatia novae-zelandiae* found in Tasmania and New Zealand. Once included in *Saxifragaceae*, *Donatia* is now thought by some botanists to be more closely related to the *Stylidiaceae* (Trigger Plants).

Donatia novae-zelandiae J. R. & G. Forst

Donatia novae-zelandiae is one of a group of plants found in Tasmania, commonly called "Cushion Plants", so named because of their habit of growing in very hard, compact mounds, so hard in fact that it is possible to walk on them without leaving any impression. See associated article on Tasmanian Cushion Plants for other similar plants.

A perennial, densely growing plant, usually growing in hard compact mounds, often 3' or more in diameter. Stems erect growing very close to one another, hardly branching, about 8"-12" long, thick fleshy roots usually growing between them. Leaves erect and closely stem clasping, sessile, the uppermost leaves green and shining, the lower ones persistent, brown, about $\frac{1}{4}$ " long, linear-subulate, base wide with a tuft of fine hairs growing in the axils. Flowers occur singly at the apex of the branches about $\frac{1}{4}$ " long and $\frac{1}{4}$ " wide. Sepals five, triangular, $\frac{1}{8}$ " long. Petals five, oblong, white, about $\frac{1}{4}$ " long. Ovary inferior, styles three, short. Fruit thinly fleshy, top-shaped. Common on mountain summits, wet scree slopes etc., often growing with and sometimes mingling with other species of cushion plants. Very hard to propagate and grow on.

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FUNGAL DISEASE

Banksia are not difficult to grow and will flourish in most sunny situations provided the ground does not get boggy. The only problem appears to be an occasional death due to root disease so that the following notes are included to round off the subject.—Editor.

By far the commonest causes of plant disease are the fungi. In their vegetative state these simple forms of plant life consist of slender branched filaments of microscopic diameter, which ramify through the host plant or other substrate from which nourishment is drawn. Aggregation of the hyphae, as these filaments are called, produces larger structures such as mushrooms and puffballs.

The reproductive stage of the fungus is the spore. Although much simpler in structure, spores perform the same function as the seeds of higher plants. They are usually produced in enormous numbers, and because of their small size are readily carried on air currents.

Fungi cause many different types of disease. *Damping-off* refers to death of seedlings due to attack by soil-inhabiting fungi such as *Rhizoctonia* and *Pythium* species. They are particularly common in soil and can attack a wide range of crop, pasture and ornamental plants under suitable conditions. Only young tissues are susceptible and usually once the stem becomes woody the plants are resistant to this type of disease. *Banksia*, *Callistemon*, *Eucalypts*, *Leptospermum*, *Hakea* and *Oreocallis* are some of the native plants in which this type of disease has occurred locally.

Root rots are also caused by soil-borne fungi, in particular species of *Phytophthora*. They are favoured by wet soil conditions, so this type of disease is usually found in soils with impeded drainage or following prolonged wet periods. A local example is the recent death of *Grevillea banksii* plants, with which a species of *Phytophthora* is associated. Damage probably occurred during the record winter rains, but the plants are only dying now because of increasing stress as the soil dries out and temperature rises.

An example of severe root rot is the mass dying of jarrah and *Banksia* communities in Western Australia. In the affected areas the plant association is destroyed, and little regeneration occurs. A wide range of species is susceptible, from the tree, understorey, and shrub layers. These include *Eucalyptus*, *Banksia*, *Casuarina*, *Xanthorrhoea*, *Xylomelum*, *Andeananthos*, *Macrozamia*, *Persoonia*, *Hibbertia*, and epacrid species. The causal fungus is *Phytophthora cinnamomi*, common in Queensland on pineapple, avocado and *Pinus* species.

Control of root rotting fungi is very difficult. The best way to overcome this type of disease is to plant resistant species in sites prone to drainage troubles. Unfortunately the susceptibility of many species is not known and much trial and error will be necessary before comprehensive lists of suitable plants can be compiled.

TROPICAL NEMATOLOGY—by V. G. Perry and G. Smart

Published by University of Florida Press and available from the editor for \$10.00 including postage. This new book is of particular interest in relation to below ground problems with plants as contained in the above article. I will refer readers to page 154 of our previous issue that suggests that the above problem in cultivation is secondary to infestation of nematodes and suggestions are made as to how they may be combated. However this book "Tropical Nematology" may be of special interest to students of this problem.

HIBBERTIA

Our No. 33 issue introduced these valuable horticultural plants to the home gardener. The reports below are from readers who give their experiences after reading that issue. I am not sure of the name of the species in the colour plate below. Who does?

The white flower is of course *Clematis aristata* described in our No. 36 issue.



Blocks by courtesy of John Sands Pty. Ltd.

From T. Tribe, Keiraville, N.S.W. . . .

Hibbertia nitida has been found growing at Currarong, N.S.W. S.E. coast, on dry sandhills up to 20 feet high in part shade and part sun. The flowers are $\frac{1}{2}$ to $\frac{3}{4}$ inch across and a pale yellow.

From F. Coate, Bunbury, W.A. . . .

Hibbertia stellaris. I read with interest the articles on this fine plant in the No. 33 issue and noted the efforts to ensure good drainage. It may interest growers to know that in its natural habitat it is a swamp plant. In most cases it stands in several inches of water right through winter and into the flowering season. There is a swamp within a few minutes drive of my home where it bloomed beautifully this spring and was right out in the water, blooming for several months. I paid a visit to the swamp in mid-summer and although the swamp is now free of water, the black sandy loam is still quite damp with the plants still in bloom.

It appears that there are at least two forms of *H. stellaris*. One grows to about two feet high with quite small flowers and always in several inches or more of water among rushes etc., that support it, and another more compact and low growing around the edges of swamps and slushy places.

I have never seen the plants near running water nor in well drained positions. They are nearly always in full sun but would need to be protected.

THIS BLOCK IS REPRODUCED AS WHEN PRINTED IN No. 39 ISSUE. AN ERROR IN BLOCK MAKING CAUSED IT TO BE PRODUCED WITH A BLUE FLOWER



Reproduced from paintings by Alison M. Ashby—Blocks by courtesy of the S.A. Museum

***Richea scoparia* Hook. f.**

"Scoparia"

One of the most eye-catching of plants on the moors and ridges of Tasmania's high country, often forming extensive patches on scree slopes and the flanks of ridges, plants from 2'-6' high. Bushwalkers abhor this plant as its very rigid and pungent foliage makes it a nightmare to try and force one's way through, indeed there are very few bushwalkers who have not had some encounter with Tasmania's "infamous" Scoparia scrub.

The leaves of *R. scoparia* are from 1"-3" long, rigid, often very coarse and pungent, erect or semi-recurved, sometimes deep reddish in colour, persisting on the branches for two or three seasons after dying; base sheathing and somewhat imbricate. The bark is tan brown in colour and usually shed in large flakes, leaf-scars obscure.

Flowers in terminal spikes or panicles, somewhat similar to the inflorescence of *R. dracophylla*, though of course smaller and coloured from all shades of pink, orange and scarlet to the most exquisite 'burgundy' shades.

Other species of *Richea* are shown in colour in our No. 39 issue.

Variation and Inheritance of Flowering in *Acacia baileyana*

F. MUELL.

By R. W. BODEN*

* Parks and Gardens Branch, Department of Interior, Canberra, A.C.T.

I. INTRODUCTION

Acacia baileyana F. Muell., "Cootamundra Wattle", is one of the most attractive and widely planted ornamental trees. Used extensively in Australia, New Zealand, America and southern Europe it is particularly valuable because of rapid growth when young, massed floral display in spring, and attractive blue grey feathery foliage throughout the year. It has been in cultivation for many years and Newman (1935) refers to plantings made in 1880 in the garden of Mr. Joseph Hadfield, Christchurch, New Zealand; its popularity amongst horticulturists still persists. The wide interest in this species is reflected in the fact that more than 10,000 plants are raised annually in the government nursery at Canberra for garden and shelterbelt planting in the city and surrounds.

In commercial production "Cootamundra Wattle" is raised entirely from seed, thus giving large populations from which selection and genetical studies can be made, however there are very few references to such investigations with this or other Australian *Acacia* species. The major exception to this is the work of the Wattle Research Institute at Natal with tannin producing species, *A. mearnsii* De Wild. and *A. decurrens* (Wendl.) Willd.

II. NATURAL OCCURRENCE

A. baileyana was described by Ferdinand von Mueller in 1887 from specimens of a planted tree collected in Bowen's Park Brisbane by the then Government Botanist, Dr. F. M. Bailey.

The natural occurrence of the species is now very restricted and even as early as 1902, Cabbage wrote that a circle of radius about 30 miles, centred between Cootamundra and Temora, N.S.W., "would have included every tree of Cootamundra Wattle known in the world" before its cultivation. Newman (1935) in a series of papers on studies in Australian *Acacias* dealt extensively with *A. baileyana* and attempted, by intensive field study, to determine the natural occurrence of the species and suggest reasons controlling the distribution. He found that the natural habitat was characterised by a conjunction of three features—an area of silurian rocks with some patches of igneous, altitude 500-1500 feet, and rainfall of 18-23 inches, and claimed that the only other area in N.S.W. of similar conjunction "is a smaller one immediately to the north separated from the first by an eastward recession in the boundary of the silurian rocks and a westward advance of higher land".

In the field, Newman (1935) found the species in approximately six separate localities within a range of 30-40 miles in the vicinity of Cootamundra and Temora and suggested that it may be a relict of a species which had previously flourished before physiographic or climatic changes occurred. There was no evidence from field studies to suggest that *A. baileyana* was a garden form which had escaped from cultivation or of hybrid origin, although subsequent observations by a number of workers, including Cheel (1935), and workers at the Wattle Research Institute, Natal, have confirmed that, as a species, *A. baileyana* hybridises quite freely with other species, in particular *A. decurrens*.

III. PHENOLOGY

Newman (1934) described the annual growth pattern of *A. baileyana* based on observations at Hill Top, located 80 miles south-west of Sydney, N.S.W. at an altitude of 1800 feet. Observations at Canberra altitude approximately 1875 feet, latitude 35°18'S, longitude 149°6'E, indicate a similar pattern of behaviour to that recorded for Hill Top.

The racemes appear in late December and gradually develop until they are mature in June-July. Flowering extends from late June to early September and the peak of flowering for most trees is in mid-late August. Seeds develop rapidly and are shed over a short period of a week or two in late December, i.e. 3-5 months after flowering.

After seed shed, which is rapid and complete, there is a burst of vegetative growth which covers the tree with young glaucous leaves.

No detailed records of flowering time have been made in other locations however scattered observations in coastal N.S.W. and near Adelaide suggest that, in regions with mild winters, flowering may commonly occur in July. Wherever it is grown it is safe to assume, that "Cootamundra Wattle" will be amongst the harbingers of spring.

IV. VARIATION IN FLOWERING TIME

Whilst the flowering period for the species is from June to August, individual trees flower for only a few weeks within this period and, in one area at any one time from late June-August, trees can be found at all stages of blossoming. Trees growing side by side in an apparently similar environment may vary in their flowering time by several weeks (Plate I).

In 1955 Pryor (Personal Communication) recorded the peak flowering time of sixteen Cootamundra Wattles growing in Canberra, noting that they were well ahead of the bulk of the population. In 1960 some of these trees were relocated (unfortunately many had been lost during urban development), and their annual flowering patterns, and those of an additional number of selections, have been followed for 5-7 years.

Observations were also made of a number of trees whose general flowering period was consistently later than the bulk of the population.

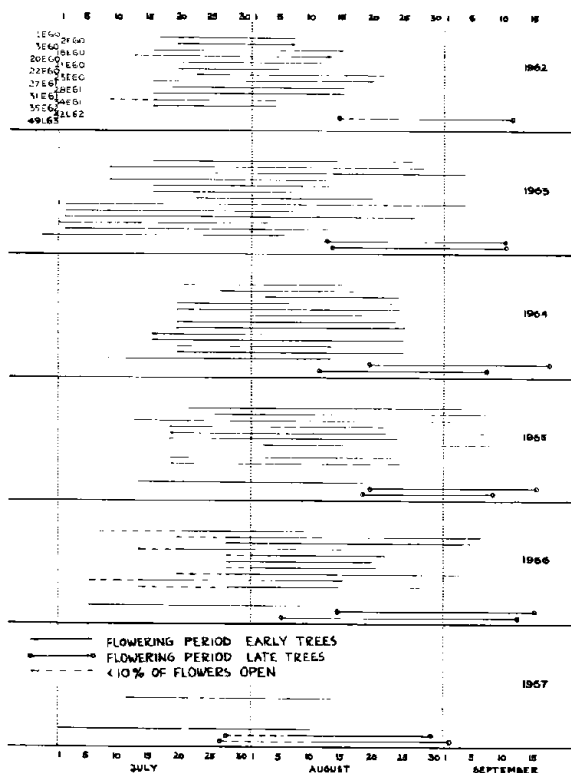


FIG. 1

Figure 1 shows the flowering periods of 13 early and 2 late flowering trees over a period of six years and indicates that, although there were variations from year to year in onset of anthesis, it was clear that trees which flowered early were consistently early, whilst those which flowered late were consistently late. There was always some variation over the whole tree with a tendency for flowering to commence on the northern or eastern side. On occasions when a sudden cold snap occurred some of the buds, or opened flowers were frost damaged; this was often the case with No. 35E62, the earliest flowering tree under study.

An examination of climatic data for Canberra was made for the years of observation to self a correlation existed between any particular climatic factor and onset of flowering. This was essentially on a broad scale using local meteorological data and could not take into account micro-climatic effects, such as amelioration of climate by protection from buildings or other trees, or intensified cold due to cold air drainage patterns which is common in Canberra.

(Continued on page 235)

Within the limits of these observations it appeared that whilst there is variation in time of flowering between individual trees which is maintained from year to year, the climate at the immediate flowering period can either delay or induce flowering.

(Continued on page 235)



Blocks by courtesy of John Sands Pty. Ltd.

ACACIA

This plate was prepared on the understanding that it was *A. baileyana*. Flowering is similar but it appears from the leaves to be *Acacia decurrens* featured in our last issue. The leaves of *A. baileyana* are a silvery grey and more drooping in habit. Most issues of "Australian Plants" describe wattles that are ideal for your garden.

THE BLUE TINSEL LILY

by Alf Gray, Maileup Downs, Borden, W.A. 6338

"The Blue Tinsel Lily", *Calectasia cyanea*, is not as rare as popular opinion has it, though disappearing very rapidly from many of its former haunts through the cultivation of coastal sand plains and semi-deserts in recent years. In the West it occupied the west coastal plains as far north as Jurien Bay, 130 miles north of Perth. It was once very common around Perth itself, and on peaty sand plains there grew to maximum height of 2' 6" in dense clumps. Seedlings were not uncommon, but the main growth is from rhizomes apparently.



Reprinted from "Australian Native Plants and Trees" by courtesy of Lamb Paterson Pty. Ltd.

Some readers are very critical of me because I occasionally repeat a colour plate such as that above, that appeared in our No. 23 issue together with an article on the plant. Not all readers are so familiar with our natives that they can readily call to mind what a plant looks like when it appears in an article such as this and some plates are worthy of repeating occasionally. Even with 11 new plates, as in this issue, not all people will be satisfied—Editor.

It is possible to propagate the Lily by division of the clumps, which are merely the annual growth from the rhizome entwined in a tangled mass. Seeds are shed annually shortly after flowering (about November), when the flower fades and the pearly white calyx falls. I have not had any difficulty with seed, but find the clumps need care in lifting and dividing at the proper time of the year, about March or April. As the seed is very fine the whole calyx should be sown intact as you would grow *Gerbera* seed, i.e. by pressing the point down into the soil without covering the perianth.

Besides the west coast plains, the species is equally widespread in the south, especially in the Stirling zone and the Barren Range. Though it is found on rock in the ranges, it is everywhere a sand plain denizen in West and East. In the south of W.A. the flowers are much larger and very brilliant in colour—blue to purple, and in the Barren Range bronze purple or brownish blue. Doubtless it is the sheen that gives this unusual and practically indescribable shade.

As well as the coast around Albany and Denmark, and the vicinity of the Stirling and Porongorup Ranges, it is found as far north as Lake Grace on granitic sands. To one collecting in these areas the general impression is that the "Blue Tinsel Lily" was once ubiquitous and the species is undoubtedly extremely ancient, cropping up unexpectedly here and there all the way to Esperance along the south coast.

I think it is fairly certain *Calectasia cyanea* found its way to western Victoria from the W.A. south coast. It used to be common in both the 90 Mile and Little Deserts, as well as the sandy areas around the Grampians. Not only the Tinsel Lily but a considerable range of other western Victorian species are common to southern Western Australia.

CALECTASIA CYANEA

by J. C. ANWAY, Botany Dept., Ohio University, Athens, Ohio 45701 U.S.A., from details in the Aust. J. Bot., 1969, 17, 147-59.

Calectasia has been found in three separate areas in temperate Australia: two of these separated by at least 110 miles, are southwestern W.A., and the third an eastern area (western Victoria) is separated from both western areas by at least 1,200 miles. The plants are growing in well drained soils of a high sand content in areas with annual rainfalls of 12-40 inches. In Western Australia, the plants are most often collected in sand heath and *Banksia* communities and a few in forest. In S.A. and Victoria, most of the plants observed were in forest but this probably because of the more extensive clearing of heathlands for grazing and cultivation.

It appears that *Calectasia* is normally self-pollinated. It is a true relic, apparently committed to ultimate extinction by the adoption of an ultra conservative genetic system.

A close study of specimens collected from the three areas reveal that while there is no doubt that all are the same species, differences that may affect their horticultural value have warranted their separation as varieties. *Calectasia cyanea* R.Br. var. *cyanea* stat. nov.

This is the type form from Western Australia at one time known as *C. grandiflora*. The rhizome is short, less than 2 cm, and aerial shoots in compact clusters rise from the axils of old leaves.

Calectasia cyanea R.Br. var. *intermedia* (Sunder) comb. nov.

The eastern form has evolved an extensive rhizome system, the aerial shoots being scattered. The anthers are yellow but turn brown with age.

VARIATION OF FLOWERING IN *ACACIA BAILEYANA*—continued from page 232

V. CLONAL STUDIES

In an attempt to determine if early flowering is a response to a particular microclimate, clones of several parents were propagated and established in four sites scattered through the Canberra city area in a range of aspects and elevations.

Little consistent success has been achieved in raising *A. baileyana* from cuttings and air layering was used as a means of vegetative propagation. (This method was described in "Australian Plants", and has been used for several *Acacia* species at the Wattle Research Institute, University of Natal). The main advantage in using air layers is that relatively large plants with buds can be obtained to give some flowering in the first season, although flowering on an extensive scale does not occur for 2-3 years, until the plant has become established.

Air layers were prepared on three parent trees Nos. 23E60, 28E61, 42L62 in December 1962 and planted in the field in April 1964 at four sites varying in altitude from 1845' to 2055'.

In most cases there were five plants of each clone at each site, however losses in the nursery stage with 42L62 meant that there were insufficient plants to complete planting on all sites. The ramets from each clone were planted in small informal groups at approximately 12' spacing, however even within the relatively small area of each group there were some differences in soil type and moisture received from lawn irrigation systems.

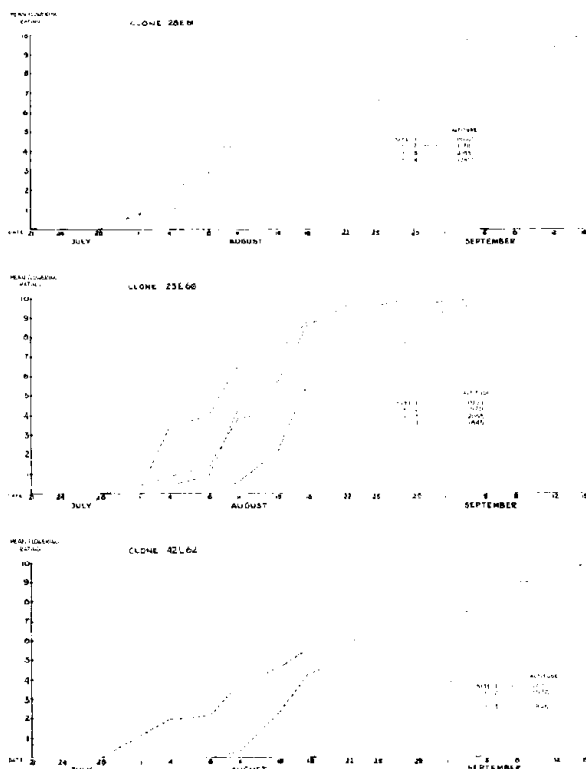


FIG. 2

Figure 2 shows the flowering patterns for air layers at four sites in 1966. The rating of flowering used was from 1-10 and whilst there was variation between individuals of the same clone at the one site the general pattern is that clones from early flowering trees flowered ahead of those from the late flowering parent. Clones did not flower at the same time as their respective parents, or at the same time as clones planted at different sites.

Flowering commenced first at Site 3 (2055') followed by Site 4 (1845'), and Sites 1 (1900') and 2 (1970').

Minimum temperature readings were taken at each of the four sites in 1966, and continuous temperature readings were made at Sites 1, 2, 3, in 1967. In periods of cold weather the minimums reached at the highest altitude, east facing site were up to 2°C above those for sites 1 and 2. During warmer weather the differences in minimum readings were not so great.

It is unlikely that minimum temperatures alone are the controlling factor for flowering initiation as other climatic and soil effects may well play an important part in the total flowering process, however the pattern observed suggests that the flowering period is controlled by both genetic and environmental factors.

VI. INHERITANCE OF FLOWERING TIME

Studies by the Wattle Research Institute, South Africa with *A. decurrens*, "Green Wattle", and *A. mearnsii*, "Black Wattle" (syn. *A. mollissima*), have shown that there is a high degree of genetic control over characteristics such as gummosis and branching habit.

There are no records of genetic studies with any characters of *A. baileyana*. To study the inheritance of flowering time of "Cootamundra Wattle" seedlings were raised from open pollinated seed collected from several early and late flowering parents, and established in an experimental area in a relatively uniform site on a slightly north facing slope.

The first flowering occurred on some plants in 1963, and the first assessment was possible in 1964, for progeny from seven early flowering and four late flowering parents. The first flowering was recorded on 28th July on 2 plants of the 96 early flowering progeny observed. By 22nd August, 83 or 86.5% of seedlings from early flowering parents were in bloom whilst only 33 out of 126, or 26.2% of progeny of late flowering trees were in bloom.

There was variation in flowering time between individuals within each progeny and between progenies from different mother trees but the general pattern over five years was that a high percentage of progeny from early flowering parents flowered early, whilst those from late flowering parents flowered late.

Seed was open pollinated and may have been selfed or outcrossed. If outcrossed it is not known if the pollen parent was a late or early flowerer, although in general the differences in flowering time would be such that early flowering trees would be largely cross fertilised by other early flowerers, however the seed collected could have been from the latest flowers on the early tree crossing with the first flowers on the late tree.

Before firm conclusions can be drawn on the mode of inheritance of the early flowering characteristic it will be necessary to carry out further trials with selfed, open pollinated and hybrid progeny between early, late and early x late parents.

VII. DISCUSSION

This study was carried out in an attempt to determine whether groups of *Acacia baileyana* could be planted to flower at the one time instead of over an extended period. It appears that, within certain limitations, this may be possible in a number of ways.

Firstly, the obvious method appears to be vegetative production of selected individuals, either by air layers or cuttings. These could be expected to flower as a group at the same time, however the actual flowering time would vary from year to year depending on seasonal conditions.

Another method is to attempt a programme of selection with some reduction in degree of outbreeding by raising clones of a number of early flowering parents in the one area, and carrying out further selection from seedlings collected in this plantation.

Knowledge of the degree of selfing would be necessary. Philp and Sherry (1946) found that selfed green wattle seedlings had a mean height 20% less than that of natural seedlings, and whilst maximum vigour is not the aim for ornamental plantings it would be necessary to establish the degree of inbreeding depression which might occur.

VIII. ACKNOWLEDGEMENTS

A number of people have assisted with the field observations and their help is gratefully acknowledged. In particular I wish to thank P. J. Setchell and A. L. Higgs for assistance in the field and F. Hebold for help both in the field and in the preparation of figures.

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Climbing on the bandwagon most publishers have produced books on wildflowers. Many cover the same range of subjects, which have already been introduced in "Australian Plants" but most have either of the following disadvantages. They either have a large number of beautiful colour plates with inadequate descriptions and practically nothing on cultivation, or they attempt to deal with cultivation and skimp on colour plates leaving it to the readers experience or imagination as to what the plant and flower really looks like. If you bought most of the books available you would have less than half of the range of material available in past issues of "Australian Plants". There are exceptions.

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BANKSIA COLLINA

A series on the wildflowers of North Queensland by L. K. BATES, Page Street, Mareeba

Banksia compar

This forest tree always seems to be found above 2,000 ft. here, and invariably grows in moist situations; in fact many grow along the side of running mountain streams. Bark is rough, and height about 30 feet, although trees competing with rain forest verge trees may grow to 60 feet. Flower spikes are short and fat and are produced in winter, with buds a pretty light green changing to pale yellow when the flower matures. They are good nectar producers and attract lorikeets and honeyeaters.

Banksia collina

It was quite exciting to recently record a form of this fine plant in N.Q. (thanks to a tin miner!). The mining road led literally straight up a mountainside to a very remote area of open forest above 2,000 feet. But it was worth it to be able to wander up and down granite soil slopes amongst these lovely 5 ft. undershrubs. Interestingly enough the two distinct flower colours grow side by side: one is wholly a rich golden yellow, while the other has golden-brown segments with purple style (flower spikes grow up to 9 ins. in length).