

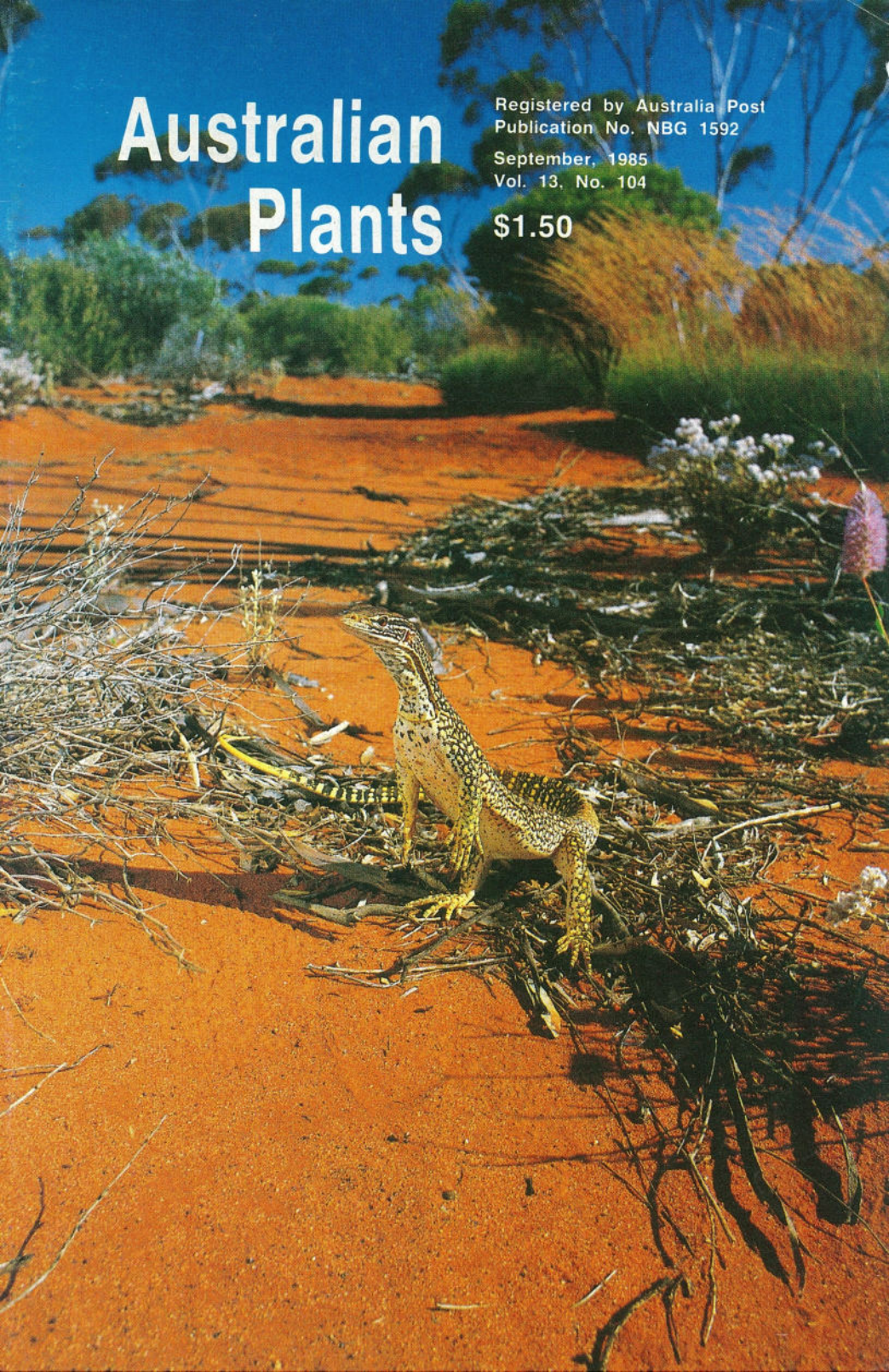
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Australian Plants, your periodical. What is it all about? It is run on a non-profit-making basis with honorary officers who work and try hard, but are we meeting the requirements of our readers?

The most common comment we receive is that it is too technical. We publish every simply worded, down-to-earth article that we get, so is it the readers, you, who are letting us all down? Send interesting notes for publication.

I think the comment "too technical" comes from readers who have not really made the effort to read it, or from people who are frightened off by the many scientific names. To these I request that you be patient, stay with us, take the articles in small doses and get used to the scientific names, at least the first one, the generic name such as *Grevillea*, *Banksia*, *Acacia* etc.

May I appeal now to the majority of readers, most of whom were "ignorant" beginners a few years ago, who did stay with us, did persevere with the scientific names and jargon, and have found a whole new world.

We are at the beginning of an explosion of knowledge, a breakthrough into a new era, the point where we can move back the surviving Australian flora from the brink of extinction, the time when a huge range of our wildflowers may be reliably grown as cherished horticultural subjects, or in reserves.

Whether we actually make the staggering breakthrough I have predicted above will be dependent on thousands of our readers. You, the beginner, are at the forefront of scientific knowledge. To achieve any worthwhile result there must be a little pain, a little effort, in fact as much effort as you can spare. Take the time to read the issues as they come out, be patient and try to go along with me as suggested. Attempt to understand the apparently more scientific articles (I have gone to a lot of trouble to make them as easily read as possible) and learn.

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COVER PLATE

Photography by John Weigel

Threat display by a racehorse goanna, *Varanus gouldii*. The plants in the background include *Ptilotus*. You may not be fortunate enough to have such a beautiful creature as this goanna in your garden but make welcome any wild creature that does visit. All have a place in nature's 'home'. See the article opposite. Reprinted from "The Biology of Australasian Frogs and Reptiles". See page 158.

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A Wildlife Garden

by Harry Butler

Over many years I have been involved with the propagation and growth of native plants, both directly, and through my friends and acquaintances. Not long ago it struck me that I never really understood the drives of other native plant growers.

As a result, I have spoken to various people who grow native plants around Australia to seek their reasons. Their answers are most fascinating.

The following, not in order of importance, are included in various growers' assessment of "why". Needless to say I have paraphrased the answers.

Interest: I'm interested in native plants — they're fascinating. Introduced plants are well documented in nurseries and gardening catalogues but there's a great deal of challenge and interest in growing relatively unknown native plants.

Research and Study: My interest lies in the best ways to propagate native plants as well as the study of how they grow. Such researches and studies are the prime purpose for a very wide range of native plant growers.

Purity: I live in Australia. I'm proudly Australian and I would like to grow Australian plants in my garden.

Economy: Properly grown native plants require little maintenance, watering or any of the necessary appurtenances of other forms of gardening, and that suits me fine.

Rarity: Many native plants are rare or endangered, and by growing them in gardens I'm able to ensure their continuity. Growing native plants is one form of conservation.

Beauty and Amenity: I find that the shape, form, texture and smell of native plants are subtle and delightful — much more so than the more distinctive demarcations of formal gardening. In addition, with proper planting, my native garden flowers all the year round and offers me a sense of continuity.

Wildlife: My purpose of a native garden is to bring wildlife into the garden.

All of these and many more reasons are advanced to argue the cause of growing native Australian plants. However, I particularly want to address the last reason given above, that is, growing natives for the purposes of bringing wildlife into the garden.

When most gardeners talk of wildlife, they tend to relate to birds only. They talk about honeyeaters, white-eyes, wattle birds, wagtails, robins or wrens in the garden feeding or nesting or otherwise reacting. This seems to be the limit of their interest in the wildlife of the garden. The fact that a considerable range of other wildlife is also present in the garden appears to be overlooked or neglected.

It surprises me that not more people understand *why* birds come to a garden. The first reason is food. This may take the form of products (nectar, pollen, fruit or what-have-you), or predation on other users, mostly insects, of those same plant products.

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Feathertail Glider (*Acrobates pygmaeus*), a widespread but rarely seen inhabitant of eucalypt forests that feeds on nectar, pollen and insects. Photography by Andrew Smith. Reprinted from "Possums and Gliders", published by Surrey Beatty & Sons Pty Ltd, 43 Rickard Road, Chipping Norton, New South Wales 2170.

PHOTOGRAPHERS: *For a special project in hand we need good slides of the following species:*

Acacia amblygona, *A. cognata*, *A. gracilifolia*, *A. plicata*, *A. triptera*, *Alyogyne huegelii*, *Anigozanthus manglesii*, *Banksia petiolaris*, *Callistemon comboyensis*, *Calothamnus quadrifidus*, *Boronia megastigma*, *B. mollis* 'Lorne Pride', *Brachycome* spp., *Cassia artemisioides*, *Chorizema cordatum*, *Dampiera stricta*, *Eucalyptus macrandra*, *Eriostemon australasius*, *Eremophila calorhabdos*, *E. youngii*, *Gompholobium grandiflorum*, *Hemiantra pungens*, *Hibbertia stellaris*, *Hakea bucculenta*, *H. francisiana*, *H. orthorrhyncha*, *Jacksonia scoparia*, *Kennedyia prostrata*, *Leschenaultia biloba*, *Leptospermum flavescens*, *Melaleuca huegelii*, *M. fulgens*, *M. incana*, *M. megacephala*, *M. nesophylla*, *M. radula*, *Pimelea linifolia*, *P. ferruginea*, *P. serpythifolia*, *Prostanthera discolor*, *P. incisa*, *Rulingia hermannifolia*, *Scaevola aemula*, *Grevillea* 'Boongala Spinebill', *Grevillea* 'Cadwell's Hybrid', *Grevillea* 'Coochin Hills', *Grevillea* 'Honey Gem', *Grevillea* 'Misty Pink', *Grevillea* 'Robyn Gordon', *Grevillea* 'Royal Mantle', *Grevillea* 'White Wings', *Grevillea arenaria*, *G. asteriscosa*, *G. alpina*, *G. banksii*, *G. bifernata*, *G. brachystylis*, *G. buxifolia*, *G. barkylliana*, *G. dielsiana*, *G. endlicherana*, *G. infuntibularis*, *G. johnstonii*, *G. laurifolia*, *G. longistyla*, *G. sericea* 'Collaroy Plateau', *G. synaphaea*, *G. tetragonaloba*, *G. triloba*.

Please help if you can in this very important project, by sending slides for checking to the Editor, Australian Plants. They will be returned promptly.



Grevillea petrophiloides

Photography by George Adams

Yellow-Plumed Honeyeater

It is the beautiful bird that takes the eye. *Grevillea petrophiloides* carries its flowers on long stalks such that they are held well above its foliage, usually only to 1 metre high. The other flower stalks make the picture appear a little messy but George Adams has done an excellent job in capturing the bird and a flowerhead in beautiful colour.

The second reason birds use a garden is because of availability of suitable habitat for nesting sites or cover in otherwise open and exposed areas.

Possibly a third reason is the capacity of birds to learn a good safe place and make use of native gardeners' consciousness of their gardens' interface with other aspects of nature.

Birds, like man, are part of the web of life that occupies and services this biosphere on which all life depends. Birds and man, and all other living things, are totally integrated and interdependent on the face of the earth. It still escapes some people's awareness, but life on earth, the only known life in the so-far explored universe, is endangered by human misuse of various components. Our misuse of water, of soil and of air, and the things that rely on them, such as the forests, the rivers and the seas can and will lead to the inevitable destruction of man.

A successful Australian native garden contains a whole range of users beyond birds and the gardener.

Plant users include insects, slaters, millipedes, snails, and all of the myriads of pests and problem species that occur in a garden. Helping to control these are the predators: the controllers of local resident extremes — preying mantises, spiders, centipedes and scorpions are examples that occur in most gardens.

Lizards and snakes are less common but still occur while mammals are widely present but most often not observed.

Some fascinating studies in survival laws can be seen at any time in our gardens, but in Australian plant gardens the chances are that native species will fight out the battles. In such cases insights into nature which are usually regarded as best taking place in the wild can be recorded.

The relationships between native insects and native plants are recognised as including some of the most exciting and bizarre relationships in the world. For example, male wasps are induced to copulate with orchids in the mistaken belief that they are female wasps; and orchid pollination can only take place on such a coupling.

Such items of excitement in the web of life within a native garden are of particular interest to those who, for reasons of economy, health, age, or inclination, cannot travel vast distances to outback or wilderness areas.

First in normal development in a native garden are the insects and the birds. These make use of a wide range of resources from new plantings. Next come the millipedes, snails, slugs and similar plant users that seem to delight in new growth, moreso than established growth. Following them come the predators, and before long there are spider webs in all available places, wolf spider holes in suitable areas and cryptic species, such as centipedes and scorpions may be found under cover.

Once this busy ecosystem of invertebrates plus birds is established other vertebrates move in. Frogs are usually first as they have an uncanny knack for finding a protected place but small lizards, particularly skinks, are very early users of native gardens.

continued on page 164



***Isopogon* and *Petrophile* of New South Wales**

by Alan Fairley and Philip Moore

Isopogon and *Petrophile* together constitute a subtribe in the family Proteaceae in which the flowers occur singly in the axils of scaly bracts forming dense globular or cone-like spikes or heads. In both genera the style is thickened and often hairy below the stigma and acts as a pollen presenter.

Isopogon, with 35 species, and *Petrophile*, with 42, are endemic Australian genera which show their greatest development in the south western part of the continent, but are absent (*Petrophile*), or almost so (*Isopogon*), in the south east. Seven species of *Isopogon* and four of *Petrophile* occur in New South Wales.

Cultivation

The eastern species of *Isopogon* and *Petrophile* are little known in cultivation. *Isopogon* species most suitable for cultivation are *I. anethifolius* and *I. dawsonei*. Both germinate readily from seed and are easily grown on, although flowering does not occur for several years.

If pruned to encourage branching *Isopogon anethifolius* forms a dense shrub to 2 metres high with bright yellow flower heads contrasting pleasingly with red stems and deep green foliage. *Isopogon dawsonei*, with greyer foliage and paler flowers, is a taller, more open shrub. *Isopogon anemonifolius*, also easily grown, eventually forms a spreading shrub with numerous grey branches arising from a lignotuber. *Isopogon prostratus* is more difficult with seed slow to germinate and cuttings slow to root.

Petrophile can also be easily raised from seed. Although the flowering spikes of the eastern species are unspectacular, the plants grow quickly and provide a foliage contrast in the garden. The pinkish or bronze coloured new growth also adds interest.

ISOPOGON

Members of this genus are commonly called "Drumsticks" because of their distinctive globular or oval fruiting cones (infructescences). When the fruits are dispersed the infructescence breaks up and the cone scales (bracts) fall away from the central axis (rachis). Individual fruits are small, hairy, ovoid to conical nuts, each with a tiny wingless seed.

Sydney Sandstone Flora

The Society has commissioned Alan Fairley and Philip Moore to compile a book that will be an easily read and widely appreciated "Beadle". "Flora of the Sydney Region" by N. C. Beadle *et al.* (available from The Editor for \$45.00 plus \$2.00 postage) has been the handbook for the wildflower enthusiasts in the Sydney Hawkesbury area. This book, however, was meant as a student's reference and is rather technical for many. If the flora of this unique area is presented in the manner above, it will satisfy all. We would appreciate comments and suggestions. We would also be pleased to see your best colour slides.



Isopogon anemonifolius △

▽ *Isopogon prostratus*





***Isopogon anethifolius* (above)**

Photography by Philip Moore

Narrow-leaf Drumsticks is a beautiful form shrub, one metre rarely two metres tall, if grown in the open. You will note how the individual flowers of the round "flower" head open from the bottom and progressively open up the tight spiral. The leaves are deeply divided and terete (cylindrical).

***Isopogon anemonifolius* (top left)**

Photography by Philip Moore

Broad-leaf Drumsticks is very similar to the species above. You will note that the leaves are similarly divided but each segment is wider. The picture also shows the fruit or seed head formed after flowering. These resemble a drumstick. See page 171 for propagation by seed.

***Isopogon prostratus* (bottom left)**

Photography by Philip Moore

A rare plant worthy of wider cultivation — Who can supply seed to the Editor?

Key to *Isopogon* in New South Wales

- A. Plants upright, 0.5-3 m tall.
 - B. Leaves divided into narrow segments.
 - C. Leaf segments terete. *I. anethifolius*
 - *C. Leaf segments flat.
 - D. Perianth with dense silky hairs.
 - E. Floral tube with silky hairs on upper part, glabrous on lower. Small shrub to 1 m. North-eastern NSW only. *I. mnoraifolius*
 - *E. Floral tube with silky hairs on both upper and lower parts. Shrub to 3 m. *I. dawsonii*
 - *D. Perianth glabrous or sparingly hairy.
 - F. Leaf stalks 4-8 cm long. Leaf tips sharp pointed. North coast and tablelands. *I. petiolaris*
 - *F. Leaf stalks 2-4 cm long. Leaf tips acute but not pungent. Widespread. *I. anemonifolius*
 - *B. Leaves entire, oblanceolate, 8 cm long, 2 cm wide. Wet cliff faces near Blackheath. *I. fletcheri*
 - *A. Plants prostrate, less than 0.5 m tall. Leaves with narrow flat segments, rising vertically from the stems. *I. prostratus*

Isopogon anethifolius

Narrow-leaf Drumsticks

This species is an erect shrub about 1-2 m tall. Its leaves are divided into narrow segments which are terete (needle-like). Leaf segments point upwards; in winter, the new growth is a striking tan-red. The stems of the plant are often also reddish. Flowers are yellow, in dense, terminal, stalkless, globular cones. This species forms an attractive dense shrub in cultivation. Flowering: Spring.

Distribution: Widespread in dry forests and heaths of the Central and South Coast and Central and Southern Tablelands of New South Wales. Common in the National Parks around Sydney.

Isopogon anemonifolius

Broad-leaf Drumsticks

Broad-leaf Drumsticks is a common and well-known shrub in the xeromorphic forests and heaths of New South Wales. Its leaves are deeply dissected into three narrow segments, which are again divided and lobed at the tip. Leaf segments are flat, not terete (clearly distinguishing it from *Isopogon anethifolius*), and from 3 to 5 mm wide. The leaves are spreading and although the segments are pointed they are not pungent. Flowers are yellow in cones up to 20 mm across. Flowering: Spring.

Distribution: Widespread and common in dry forest and heaths along the coast and tablelands, extending into Queensland.

Isopogon prostratus

This species was originally regarded as a variety of *I. anemonifolius* the variety *tenuifolius*. It closely resembles that species, except that its leaf segments are narrower (about 2 mm wide) and are ridged near the ends on the under-surface. The former name *tenuifolius* was a reference to the 'slender leaves'. The most conspicuous feature of this species is its ground-hugging habit with the leaves rising vertically from prostrate stems. Flowers are yellow and the cones are usually smaller than those of *I. anemonifolius* (12-16 mm across). Flowering: Late Spring and Summer.

Distribution: Higher Blue Mountains (small areas north of Clarence in the Newnes State Forest), South Coast, Southern Tablelands, extending into Victoria.

Isopogon petiolaris

The specific name *petiolaris* refers to the prominent leaf stalks which are up to 8 cm long. This distinguishes this species from *I. anemonifolius* whose leaf stalks are only 2-3.5 cm long. Leaf segments are flat, 3-7 mm wide, and the tips are sharp pointed. Cones are 12-16 mm across. An upright, but somewhat spreading shrub, usually under 1 m high. Flowering: Late Spring and Summer.

Distribution: A northern species, found in dry, stony locations in forests from the North Coast, through the Northern Tablelands to the North-Western Slopes.

Isopogon mnoraifolius

This is a recently named species related to *Isopogon dawsonii* and found in heath or woodland on the north coast. It is a small shrub less than a metre tall with pubescent branchlets. The flowers are creamy yellow, glabrous on the lower part of the perianth and covered in silvery white hairs on the upper part. The leaves are short (4-6 cm) with the (undivided) leaf stalk nearly twice as long as the (once or twice divided) blade, and with ultimate segments less than 2 mm wide. Cones are 15 to 20 mm across; the cone scales are narrowly acute. The specific name refers to the resemblance of the leaves to the menorah, a Jewish ceremonial candelabrum. Flowering: Spring.

Distribution: Restricted to the Coledale area north west of Grafton and coastal heaths from Minnie Water to Yamba, including Yuraygir National Park.

Isopogon dawsonii

This attractive tall shrub has a limited distribution, and its preference for rocky slopes and cliffs means that it is seldom seen in its natural habitat. Its divided leaf segments are flat and point upwards. The floral tubes are white, tipped with yellow and pink; they are silky-hairy, an important identifying feature. The fruiting cones are also covered with distinctive silver downy hairs. This species is easily cultivated. Flowering: August-October.

Distribution: Restricted to rocky slopes and cliffs near the junction of Nepean River and Glenbrook Creek, the Wolgan Valley-Rylstone district, and the Central Western Slopes.

Isopogon fletcheri

This rare plant occurs only on sheltered cliff-faces in the Upper Blue Mountains. Its population is considered at risk, mainly from bushfires which could destroy its habitat. The fires of 1982/83 burnt many of the plants and considerably damaged their habitat. Some plants are regenerating. No other *Isopogon* in the state has entire leaves, so it is readily identified. The leaves are about 8 cm long and taper towards the stem. The flowers are terminal on stout erect stems. The whole plant is rarely more than 1.5 m tall. It grows amongst ferns and other small plants on damp ledges along cliff-faces. Flowering: Spring.

Distribution: Very localised near Blackheath.

PETROPHILE

Eastern species of *Petrophile* are known as "Conesticks" after their elongated, more or less conical flowering and fruiting cones. In *Petrophile* the bracts harden after flowering to produce somewhat woody cones up to 5 cm long. These bracts, or cone scales, open to release the fruits but, unlike those of *Isopogon*, remain attached to the rachis. The fruits are small hairy flattened nuts with a single seed.



Petrophile pedunculata (above)

Photography by Philip Moore

This beautiful character plant is shown with its new growth as a bonus in spring. You will note that the flower head is cone-shaped the lower flowers opening first. The cone-shaped seed capsules are also shown, each of the segments holding a flat triangular seed, see page 171.

Petrophile canescens (top right)

Photography by Philip Moore

A widespread plant of the Blue Mountains and of the tablelands to Queensland.

Petrophile pulchella (bottom right)

Photography by Philip Moore

Common on the sandstone soils of the NSW coast and tablelands this plant can be distinguished by its terminal flowers, i.e. at the end of the upright branches. All *Petrophile* look well when not in flower.



Petrophile canescens △

▽ *Petrophile pulchella*



Key to *Petrophile* in New South Wales

- A. Cones terminal, sometimes exceeded by new growth, sessile or nearly so.
- B. Young growth glabrous or nearly so. *P. pulchella*
- *B. Young growth pubescent.
- C. Leaf segments stiff, spreading. *P. sessilis*
- *C. Leaf segments close upward pointing, not stiff or spreading. *P. canescens*
- *A. Cones axillary, on peduncles 1-2 cm long. *P. pedunculata*

Petrophile pulchella

Conesticks

Formerly known as *Petrophile fucifolia* this species is an erect shrub to 3 m tall, with yellow-flowered, terminal, stalkless cones. These may be solitary or in small axillary clusters. Although the cones are terminal, the stems continue to grow, sending new branchlets around the cone, and new flowers are borne above the old cones. The fruiting cone is 20-35 mm long and about 20 mm wide. Leaves are very divided, erect but not pungent-pointed. Young shoots are without hairs or slightly pubescent. The main features which separate this species from others in the genus are its terminal cones, non-pungent leaves and almost hairless new growth. In some areas, there are intermediate forms between this species and *P. sessilis* and *P. canescens*. Flowering: most of the year, but particularly in early summer.

Distribution: Common on sandstone soils of the coast and tablelands.

Petrophile canescens

As this species has sessile cones and spreading-ascending, non-pungent leaf segments, it is easily confused with *P. pulchella*. It differs from the latter species in having young downy shoots and greyish downy leaf segments (especially when young). Leaves are 2-5 cm long, with rounded or flattened segments, 3-9 mm long. Unlike *P. sessilis*, with which it was once grouped, its leaf segments are not pungent-pointed. Fruiting cones are up to 25 mm long and 15 mm across. This species prefers deeper sands rather than shallow sandstone soils, the usual habitat of the other members. A shrub to 3 m tall. Flowering: Spring-Summer.

Distribution: Blue Mountains, North Coast and Northern Tablelands to Queensland; deeper sands of Castlereagh State Forest, between Penrith and Windsor.

Petrophile sessilis

Prickly Conesticks

The most characteristic feature of this species is its very spreading, rigid and pungent leaf segments. This feature distinguishes it from *P. pulchella* and *P. canescens*. It is an erect stiff shrub which, like the others, bears stalkless flowers and cones. The specific name *sessilis* refers to these stalkless flower-cones. In this species, the young shoots are softly hairy but the leaves are hairless. Flowering: chiefly late Spring-Summer.

Distribution: Coast and tablelands south of Sydney; also recorded from the Agnes Banks Nature Reserve near Penrith.

Petrophile pedunculata

Stalked Conesticks

This is the only species of Conesticks in NSW with stalked cones. It is a tall, hairless shrub with fine leaves which are spreading but not pungent. The flower-cones are borne in the axils of the leaves. Unlike the preceding three species, which all have downy grey bracts on the young cones, this species has smooth and hairless bracts. Flowering: Spring-Summer.

Distribution: Blue Mountains, Southern Highlands and South Coast. ■

Native Rose — 1

by Greg Lamont, Gosford, NSW**

Boronia serrulata — ECOLOGICAL STUDIES

Boronia serrulata is one of the many outstanding flowering plants which grow on soils derived from Hawkesbury sandstone on the Central Coast region of New South Wales. The heavily scented blooms are an attractive pink and make a highly desirable cut flower. Curtis's Botanical Magazine (T. 1,763 undated) reported it to possess the scent of a rose, a possible reason why *B. serrulata* is commonly known as Native Rose. Bunches of bush-picked flowers were once sold in great profusion at the Sydney markets and on Gosford railway station. As a garden specimen, *B. serrulata* like other boronias has a reputation for being difficult to grow and short-lived.

(i) Geographical Distribution

The geographical boundaries of *B. serrulata* to the north-east is in the Brisbane Waters National Park near Kariong and in the north-west along sandstone ridges on the western side of Mooney Creek at Peats Ridge. The southern coastal boundary is at Waterfall in the Royal National Park. In the south-west *B. serrulata* has been sighted in the military reserve near Kentlyn (B. Michie pers. comm.). Despite a claim by Rowell (1980) that *B. serrulata* grows on the sandstone soils of the lower Blue Mountains I have not located plants in this area. Several other native plant enthusiasts who are familiar with the flora of the lower Blue Mountains confirm my findings.

The vernacular name "Port Jackson Fairy Rose", used by Guilfoyle (1911) to refer to *B. serrulata* suggested that it grew in close proximity to Port Jackson. This is confirmed by the specimen used by Bentham (1863) to write his description of *B. serrulata*. A survey of the few remaining parcels of undeveloped land around Port Jackson failed to locate any plants of *B. serrulata*.

Extensive areas of Hawkesbury sandstone soils north of Sydney harbour where *B. serrulata* was once known to have grown have become residential suburbs and the process of suburbanization is continuing in areas such as Duffy's Forest, Belrose, Mt Ku-ring-gai, Kellyville and Arcadia. Professor N. White (pers. comm.) recalls the presence of *B. serrulata* in Hawkesbury sandstone woodland near Beecroft during the period 1912 - 1920 but the species had disappeared from this area by 1930.

The most abundant areas of occurrence of *B. serrulata* are found in the Royal, Ku-ring-gai Chase and Brisbane Waters National Parks and are thus protected from residential, agricultural or industrial development.

*Part 1 is a summary of some ecological studies on *Boronia serrulata*. Other aspects of the cultivation of *B. serrulata* including propagation, nutrition and extraction of perfume will be published in forthcoming issues of Australian Plants. Readers are invited to advise of their experiences in the cultivation of this plant.

**Greg Lamont is a Research Horticulturist with the New South Wales Department of Agriculture at the Horticultural Research Station, Gosford. His research covers many aspects of commercial nursery stock and cut-flower production. He has a keen interest in the horticultural development of native flora and completed a Masters degree on the Biology and Cultivation of *Boronia serrulata* (Native Rose). Greg is President of the Central Coast Group of S.G.A.P.



Boronia serrulata

Photography by Murray Fagg



(ii) The Habitat of *B. serrulata*

The soils on which *B. serrulata* was found growing were, without exception, derived from Hawkesbury sandstone. These soils are shallow, varying in depth from 170 mm to 500 mm. The soil surface is covered with a layer of decomposing litter and the texture of the soil is fine to coarse sand with a clay content of 15 to 35%. Based on Northcote's (1971) classification the soils can be described as Uniform (Uc 1.21 or 1.22). The pH of the soil is strongly acid (4.0 to 5.0) and ironstone nodules are commonly present. Hawkesbury sandstone soils are known to contain extremely low levels of mineral nutrients.

B. serrulata was found growing on ridges and plateaux but never near the base of gullies. In open heath communities *B. serrulata* was associated with rocky outcrops and plants were often observed growing out of rock crevices or with their root systems growing under shallow surface rock. In open woodland communities, the association of *B. serrulata* with rocky outcrops was not so apparent. A north-facing or west-facing aspect was the most frequently observed habitat for *B. serrulata*. In open heath, where plants received less protection from sun and wind the growth habit was compact and erect (0.6 to 0.76 m height). In closed heath and in open woodland, *B. serrulata* received more shelter from surrounding vegetation and the growth habit was more sprawling. The plants also reached a greater height (0.7 to 1.2 m). Some of the plants generally associated with *B. serrulata* include *Banksia ericifolia*, *Baeckea brevifolia*, *Darwinia fascicularis*, *Casuarina littoralis*, *Hakea teretifolia*, *Leucopogon microphyllus*, *Woolisia pungens*, *Boronia pinnata* and *Isopogon anethifolius*.

(iii) Regeneration of *B. serrulata* after fire

An area under study in Ku-ring-gai Chase National Park was burnt during a bushfire on 15th December, 1979. The previous fire in the same area occurred in May 1975 as part of a controlled-burning programme carried out by the National Parks and Wildlife Service.

Before the fire in 1979 *B. serrulata* plants were observed to flower during spring of that year. Growing in close proximity to *B. serrulata* was *Eriostemon australasius* another member of Rutaceae. The regeneration of this species was observed in comparison to the regeneration of *B. serrulata*.

Immediately following the fire all vegetation appeared to be dead. The soil moisture was low until heavy rains fell during early January 1980. Within one week of the rain falling, there were signs of new growth emerging from *Xanthorrhoea* sp. and *Angophora hispida*. Two weeks after the rain, seedlings of *Banksia ericifolia* and *Casuarina littoralis* were observed.

Plants of *B. serrulata* or *E. australasius* were killed outright by the fire and no regeneration from underground stems was observed. Germination of both species had commenced two months after the rain. The seed of *B. serrulata* is much smaller in size and weight than *E. australasius* (Table 1) and this was reflected in the seedling size. Four months after germination, seedlings of *Eriostemon* were more than twice the height of the *Boronia*s and this difference was maintained after 12 months. The site was visited the second spring following the bush fire and approximately 20% of the plants of *B. serrulata* were flowering. All seedlings of *Eriostemon* were flowering.

It would appear then that both *B. serrulata* and *E. australasius* rely on seed for survival after bushfire, unlike *Boronia pinnata* and *B. ledifolia* which can regenerate from underground stems (Evans 1960). Fires occurring at a frequency of greater than once every five years would thus pose a severe threat to the survival of *B. serrulata*.

(iv) Flowering and Growth of *Boronia serrulata*

The main flowering period of *B. serrulata* is spring extending from late August to late November although the occasional flower can be seen as early as June. Individual plants may flower over a period of 4 to 8 weeks.

At flowering the petals open to expose the stigma and anthers, remaining open for 10 to 14 days. Armstrong (1984) found that *B. serrulata*, like many other boronias is strictly outcrossing. *B. serrulata* is pollinated by moths and butterflies. If the flower is successfully pollinated, the petals close around the developing seed capsule for a period of up to 6 weeks. Petal abscission occurs 2 or 3 days before the capsule changes from green to straw-coloured. After the dew has dried from the capsule, dehiscence occurs and the seeds (up to 4 per capsule) are ejected for a distance of 1 or 2 metres from the plant.

Following the dispersal of seed, new vegetative growth arises from axillary buds below the terminal inflorescence. The growth flush occurs mainly between December and January but appears to be delayed if soil moisture is limiting. Annual growth increments, can be used to estimate the age of plants.

It is common to see inflorescences retained on plants during summer, autumn and winter. On close examination the flowers are heavily sclerified and inhabited by a small yellow Larvae (family Cecidomyiidea, order Diptera). The larvae pupate and flies emerge in late winter, followed by the abscission of these flowers.

Table 1. A comparison of the growth of seedlings of *Boronia serrulata* and *Eriostemon australasius* after bushfire.

	<i>B. serrulata</i>	<i>E. australasius</i>
Mean seed weight (mg)	3.3 ± 0.7 (70)†	15.4 ± 1.6 (93)
Mean height after 4 months†† (mm)	12.1 ± 2.2 (22)	31.7 ± 6.6 (27)
Mean height after 12 months (mm)	54.5 ± 29.1 (24)	163.6 ± 37.7 (27)

± Standard error — † Sample size — †† After germination.

The Biology of Australasian Frogs and Reptiles

This book is the first major review of the Biology of Australasian Frogs and Reptiles. Its publication is timely because the colourful, diverse and often spectacular herpetofauna of Australia, New Zealand and the Pacific Islands has been receiving an enormous amount of attention in recent years and there are many important advances to report.

The book stems from the 1984 Australasian Herpetological Conference held at the University of Sydney, which was planned with this book in mind. Accordingly, symposium topics were chosen around conceptual rather than taxonomic themes so as to achieve a full cover of all the most exciting new discoveries.

All papers received rigorous review by two or more expert referees and the editors are pleased to be able to include several provocative papers which present bold new ideas. A comprehensive index is provided. There is no doubt that this is a landmark publication, not only locally, but for students of reptiles and amphibians everywhere.

Apart from its value to herpetologists and to specialist ecologists, taxonomists, biogeographers and physiologists, the book will be a valuable reference for organisations and individuals concerned with fauna conservation and management, teachers and students of zoology and environmental sciences. Price including cert. post \$65. Size of book: A4. 527 pages. 13 colour plates. Available from Surrey Beatty & Sons Pty Ltd, 43 Rickard Road, Chipping Norton, NSW 2170.

The Properties Of Potting Mixes

As published by
the CSIRO
Extracts by W. H. Payne

As with soils, the properties of potting mixes can be grouped under three headings — physical, chemical and biological.

PHYSICAL

Aeration — Somewhere between 10 and 50 percent of the volume of a thoroughly watered mix in a pot should be air immediately after it has stopped draining. With less air, movement of oxygen to the roots is too slow. As a rough guide air-filled porosity will be adequate for most plants when 10 mm depth of water drains through a pot in less than one minute. The mix must be thoroughly moistened before this drainage test is made.

Readily available water — Around 20 percent of the volume of a mix in a pot should be water that can be easily used by plants. Deciding when to water to achieve this is the problem. The solution differs with the situation, the size of the pot and the type of mix

Types of materials — affect the proportions of water and air. These differences are mainly dependent on particle size and hence the sizes of the air/water spaces between the particles, but additional effects include:

- the ability of fibrous peats to hold much water without seriously impairing oxygen supply;
- the greater amount of water held by sands with irregular and sharp grains over those with more rounded grains;
- the increased ability of barks and sawdust to hold water after a limited amount of decomposition.

Particle stability — All moist organic materials are decomposed by micro-organisms. Particles become small, so mixes in pots shrink. A good mix will show little shrinkage over 6 months.

Wettability — A mix should be reasonably easy to rewet if it dries out. Some organic materials become almost water-repellent when dry. The best way to avoid re-wetting problems is to use a wetting agent; when present in minute amounts in a mix, they allow rapid rewetting of the driest of mixes. Do not use household detergents as most are toxic to plants, but use Aquasoil or Wettasoil. If a pot has dried out, stand it in a bucket of water for 10-15 minutes.

A new publication "Potting Mixes And the Care of Plants Growing in Them" has been produced by the CSIRO Division of Soils. Extracts above were prepared by your Editor with due apology to the magnificent efforts by the writers of the book. All of the above items are presented in separate sections of the book. A feature of the presentation is the very simply written and illustrated notes that make a technical subject so readily understood by all.

This is No. 9 of a series that comprises — 1. Soils - Their Properties and Management; 2. Soil — Australia's Greatest Resource; 3. Composting — Making Soil Improver from Rubbish; 4. What's Wrong With My Soil?; 5. Earthworms For Gardeners and Fishermen; 6. Food For Plants; 7. Organic Matter and Soils; 8. When Should I Water?

Each book is available for \$3.00 from the Australian Government Publishing Service Bookshops or the CSIRO, P.O. Box 89, East Melbourne, 3002. All are highly recommended to gardeners.

CHEMICAL

Nutrients — The three nutrient elements needing most careful attention are:

Nitrogen — While some manufacturers have added some soluble nitrogen, you can assume that any potting mix which has been stored moist for some months will contain little soluble nitrogen — unless it contains a slow release fertilizer. Continuing decomposition by micro-organisms consumes available nitrogen. Start feeding your plants as soon as you pot them.

Phosphorus — For most Australian plants the presence of Phosphorus is toxic.

Hence select a fertilizer with a low P fertilizer. A normal general fertilizer with a N : P : K analysis of 23 : 4 : 18 (23% nitrogen : 4% phosphorus : 18% potassium) may be too high in phosphorus.

Trace Elements — Certain elements are required in small quantities especially Iron, Calcium and Magnesium. Iron deficiency causes yellowing and whitening of young leaves — as distinct from nitrogen deficiency that shows up as yellowing of the oldest leaves. Spray the plant with a solution of iron sulphate at 2.5 grams per litre of water or by drenching with a solution of iron chelate at 0.05 grams per litre or of iron sulphate at 0.02 g/l. An occasional drenching of the pot with a solution of magnesium sulphate (epsom salts) at 0.6 grams per litre will correct any tendency to magnesium deficiency.

Nutrients may be supplied by a soluble low P (phosphorus) fertilizer such as Aquasol or Thrive or by a slow release fertilizer such as low P Osmocote or Nutricote. A mixture of both is recommended.

pH — is a measure of how acid or alkaline something is. A pH value of less than 7 indicates acidity. A general potting mix containing organic matter should have a pH of 5 to 6, suitable for general horticulture. A range of 4.5 to 5.5 seems preferred by most acid-loving Australian plants. To lower pH, use a solution containing iron sulphate at 3 grams per litre.

Salinity — High levels of salinity damage plants. White crusting on the surface is one sign. It may be caused by over fertilizing or by watering with saline water. To remove, leach, i.e. water heavily, so as to take the salts away in solution. Do this with new plants or newly potted plants, 2-3 times.

Toxins — Materials such as raw sawdust or fresh pine bark are often toxic to plant roots. They must be first composted and aged while moist.

Buffer capacity — A potting mix should have an ability to prevent rapid changes in its pH. Any mix with a high proportion of aged organic materials or some soil will automatically have this ability. ■

The U.C. System for Producing Healthy Container-Grown Plants

First published in 1955, one may wonder why such a book should be reviewed and quoted upon in 1985. This book is available from the Editor (as reprinted in 1985), for \$20.00 including postage. It is an extremely valuable, essential, reference for all commercial nurserymen and has been used as a handbook in the nursery industry for 30 years. Based on intensive research since 1941, the book is the product of a team dedicated to the needs of the huge American horticultural industry to "produce better plants faster, easier and more dependably" a team that developed the world famous U.C. System of plant production.

Container-grown plants? The Editor, Australian Plants, is more concerned about our major problem, "to grow better Australian wildflowers, easier and more dependably", the whole objective of the periodical "Australian Plants". I am convinced that our major problem is "below-ground" level and the report opposite may give a guide to a better understanding of the problem. This is the first of a series to study the problem.

MICROORGANISMS IN THE SOIL — 1

by John Ferguson — Edited*

Untreated natural top soil has a vast population of microscopic plants and animals. The members of this extremely active population include many forms of life. For every 100 pounds of plant material in normal field soil there are about 10 pounds of microorganisms. Soil fungi alone consistently occur in quantities weighing 1,700 pounds per acre, and they are only one of the numerous representatives of the soil community. Bacteria commonly occur in amounts of 30 to 40 pounds per acre, each pound comprising upwards of 500,000,000,000 individual bacteria. (Five hundred to 1,000 bacteria placed in a line would extend across the head of a pin.) It is interesting that another group of microbes very similar to bacteria, the actinomycetes, occur in high enough concentrations to give soils their typical musty odor. Most of this vast microbial population is concentrated in the upper 0.4 to one metre of soil, the depth depending upon the environment and nutrient availability.

Competition

Soil may well be likened to a miniature jungle in which some species prey upon others and all compete for available space and nutrients. All forms of microscopic life (including bacteria, fungi, actinomycetes, algae, nematodes, and protozoa) exist in the soil in a state of dynamic equilibrium, or ever-changing balance. Any change, such as in food supply or environment, affects all members of the colony and, therefore, different species become dominant from time to time. Any new addition to this population faces intense competition and often perishes or develops slowly until some factor shifts to its advantage. Thus for any so-called "microbial inoculant" to be effective, the environment must be favourable and a ready nutrient source must be available.

Relation to Crop Plants — Parasites and saprophytes

In their relation to plants, microorganisms can be considered as either parasites or saprophytes. The parasitic forms are capable of growing on the living plant and causing its decreased growth or death. Saprophytic microorganisms grow only on dead tissue or its decomposition products. The typical soil population consists of organisms which are largely saprophytic in nature. Certain plant parasites may persist in soil for several months, however, and some are capable of leading a normal existence there. In water moulds, for example, the parasitic activity may be relatively unimportant for the survival of the organism, and only incidental to its normal saprophytic life.

Within one species of the fungus genus *Fusarium* are purely saprophytic forms and highly specialized vascular parasites capable of saprophytic survival.

*Microorganisms In The Soil — Edited

This article by John Ferguson is reproduced, by permission, from "The U.C. System for Producing Healthy Container-Grown Plants", Edited by Kenneth F. Baker, Manual 23 of the California Agricultural Experimental Station of the Division of Agricultural Sciences, University of California, Los Angeles, USA. It has been edited only slightly for Australian conditions by the Editor, Australian Plants, with sincere apologies for any errors or unintended change of emphasis.

This illustrates the escape from competition achieved through the specialization of parasitism. As a saprophyte an organism must compete with the majority of the soil population for the available organic matter and mineral elements, while as a parasite capable of penetrating a living plant, most of the competition is eliminated. The parasite damages the plant not only through its own activities, but also by providing an entrance for secondary organisms capable of damaging the plant but unable to penetrate alone.

Direct and indirect effects

The number, kinds, distribution and interrelations of soil organisms have a very decided effect on plant growth. Within this *delicately balanced complex* are organisms favourable to plant growth and those which affect growth adversely. Included in the group which directly favour plant growth ("beneficial", in the figure below) are, for example, microbes which aid in making essential nutrients available, decompose toxic materials, or improve soil structure. Organisms which inhibit plant growth ("harmful") may do so either by direct attack, as with parasites or predators, by competition for space or nutrients, or by the release of toxic substances. As illustrated the harmful or the beneficial organisms are in turn affected, either favourably or adversely, directly by other microbes or indirectly through a series of organism reactions. *All soil microbes thus ultimately contribute to either the increase or decrease of plant growth.*

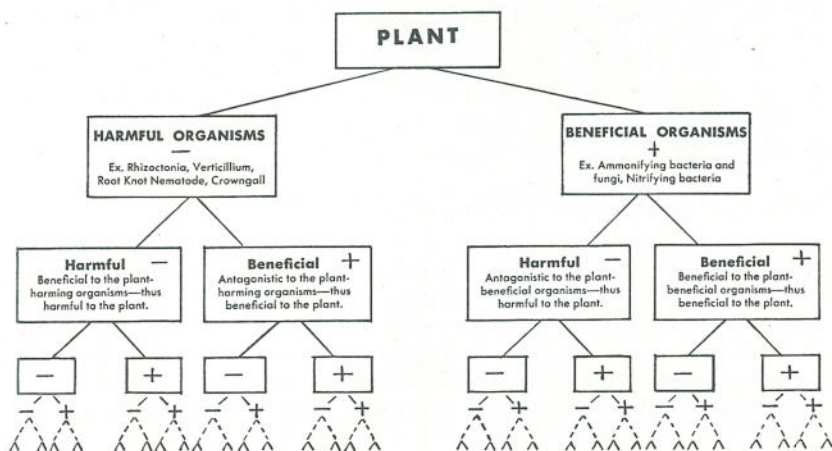


Fig. 116. Relation of harmful and beneficial soil organisms to plant growth. All soil organisms inhibit or enhance plant growth, directly or indirectly.

Directly beneficial organisms are those which attack organic matter and release elements in a form available for plants, for example, ammonifying and nitrifying bacteria. Directly harmful microbes are represented by plant pathogens such as *Rhizoctonia solani* or *Verticillium albo-atrum*.

The soil fungus *Trichoderma*, which attacks *Rhizoctonia*, is a good example of an indirectly beneficial organism. The nematode-trapping fungi also illustrate the indirectly beneficial effect.

An organism antagonistic to *Trichoderma* would represent a harmful agent working several steps removed from the plant since a reduction of *Trichoderma* could cause *Rhizoctonia* damage to increase and thus decrease plant growth. There are numerous cases where organisms attack other organisms, change pH, or tie up essential elements markedly affecting the plant health.

Distribution of Microorganisms

The distribution of the types and numbers of organisms comprising the complex soil population is controlled by the nature and availability of nutrients, the physical and chemical properties of the soil, and the environmental conditions, especially aeration, temperature, and moisture supply. Because of their small size, tremendous abundance and power of multiplication, and wide variability in growth requirements, microbes are universally distributed in nature.

Concentration in surface layer

Microorganisms occur in largest numbers in the surface layer of soil, which varies in thickness from a few centimetres to one metre. The greatest abundance and variety of individuals are found either at the very surface of soils (for example, soils covered with litter in forests, meadows, or other shaded areas) or just below the surface as in regularly cultivated fields.

Effect of organic matter

The numbers of microorganisms decrease with depth, the amount of decrease varying with soil conditions, especially the distribution of organic matter and the degree of aeration. The numbers, types and activities of microorganisms fall off rapidly in shallow soils deficient in organic matter. An excellent example is the wind-blown soils recommended for the U.C. soil mixes. As few as 17,000 organisms per gram have been reported from such soils which contain about 0.3 percent organic matter. These organisms were largely bacteria. The same type of soil with 0.45 percent organic matter gave an average of 60,000 organisms per gram. Common agricultural soils containing 3 to 5 percent organic matter have from 1,000,000 to 500,000,000 organisms per gram. These facts show the close relation between organic matter and soil microorganisms.

Concentration in the rhizosphere

The rhizosphere is the name given to that area of soil immediately around and on plant roots, which supports increased microbiological activity. There are from three to fifty times as many organisms in the rhizosphere as in soil not closely associated with plant roots. This increased activity in the root area varies with different plants and is characteristic of any given species. For example, corn is typically high in numbers of organisms in the root area, while some of the grasses are comparatively low. Organisms in the rhizosphere are greatly influenced by plant roots in respect to both kinds and number, and constitute a definite and unique micropopulation.

A Wildlife Garden — continued from page 146

Among the hardest to attract to a garden seem to be the big lizards, like blue tongues, goannas and dragons.

Many people are not too happy about sharing a garden with a snake but bona fide native plant growers remove the snake rather than kill it.

Perhaps the most difficult of all to attract to your garden are native mammals, with one or two notable exceptions. In some of our urban areas the common brush-tail and the ring-tail possums are so attracted that they have become pests. In other areas bandicoots are quite prolific in suburban gardens. However, the delightful smaller mammals, such as honey possums and pygmy-possums, are very rare indeed, although they can persist in a good garden.

My garden is successfully designed to attract the widest range of native species up to and including kangaroos. Part of this success is due to its proximity to a bushland area, and part is due to the fact that there is no disturbance so that wildlife regards my garden as an extension of their bushland territories.

A plant layering system was used to create the garden so that trees, small trees, shrubs and ground covers are intermixed to give the equivalent of the adjacent forest, and as a result, to attract species that can use this structure.

However, I admit to certain bias and have a garden which collectively produces continuous flower over each twelve months period. One end result of this is that flower-dependent species of wildlife have a refuge area which offers a range of food over the entire year.

In analysing this, it is obvious that the greatest wildlife population that can be permanently held is that which can be sustained by the worst possible season. During good seasons with flush flowering, a number of opportunistic species which are not seen during other periods will utilise the garden.

These are mostly nomadic species which wander across Australia, following nectar flows and other dynamic food upsurges.

Some users of my garden have learned new characteristics. For example, in order to protect the vegetable area a light has been placed which tends to keep off kangaroos and other nocturnal species with a taste for vegetables.

Spiders were the first to take advantage of the light. Because of the phototropic effect on insects in the garden, usually it is swarming with moths, bugs or flies, dependent on the season. Spiders quickly reacted to this and the whole light surround is a spider hotel.

Next to take advantage of the light were frogs. Both ground and tree frogs learned quickly and the ground below the light is riddled with burrowing frog holes, while leafy vegetation hides a considerable number of tree frogs. Come night, the tree frogs, using their clinging feet climb the light and catch insects on the wing, while the ground dwellers feed on those which stun themselves against the lampshade.

Bats swoop in to take insects while an occasional Frogmouth or Boobook Owl will come in and share the light harvest.

Among the more exciting learned behaviours is that of the Honeyeaters and the Butcher Bird.

Each morning the Honeyeaters make a dash for the window to snap up any exposed insects, which is not very different from their normal diet of nectar-feeding insects. The Butcher Bird visits an hour or so after sunrise, by which time the Honeyeaters have cleaned out all the obvious insects. The Butcher Bird does the rounds of last night's spider webs and takes all the carefully wrapped victims — web and all.

In the wild I have rarely observed Butcher Birds taking material from spider webs, but certainly my residents have learned this very quickly.

When the Butcher Bird arrives, the Honeyeaters disappear as do all the other small birds. This is one of the problems that must be faced in any successful native garden — the need for balance and control. Recently, while having afternoon tea with some friends, a Sparrow Hawk struck down a Honeyeater in the garden. There was a tremendous uproar from the surviving birds and an equally tremendous uproar from my friends, who urged me to immediately destroy the Sparrow Hawk. It took considerable argument with them to convince them that the predator's control prevented the proliferation of one species in the garden and allowed the development of others.

My garden birds are a delight as they have recognised for a long time my antipathy to cats in the garden. If ever a cat appears in our garden the bird call for cat is repeated and all locals including yours truly are advised that there is a cat.

Some time ago while gardening I got the bird word "there is a cat in the garden!" On going to the area, no cat was to be seen but the birds were insistent. "There is a cat in that bush!" A closer investigation showed a small racehorse goanna clinging to the trunk of the bush with just its claws and one eye appearing. I lost face with my birds because I did not destroy the racehorse goanna, and I also learned that I wasn't as smart as I thought I was. The birds were not saying "there's a cat", they were saying "there's a danger". The call for goanna or snake or cat has the same sound in my garden.

However, the calls for fox or strange human are quite different and bird language is quite precise in this respect.

A native garden that can contribute to the continuance of wildlife of this country forms an island, often surrounded by a desert wasteland of roses and other thorny cabbages. Each island connects to parks and reserves and other bushland areas through similar gardens, street trees and plantings, urban parks and the like.

In the vast desert of suburbia, native wildlife is disadvantaged, partly because it is mistrusted, partly because it is misunderstood, but mostly because it has very few safe places. If you grow Australian plants and care about the total ecosystem and its dependent species, you can make your garden a safe place for native fauna.

Bell your cat! Cats are delightful in a house, but in a garden they tend to be disruptive. Dogs may romp through the garden and scatter things, but they rarely kill or capture, excepting some of the smaller dogs which are adept at biting the tails off lizards.

Educate your kids about what you are doing in the garden and why! Most importantly, educate your visitors. One of my delights is to have visitors to the garden. "Sit down and shut up! See what is happening around you!" Many people enjoy nature documentaries on the television but it's an absolute delight to enjoy them in your own backyard.

One word of warning: Beware of the bites. Because of the needs of garden species, there are some that possess stings, bites or poison. This does not mean that they should all be destroyed. But be aware of the potential of their interface with you and yours.

Not only are there bities in the form of wildlife in the garden, but a number of our native plants contain quite toxic products, while others are protected by most unpleasant spines. Just as this is no reason for not growing these plants, likewise we should accept our garden fauna the way they are and leave their right to life uninhibited.

Next time you see a native animal of any sort in your garden, enjoy it, and recognise its role in making your Australian native plants what they are. Think of the millions of years of background formulation and interaction that resulted in our current wonders of beauty and utility.

A good native garden is a delight and joy to all but it is bettered if it is populated by some of its fellow Australians. So enjoy; don't destroy the little beasties in your personal bushland.

Good luck and good growing. ■

THE LIVING CENTRE OF AUSTRALIA

A new book by Alec Blombery of 78 pages (250 mm × 185 mm). It is well illustrated with a large number of colour plates and is excellent value at \$24.95. (Available by mail from Editor, Australian Plants plus \$2.00 postage). Alec has done his usual thorough job. The first 25 pages are devoted to "The Physical Environment". They describe the various areas of the centre, the descriptions largely supplementing the beautiful colour plates. The flora of the centre is then presented in families. By permission we have reprinted a section on page 176 and illustrated on page 177 of this issue of Australian Plants. You will see how well it is written and illustrated with colour plates.

The last ten pages introduce the reader to the mammals, birds, reptiles and small creatures of the arid centre.

AUSTRALIAN FERNS

1. **Ferns in Australia — Common, Rare and Exotic** by David Jones and Chris Goudes

This is a new book about our beautiful Australian ferns. I shall have more details in the next issue of Australian Plants but from what I have seen of it, it is excellent value at the recommended price of \$19.95. For orders received prior to 31-12-85, I can send it to you post free.

2. **Australian Ferns and Fern Allies** by David Jones and Stephen Clemesha

This has been the very best reference to our ferns to date and is still good value at \$19.95, post free for orders received prior to 31-12-85.

3. **Ferns In Colour** by David Jones

This new book describes 43 species of popular native and exotic ferns each accompanied by a photograph and a full description of its habitat and needs in cultivation. A 96 page (175 mm × 188 mm) book for \$9.95 plus \$1.05 postage.

4. **Australian Fern Series** by The Fern Study Group

We are preparing to produce a series of inexpensive books describing and illustrating our whole fern flora. Being such a large flora it will require a number of books in the series. The species will be described in simple terms, illustrated in full colour, but most importantly, with detailed advice on how to grow them. We need good colour slides and a sketch artist. Who can help?

AUSTRALIAN PALMS

Amazingly we now have a second book on all palms with emphasis on Australian palms.

Palms in Australia by David Jones

This is an excellent reference and a future issue will give more details. It is available from The Editor — Australian Plants for \$24.95 post free for orders received by 31-12-85.

The need for a litter layer

The Eco-garden — 4* by Coralie Whitby

In healthy eucalypt forest, the soil surface is covered by an undisturbed litter layer of variable thickness composed of shed forest leaves, bark and flowers. Tiny animals, fungi and bacteria live there using the litter as food, transforming it into a fine, soft, dark material which forms an element-rich coat on the soil surface. Roots of forest plants can be found foraging in this re-cycled material, in the moist shade provided by the more recently-added upper litter layers.

How litter acts to conserve forest stability

By protecting the soil from sun and wind, a blanket of litter minimizes fluctuations in soil moisture and temperature, producing the stable soil climate required by forest plants. It conserves soil water by trapping the water vapour rising from soil pores. Organic material taken below by worms retains water as a sponge does, giving plants access to moisture over a longer period. Since the soil remains humid, earthworms can live right through a hot, dry summer, continuing to improve soil structure and fertility, whereas during a summer in bare soil the earthworm population dies.

A litter layer is the first step in soil conservation because it covers the soil. On slopes, fallen branches retain eroded soil and detritus until plants can take root in the natural terraces. With litter keeping the soil surface damp, more plants can grow, and their roots can retain soil right to the surface.

Soil under a litter layer is better drained and aerated and less liable to erosion because of its content of organic matter and bacteria. These are sticky, and so hold soil particles together in aggregates, creating pores. The now bulkier particles are less likely to be lifted by wind or washed away by water.

The bacterial decay of the carbohydrate and protein content of litter releases carbon dioxide and ammonia which are immediately taken up by plants and used at once to make more carbohydrate and protein. Breakdown of litter releases scarce elements for use by plants. The presence of litter ensures better growth of plants also because it uses up oxygen produced in daytime by plant leaves: the rate at which carbohydrate is made in plants increases when the oxygen of the surrounding air decreases.

Natural litter provides the necessary conditions for the growth of mycorrhizas which can extract elements such as phosphorus from organic material and make them available to their host plants at a constant rate. It provides habitats for an additional range of small animals and plants, so adding to forest diversity (itself a major aid to stability); and it tailors the pH of forest soil to suit the range of plants living there, by means of the calcium content of recycled leaves.

Important aspects of litter in garden

A plant and its litter form what natural forest shows should be a unit — a plant must have mulch around it; and a compost heap should be made among plants.

***The Eco-Garden Series**

Issues 92, 98 and 99 presented the earlier articles in this series. They are based upon the book "Eco-gardening — The Six Priorities" by Coralie Whitby. The concept that has a very wide following, is based on the use of natural conditions for the cultivation of crops and ornamental gardens. The book is no longer in print but a sequel is in preparation.

Litter kept moist recycles elements faster than litter which is allowed to dry. Close-planted compatible understorey, by shading the litter, will help to keep it functioning optimally.

Almost all undecayed wastes repress plant growth for a time if turned directly into the soil. (The forest always places undecayed wastes on top of older litter.) Exotic litter particularly could cause problems in a native plant garden — for instance oak leaves contain a condensed tannin which is itself resistant to decay and which represses the activity of bacteria decaying other wastes and nodulating legume roots.

Sawdust as a mulch

In my experience, untreated native hardwood sawdust, mixed with appropriate rock dusts and blood and bone and placed on top of the soil, has shown absolutely no repressive effect around any native or exotic plant, legume or other. But I have found that new sawdust needs to be lightly stirred sometimes to prevent its forming a rain-proof crust; and that, if one does not do this, slugs will make communal, weatherproof nests beneath the crust. The pH of sawdusted areas should be monitored from time to time, as sawdust tends to acidify the soil. ■

Growing Your Plants From Cuttings

by W. H. Payne, with notes for the beginner

To be certain that the plant you grow is the same as the plant you want with all its desirable features, you must propagate vegetatively, the easiest way being by cuttings. Alternatively you may prefer to grow from cuttings for the fun of it as I did.

Growing plants from cuttings is fun. It was the first method I used in the days when I knew nothing about propagation and I have been doing it ever since with variable success. We would all like a successful method. I chose the article "Cuttings — Vegetative Propagation" by Alec Blombery, page 353 of our No. 100 issue, as being the very best guide I have ever read for the beginner. Read it. It has encouraged the largest mail from beginners that I have received for many years. Even very experienced propagators have commented on the excellent way the matter was presented.

Alec Blombery has advised there are two errors in the article, errors that were also in the book from which it was taken, "Practical Gardening and Landscaping".

Readily Made Cutting Containers

The article is illustrated with sketches showing how to house your prepared cuttings in pots, ice-cream containers, etc., inside a plastic bag. On page 359, it mentions that several cutting tubes may be housed in a plastic ice-cream or margarine tub, but to "Seal a plastic bag over each tube". What is obviously meant is as shown in the sketch on page 353, the plastic bag goes over the whole container and not each tube separately.

The important thing is that if you have found a satisfactory way, stick to it. If you have not got a workable system, read the article and try the methods described. My original method was with many cuttings in a pot of sand on a bench well above ground, receiving filtered sunlight. I watered them twice a day. This developed to placing the pots in a concrete laundry tub to shelter them from the wind.

I then tried covering the tub with glass. This worked well for many years although I did have trouble with fungus. Ventilation by raising the glass was important. I have now developed a more sophisticated method which I shall report on in a future issue, after further trials.

Preparation of Cuttings

The article by Alec Blombery is especially good in describing procedures for selecting and preparing cuttings. There is an obvious error on page 358 that recommends removing "a thin slice of bark on one side to a distance of 15-20 cm (6-8 in) to increase the area for root formation". This was with a cutting only 7-15 cm (3-6 in) long. The slicing is meant to be 15-20 mm not centimetres.

This practice of "wounding" as it is known, appears to be a relatively recent development. Years ago we were so careful in stripping the leaves and cutting the raw end just below the node. Heel cuttings were often preferred. One commercial nurseryman recently showed me how he ignores heel cuttings and rather than just below a node, he chops the stem anywhere and wounds all his cuttings. An inspection of his rooted cuttings showed the callousing with rooting all along the edges of the wound.

However, stick to the method that is successful for you. I still keep to the methods recommended by Alec so give them a try. ■

STUDY GROUPS

by Jo Walker, Study Group Co-ordinator, 16 Blundell Street, Queanbeyan, NSW 2620.

There are at present twenty-four Study Groups in operation. The newest is the Brachychiton and Allied Genera Study Group which at the moment consists only of a leader; of the others, most have been established for many years now.

The main aim of the Study Groups is to introduce less well-known Australian plants into horticultural use. Many such often attractive plants are unavailable to gardeners because of difficulties in propagation or because little is known of their requirements under garden conditions. Study Groups undertake the task of studying a genus or a closely related group of genera in order to overcome some of these problems.

Study Groups consist of a Leader, active members who participate in any studies undertaken, and passive members who receive newsletters but take no active part in the Group's activities. Active members collect information on the plants under study and forward their observations or reports to the Leader who collates the information for the newsletters. Most Regions now subscribe to the Study Groups so that their newsletters are available to the general membership of SGAP.

To Join a Study Group

Write to the Leader (addresses below) stating whether you wish to become an active or a passive member (some of the smaller Groups are only interested in taking on active members at the moment). Information on subscription fees, which vary from Group to Group, can be obtained from the Leader. Please send a stamped envelope with all such correspondence as Study Groups operate on slim budgets which can be quickly eroded by postage costs.

To Form a Study Group

Contact the Study Group Co-ordinator (address below) who will forward guidelines and suggestions on setting up and running a Study Group.

THE CALLISTEMON STUDY GROUP AT PRESENT NEEDS A NEW LEADER

This is a well-established Group — anyone willing to take over the leadership please contact the Study Group Co-ordinator.

New Leaders

Beaufortia and Allied Genera Study Group: David Jones has just taken over the leadership of this Group from Brian Walters. Membership fees are \$2.00 with members paying all their own postage costs. Membership will be restricted to a maximum of 100 for the time being. Newsletters will be sent out every two months or so (depending on how active members are) with one larger 'annual' newsletter.

Brachychiton and Allied Genera Study Group: This is a new Study Group formed by Peter Vaughan. He has provided the following information on his plans for the Group:—

"As this Study Group is starting now, we have no information to disperse to passive members, but need active members. One aim is to bring as many as possible of the 30 or so species of *Brachychiton* into cultivation, as well as the more impressive hybrids. As seed is not generally available for these species or hybrids, grafting is the only reliable method of propagation. Therefore members must be prepared to give grafting a go. *Brachychitons* are the simplest of all the natives to graft so enthusiasm, not skill, is the prerequisite.

"The related genera include species such as *Lasiopetalum*, *Thomasia*, *Commersonia*, and *Rulingia*. All species can be propagated readily by cutting or seed. Many species are very ornamental and yet not in cultivation. There is a lot of work that can be done here. As we will all be active members, anyone showing special interest in these genera may become a sub-group co-ordinator."

"There will be no fees, but stamped, self-addressed envelopes must be lodged with the leader if replies are expected. News-sheets will be brief but hopefully regular."

Study Group Leaders

ACACIA — Mrs Marion Simmons, P.O. Box 1148, Legana, Tas. 7251.

BANKSIA — Mr Trevor Blake, 22 Vista Avenue, Ringwood East, Vic. 3135.

BEAUFORTIA AND ALLIED GENERA — Mr David Jones, 22 Brinsmead Road, Mt. Nelson 7007.

BRACHYCHITON AND ALLIED GENERA — Mr Peter Vaughan, 38 Young St., Croydon 2132.

BRACHYSCOME AND HELIPTERUM — Mrs Maureen Schaumann, 88 Albany Drv., Mulgrave 3170.

CALOTHAMNUS — Mrs Barbara Graham, Nundle Road, Woolomin, NSW 2340.

CALYTRIX — Mrs Gwynne Clarke, 26 Henry Street, Cook, A.C.T. 2614.

CYCAD AND ZAMIAD — Mr Len Butt, 25 Ortive Street, Yeronga, Qld. 4104.

DODONAEA — Mrs Jeanette Closs, 7 Vyella Court, Austins Ferry, Tas. 7011.

DRYANDRA — Mr Keith Alcock, 59 Gordon Avenue, Montrose, Vic. 3765.

EREMOPHILA — Mr Geoff Needham, 2 Stuckey Avenue, Underdale, S.A. 5032.

EUCALYPTUS — Mr Tony Bean, P.O. Box 397, Nambour, Qld. 4560.

FERN — Mrs Phyll Brown, 254 Edgar Street, Condell Park, NSW 2200.

GREVILLEA — Mr Peter Olde, 138 Fowler Road, Illawong, NSW 2234.

HAKEA — Mrs Hazel Blackney, 23 Devon Street, Eaglemont, Vic. 3084.

HIBBERTIA — Mr Bernard Dixon, 82 Gilbertson Road, Kardinya, WA 6163.

HIBISCUS AND RELATED GENERA — Mr Doug Phillips, P.O. Box 1374, Cairns, Qld. 4870.

AUSTRALIAN INDIGENOUS PALMS — Mr Len Butt, 25 Ortive Street, Yeronga, Qld. 4104.

PROSTANTHERA — Mr Brian Timmis, 102, Lugarno Parade, Lugarno, NSW 2210.

RAINFOREST — Mr Graham Quint, 16 Evans Street, Peakhurst, NSW 2210.

VERTICORDIA — Mr Max Hewett, 11 Harvey Place, Cherrybrook, NSW 2120.

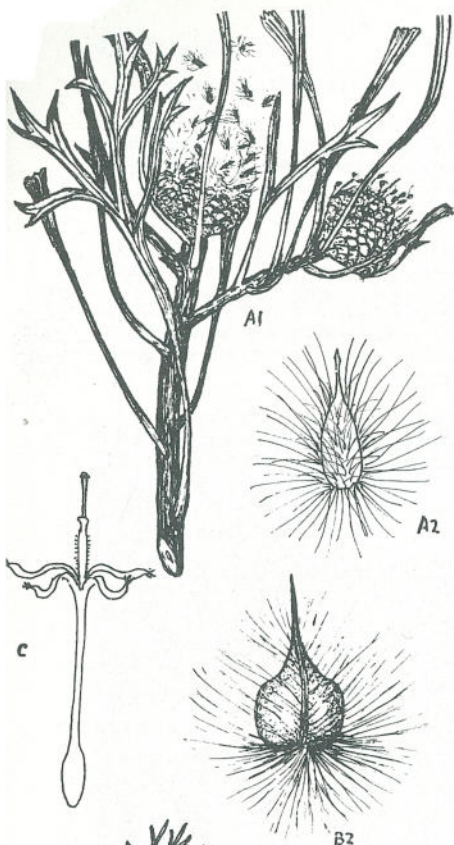
AUSTRALIAN FOOD PLANTS — Mrs Carol Newton-Smith, 21 Banksia Avenue, Beaumaris, Vic. 3193.

BIRDS AND NATIVE PLANTS — Mrs Judy Smith, 44 Hawkins Parade, Blaxland, NSW 2774.

PLANTS IN CONTAINERS — Mrs Margaret Barbour, P.O. Box 818, Wagga Wagga, NSW 2650.

Isopogon and *Petrophile* from Seed

Notes by W. H. Payne



These are plants beginners can enjoy. They are easy to grow in a well-drained soil. The plants in all states are rather similar in regard to the flowerhead. The flowerheads comprise groups of individual flowers, each being shaped as in detail "c" opposite. The *Isopogon* and *Petrophile* in Western Australia are often quite large and attractive as featured in many colour plates in previous issues of Australian Plants but I also admire the Eastern species. Wherever they come from, the foliage is most pleasing and adds interest and contrast to the garden.

Wherever you live, you can enjoy the thrill of finding your seed on plants in the wild, germinating it and growing strong healthy plants. The seeds from these plants love to germinate by the egg-box method as described in No. 99 issue, page 313.

To me *Isopogon* and *Petrophile* have very similar flowerheads but when they come to seed the difference is apparent. *Isopogon* are often called "drumsticks" as the flowerheads age to a spherical drumstick head. When the drumstick starts to break up, the seed is ripe. You could collect old drumstick heads and store in paper bags in a hot place on the window ledge and watch them break up.

The sketch of *Isopogon petiolaris* opposite "A1" shows the drumstick head and the fluffy seeds being blown out by the wind. The seed "A2" is small, less than half the size of a match head in the centre of its hairy surround. The drumstick head comprises a lot of "fluff" and few seeds, 5 to 20. The seeds are not easy to find. Pull the drumstick apart and carefully separate the seed. When you find a seed you will not mistake it, as it is the piece of fluff with the jet black centre.

Petrophile are often called "conesticks". The sketch of *Petrophile* opposite, "B1" shows the conestick left after the flowers die. The cone stays on the bush and the segments shown slowly open releasing the seed. Collect a few old cones and place in a paper bag on a window sill. The segments will open a little and you can pull out one seed from each segment with a pair of tweezers. They are flat as shown in "B2", not a fluffy ball as in *Isopogon*.

If you have never grown plants from seed or want to give a young one a thrill, start with *Isopogon* or *Petrophile*. In fact they are such fascinating plants I want to join a Study Group for them. Who will start one? ■



Australian Orchids

There are many keen growers of Australian Orchids. At last we have good news for them:

1. **Australian Indigenous Orchids - Vol. 1** — by A. W. Dockrill is to be reprinted following a major revision, late in 1986. We need good colour slides to illustrate it. May I see any you have. May I challenge all good photographers to take as many slides as possible over the next flowering season. Let us have a photographic competition with entries to The Editor, Australian Plants by 31-1-86. I will publish the best and offer a prize.
2. **"Tropical Orchids of Australia"** — This new book by Bill Lavarack and Bruce Grey is a must for all readers. It will update your present copy of Australian Indigenous Orchids. For the very first time it gives detailed advice on how to grow every single species of our tropical orchids, advice from the most informed growers/students, in Australia. It is lavishly illustrated in colour. For orders received by 31-12-85 I will send you a copy for the recommended retail price of \$49.95 post free. (At today's postal costs this is a significant discount). There will be more details of this book in the next issue but you can order now for delivery when published, October is predicted.
3. **"Terrestrial Orchids"** — by Colin Woolcock. This is the best book available for illustrations of our terrestrial orchids. For orders received by 31-12-85 you can also receive it, post free, for \$40.00. We are now frantically working on "Australian Indigenous Orchids -Vol. 2 — The Terrestrials". May I see what colour slides you have. What about a photographic competition over this flowering season, slides in by 31-1-86 and another over the next season, slides in by 31-1-87. ■

"The Orchidaceae of German New Guinea"

by R. Schlechter.

The voluminous basic reference on New Guinea orchids by Rudolf Schlechter, 'Die Orchidaceen von Deutsch-Neu-Guinea', has been translated into English. The translation has retained the quaint Schlechterian style as faithfully as possible without sacrificing accuracy.

Schlechter first published the text volume (1914) and after his death the plates appeared in print (1928). In the translation, the plates are incorporated in the text.

Seven appendices are added to assist reading:

1. Authors and their abbreviations as used by Schlechter.
2. Collecting localities in German New Guinea, and the German Solomon Islands, with grid reference, co-ordinates, map reference, and recent names.
3. Geographical names outside German New Guinea and the German Solomon Islands, with indication of locality or recent names.
4. Itineraries of Schlechter's travels in German New Guinea, and the German Solomon Islands.
5. Serial publications with abbreviations as used by Schlechter.
6. Non-serial publications with abbreviations as used by Schlechter.
7. Schlechter's collection numbers.

Three maps are given on two folding sheets. Two show collecting localities in Kaiser Wilhelmsland and the Bismarck-Archipelago, presenting Schlechter's localities and the currently used names.

The third map is a reprint of the map of 'Neu-Guinea und der Bismarck-Archipel' from Stieler's Hand Atlas, 9. Aufl. 1902.

The quality of print and plates is in general very good, and the book is well bound. It is a solid 7 cm thick, 2.2 kg heavy valuable reference source with 1180 pages, 242 mm × 170 mm, covering 1420 species. It is available from the Australian Orchid Foundation, 107 Roberts Street, Essendon, Victoria 3040, at the conservative price of \$150.00, post free. For orders placed before 1986, referring to this recommendation in Australian Plants, a 10% discount is available. ■

Calotis

The Genus, by Helen M. Stace

Calotis is a genus of Australian Compositae (tribe Astereae) which contains many attractive species. *Calotis cuneifolia* in particular appears to be a possible candidate for growing in open sunny, sandy soils and especially in spring it displays dozens of blue, white or mauve daisies. After cross-pollination (the species is self-incompatible and obviously attracts flying insects) each little fruit develops from a ray floret ovary, and is held with others in a prickly burr until it is ripe and then scattered by animals. Each little fruit has one or more small spines (awns) as well as several small scales. In fact, the name *Calotis* refers in *C. cuneifolia* to these brown shining scales and means "beautiful ears".



Calotis scabiosifolia* var *integrifolia

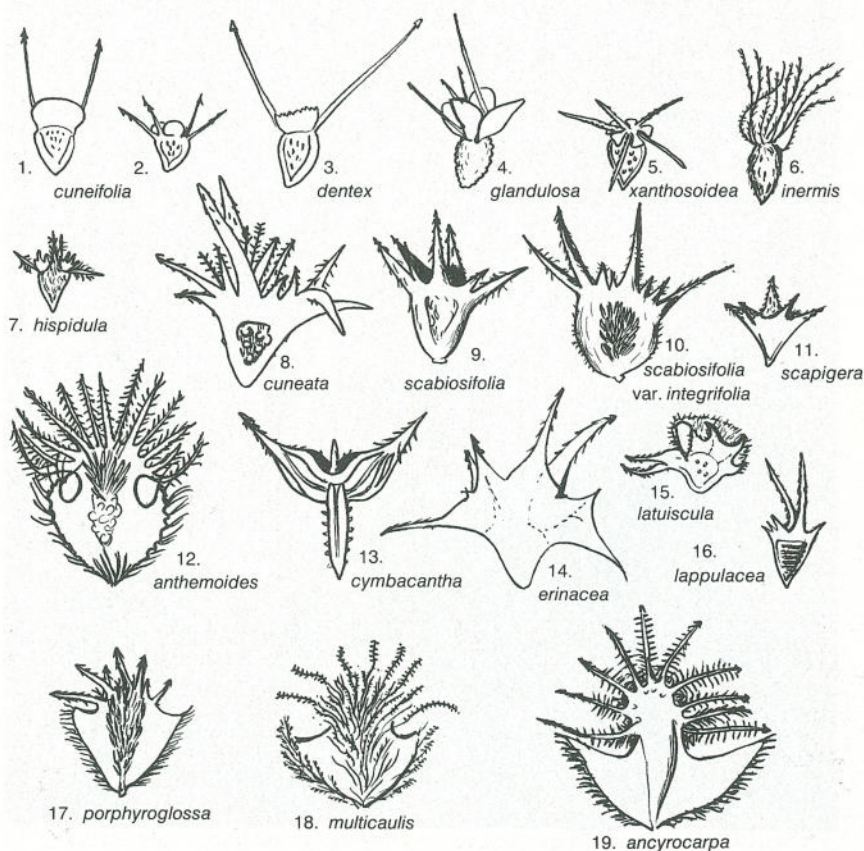
Photography by Murray Fag

Photographed at Sawpit Creek, Kosiusko National Park, NSW. This charming little plant is found in the highlands of NSW and Victoria. The Blue-burr Daisy, *Calotis zuneifolia* is shown in colour on page 177. The species of *Calotis* are listed in the table on page 175 together with their natural habitat.

The different species can be recognised by the shapes of their fruits (see Figures 1-19), which can show a bizarre variety of spines and barbed or silky hairs.

For the most part, *Calotis* species are found in arid or semi-arid regions of eastern Australia especially in western NSW and south-western Queensland, although a few occur on drier aspects of the Great Dividing Range. They inhabit a diversity of ecological conditions, although individual species and even groups of species prefer quite distinctively different habitats (Table 1).

Perhaps the most widespread species throughout Australia is *C. hispidula*, known as the Bogan Flea and well known to those who camp in the outback. It grows flat on the ground and its flowers are inconspicuous to the point of vanishing — but its burrs are ubiquitous! It has even been reported growing in Scotland where wool mills discharge the washings from Australian fleeces.



Figures 1-19. The fruits of species of *Calotis* (scale variable but approx. x10). Drawn from G. L. Davis (1952) "Revision of the genus *Calotis*" Proc. Linn. Soc. NSW 77: 146-88. There is often variation within species for the number of awns.

Most *Calotis* species grow 10-30 cm high but *C. erinacea* can reach 1 m. It characteristically grows on the crests of long red sand dunes and is readily recognized by its tangled stems, narrow glossy leaves, yellow ray florets and sharp-awned fruits. Another yellow flowered species is *C. lappulacea* found often on roadsides and dry paddocks quite close to Sydney and many points north and west.

Calotis species are sometimes mis-identified with the genus *Brachycome*. However, the latter genus lacks the prickly burrs found generally in *Calotis*. In *Brachycome* fruits form from both the disc and ray florets, whereas in *Calotis* the disc florets produce no fruits and may form a chaffy centre in half-mature burrs. The exception here is *C. hispidula* mentioned previously! Another difference between the two genera is that *Brachycome* has many species with nine pairs of chromosomes, whereas there are none such in *Calotis* and the majority of species have eight pairs of chromosomes.

Table 1. Notes on species of *Calotis*.

Species	P, A*	Ray floret colour	Distribution						Habitat
			N	Q	V	S	NT	WA	
<i>C. cuneifolia</i>	P	blue, white, mauve	X	X	X		X		Sandy soils in open Eucalypt-Callitris forest.
<i>C. dentex</i>	P	white	X	X					Sandy soils in open forest, especially New England district.
<i>C. glandulosa</i>	P	white, pink	X						Grasslands and open forest at high altitudes in the Monaro.
<i>C. xanthosoidea</i>	P	white, mauve		X					Sandy soils in open forest in Mitchell district.
<i>C. inermis</i>	A	blue	X	X					Red brown soils in w. Queensland and Paroo district.
<i>C. hispidula</i>	A	minute, green	X	X	X	X	X	X	Dry grasslands on various soils.
<i>C. cuneata</i>	P	white		X					Various soils in grassland or open country. Stoloniferous.
<i>C. scabiosifolia</i>	P	white	X	X	X	X			On soils liable to flooding. Often stoloniferous.
<i>C. scabiosifolia</i> var <i>integrifolia</i>	P	blue	X		X				Grasslands and open forest in highlands of s. NSW and Vic.
<i>C. scapigera</i>	P	white	X	X	X	X			On heavy soils liable to flooding. Stoloniferous.
<i>C. anthemoides</i>	P	white	X		X				Swampy situations. Stoloniferous, finely divided leaves.
<i>C. cymbacantha</i>	A	yellow	X		X	X	X		Sandy soils in low rainfall areas.
<i>C. erinacea</i>	P	yellow	X	X	X	X	X	X	Sandy soils in low rainfall areas.
<i>C. latiuscula</i>	P	yellow	X	X		X	X		Sandy or stony soils in low rainfall areas.
<i>C. lappulacea</i>	P	yellow	X	X	X				Various soils in open forest and cleared land.
<i>C. porphyroglossa</i>	A	mauve, white		X		X	X	X	Grasslands and dry creekbeds.
<i>C. multicaulis</i> A	A	white	X	X		X	X		Flat sandy ground liable to flooding. 5 pairs of chromosomes and polyploids.
<i>C. multicaulis</i> B	A	white				X		X	Flat sandy ground liable to flooding. 4 pairs of chromosomes and polyploids.
<i>C. ancyrocarpa</i>	A	white	X	X		X			Often dense stands on flooded soils.

*P = Perennial, A = Annual or ephemeral. This Table is compiled from G. L. Davis (1952) and H. M. Stace (1978) "Cytoevolution in *Calotis*" Aust. J. Bot. 26: 387-307.



The Living Centre

of Australia

by Alec M. Blombery*

The Daisy Family Asteraceae (Compositae)

In Central Australia following periods of rain, particularly in February and March, the arid areas literally come to life in late winter and spring, when the vast number of daisies, both annual and perennial, provide a kaleidoscope of colour, covering vast areas in yellow, white, pink, mauve, purple and blue.

The daisies belong to a very large family of plants widely distributed throughout the world. In Australia, as well as many different native species, there are numerous exotic types which have become naturalised, including many troublesome weeds such as various thistles, Bathurst Burr and dandelions. The family is botanically known as either Asteraceae or Compositae, the latter older name referring to the composite nature of the flowerhead.

The Nature of the Flower

With so many different daisies, it is often difficult to separate the various types, as only small features divide the various genera and species, so, to assist in understanding these characters, the following outline is given.

The Flowerhead

The so-called daisy flower consists of a number of small tubular flowers packed closely together into a head. These flowers may be either male, female or bisexual. The head may consist of all single flowers or small groups of flowers clustered together. The head of small flowers is surrounded at the base by a number of bracts which vary from green and leafy to soft, stiff, papery and petal-like. Collectively this group of bracts is known as an involucre. This surrounding involucre commonly forms a hemispherical or cylindrical shape, but sometimes may be spreading or even almost absent.

The Petals

In the typical daisy such as the exotic sunflower and gerbera, there is an outer ring of strap-like petals, which are soft and coloured and surround the yellow compressed centre of tiny flowers.

These strap-like petals arise from single flowers around the edges of the flowerhead, radiate outwards and are commonly called ray petals. There are variations to this outer petal arrangement, which may be small or absent.

*The Living Centre of Australia, by Alec M. Blombery, is a new book available from the Editor, Australian Plants for \$24.95 plus \$2.00 postage. This segment, with the colour plate opposite is reprinted by permission. See the book review on page 166.

Some Daisies of the Centre — Colour plates opposite

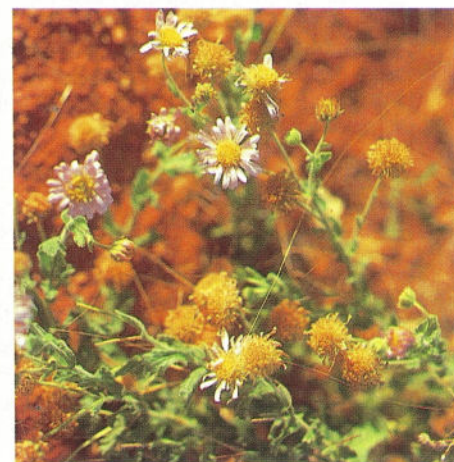
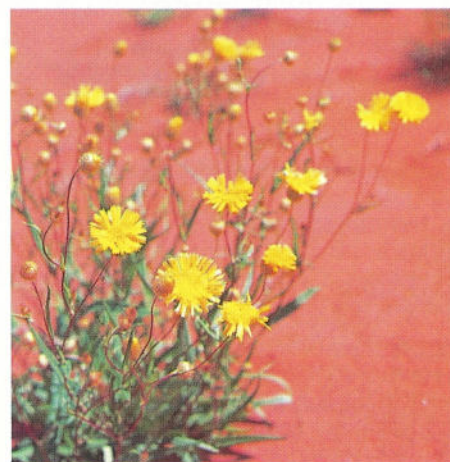
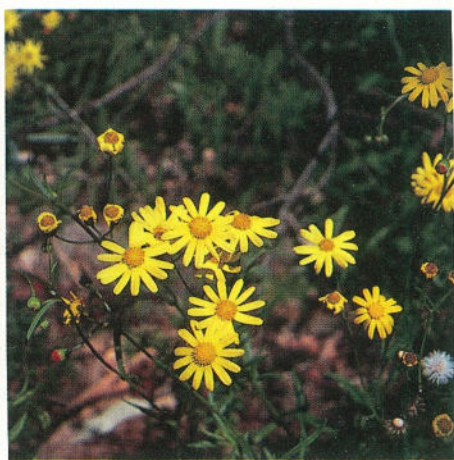
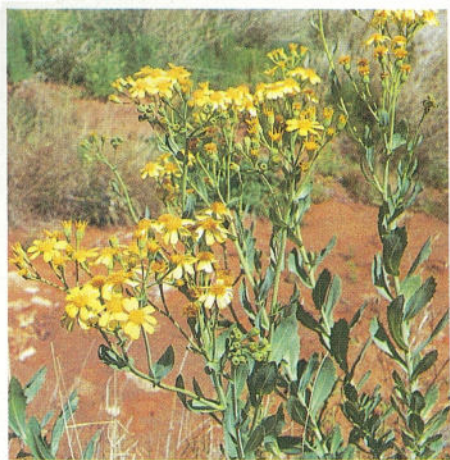
Top left — Tall Yellow Top *Senecio magnificus*

Top right — Variable Groundsel *Senecio laetus*

Centre — Swan River Daisy *Brachycome iberidifolia*

Bottom left — Showy Podolepis *Podolepis jaceoides*

Bottom right — Blue-burr Daisy *Calotis cuneifolia*



Papery Petal-like Bracts

In some groups of daisies, the outer radiating petals are replaced by a number of soft to stiff papery coloured bracts, forming the involucre. These bracts may radiate and give the appearance of petals, as in the paper daisies, e.g. *Helichrysum*. An interesting feature of the paper daisies is the manner in which these papery bracts quickly close around the flowerhead in the presence of moisture, slowly opening again as they become dry.

The Seed

The nature of the seed is frequently the separating character used to divide different genera and species. The seed is a small nut called an achene, which may be slender, cylindrical, flattened, rounded or egg-shaped, with a smooth, rough or hairy surface. Attached to the seed may be hairs, sharp scales, hooks or spines. Frequently at the top of the seed, there are a few to a number of bristles or scales forming a tuft, known as a pappus. A typical example of a pappus is the fluffy end on the seed of the dandelion and thistle. The nature of the pappus differs in the various species from sharp and spiny to soft and feathery and is an important character in separating the different species.

Understanding the Daisies

For convenience and to assist in understanding the different genera of daisies, they may be arranged into groups according to the presence or absence of petals. As there are large numbers of daisies, some of the more common genera are discussed.

Group 1. This group includes the typical daisy, usually with a yellow centre, surrounded by soft radiating, strap-like, coloured petals of white, yellow, pink, mauve, purple or blue. At the base of the flowerhead is a surrounding involucre of a number of herbaceous green to greyish green, or sometimes small papery bracts, forming a hemispherical to cylindrical surround. In the group are included genera such as *Senecio*, *Brachycome*, *Minuria*, *Calotis*, *Vittadinia*, *Podolepis*, *Olearia*. Some of the plants of Group 1 are described on the next page.

Group 2. This group includes the paper daisies. The flowerheads do not have the outer ring of coloured, radiating, soft, strap-like petals. There may be either numerous rows of soft to stiff papery bracts on the involucre or they may be close-fitting or almost absent. This group may be arranged into two:

a) In this subgroup the papery bracts in colours of white, pink, yellow to yellowish brown, radiate around the central head of flowers in the manner of petals. An interesting feature of these paper daisies is the manner in which the papery bracts quickly close around the flowerhead in the presence of moisture, opening again when they become dry. Included in this group are the genera *Helichrysum*, *Helipterum*, *Waitzia*, *Myriocephalus*, *Cephalopterum*.

b) This subgroup usually has only a few papery bracts in the involucre and there are no radiating petal-like bracts, the flowerheads having a button-like appearance. Included in this group are *Craspedia*, *Calocephalus*, *Gnephosis*, *Angianthus*, *Pterocaulon*, *Rutidosia*, *Ixiolaena*.

Group 1 — Daisies of "The Living Centre"

Senecio

There are nine species of *Senecio* in the area, three of which are wide-spread; all have bright yellow flowers with the green to greyish green involucre bracts arranged in a cylindrical manner. The seed heads are white and fluffy.

S. gregorii Yellow-Top. An annual to about 30 cm with fleshy, greyish green, narrow leaves and large single flowerheads at ends of stems. This species mainly occurs on sandplains and is common amongst mulga.

S. magnificus Tall Yellow Top. A tall bushy perennial to about 1 m with thick fleshy, greyish green, broad, stem-clasping, toothed or entire leaves; the large flowerheads grow in clusters at ends of stems. This species commonly grows in sandy alluvial soils, floodways and edges of roadways.

Podolepis

There are four species of *Podolepis* in the area, all small annual plants with narrow leaves; the soft spreading petals are usually divided at the ends; the small papery involucre bracts are overlapping and form a somewhat conical-shaped base to the flowerhead; the seeds are slender and cylindrical.

P. jaceoides Showy Podolepis. An erect to spreading small plant with woolly soft leaves; the flowerheads have yellow petals and are carried on reddish brown stems. This species grows chiefly on red sandy soils.

P. capillaris A slender erect to spreading plant with narrow smooth leaves; flowerheads with white to cream petals on slender stalks.

Brachycome

There are several different brachycomes in the area which are similar in appearance and require close examination of the seed to determine species. These soft, annual and perennial, spreading to erect plants are usually less than 30 cm in height and have divided or lobed small leaves; the flowerheads grow to about 25 mm with neatly arranged, soft, spreading petals of white, pink, mauve, lilac, purple or bluish tints; the involucre of soft green bracts forms a shallow, somewhat flattened hemisphere; the seeds are flat, short and about as long as the involucre bracts.

B. ciliaris Variable Daisy. As the common name suggests, this erect to spreading perennial has smooth to woolly, divided, or sometimes entire leaves; flower petals are white to purple. It is widely distributed on sandhills, gibbers, claypans and rock crevices.

B. iberidifolia Swan River Daisy. A small slender annual, 7 to 25 cm in height with smooth, divided leaves; flower petals white to violet; grows on sandplains, sandhills and water-courses.

Calotis

There are some eleven different *Calotis* species in the area. The flowers resemble those of *Brachycome* except that a number have yellow petals; leaves are not basal and are usually entire, toothed or lobed; the seed heads have small sharp scales, awns or spines attached to the seed forming prickly burrs. These burrs can be most uncomfortable to the traveller. See page 173. ■

***Persoonia* in Tasmania**

by Jeanette Closs and A. E. Orchard



Persoonia juniperina

A *Persoonia* found in many parts of Tasmania, the variety (var. *mollis*) pictured below and opposite, is found on the north part of the east coast. Elsewhere, the varieties found in other areas have stiffer usually shorter foliage. Photography by John Simmons.



The genus *Persoonia* belongs to the Proteaceae family. It was named by J. E. Smith in 1798, after Christiaan Hendrick Persoon, a South African, who was born in 1755 of a Dutch father and a Hottentot mother. He became a famous mycologist and his work on the classification of fungi was most important. The common name given to most *Persoonias* is Geebung, which is a corruption of the Aboriginal name jibbong used for the fruits of certain species.

Until 1975 there were approximately 73 species of *Persoonia*, all endemic to Australia except *Persoonia toru*, which is found in the north island of New Zealand. In 1975 Johnson and Briggs published a major study on the evolution and classification of the Proteaceae, in which amongst other things, they divided *Persoonia* into 4 genera. *Persoonia* in the strict sense is now considered to be mainly confined to eastern Australia, but with 5 species in south-western Western Australia; the remaining western and northern species are distributed between the new genera *Acidonia* (*Persoonia* section *Acranthera* Benth.) and *Pycnonia* (*Persoonia* section *Pycnostylis* Meissn.), and the sole New Zealand species becomes the monotypic genus *Toronia*. *Persoonia* in the sense of Johnson and Briggs now contains about 45 species.

Persoonia have yellow to white or creamy-white flowers, either solitary in the leaf axils, in small clusters or in terminal racemes. At first the flowers are tubular, and gradually the tube divides into four equal parts and these curl back giving a bell-like appearance. They mostly flower from late spring, through summer and sometimes into autumn. The fruit (known as a drupe) matures during winter and early spring. It is relatively large and succulent with a persistent style. The fruits are edible although some are quite bitter. The leaves are simple and entire, varying from the pine-like needles of *Persoonia pinifolia* to the large, broad, flat leaves of *P. levis*. Some species are prostrate, others bushy shrubs or small trees. They are difficult to propagate as the seeds have an inhibitor, which as yet has not been overcome; and the cuttings don't strike easily. However, once a plant is established, it is reasonably hardy.

Plant enthusiasts in Tasmania over the years have observed, photographed, collected cutting material and occasionally grown the one endemic species, *P. gunnii* and the indigenous species *P. juniperina*, which are listed in Dr. W. Curtis', Student's Flora of Tasmania, Part III. From time to time botanists and amateurs have noted a great variation in the forms of these two species.

Since the Tasmanian Herbarium received permanent staff in 1977 strenuous efforts have been made to increase the number of collections of all groups of plants, and to make them available for study by botanists interested in the Tasmanian flora. One of the more active collectors in this period has been Mr. Tony Moscal, an amateur botanist with a wide knowledge of the flora and an unlimited capacity for rugged bush-walking. Amongst the many interested finds he made were a range of *Persoonia* specimens which showed much more variation than would normally be expected in a single species. This prompted a detailed study of the Tasmanian plants which has now shown that three variants of *P. juniperina* can be distinguished from the typical form at least in their most

Editor's Note: *Persoonia* and related genera *Acidonia* and *Pycnonia* are interesting plants that have considerable ornamental value. Will readers please forward notes or colour slides of species for inclusion in future issues. One problem has been the propagation of plants. I would particularly like to hear from anyone who has had success in growing plants from seed or cuttings.

extreme forms. Two of these variants attracted formal varietal names as early as 1856. The third has only fairly recently come under notice. The specimens of *P. gunnii* were so dissimilar as to warrant the splitting of this species into three separate species, *P. muelleri* with three varieties, *P. gunnii* with two varieties and the new prostrate species *P. moscalii*.

Key to Tasmanian Species of *Persoonia*

1. Leaves needle-like (never more than 2 mm wide), $\pm$ sharp at the tip; perianth segments lacking lateral flaps 1. *P. juniperina*.
1. Leaves (linear-) lanceolate to obovate (always more than 3 mm wide), tip acute or rounded, never sharp; perianth segments with undulate lateral flaps.
 2. Erect shrubs; leaves more than 1 cm long, radially spreading.
 3. Perianth segments 15.5-19 mm long, outer surface with appressed hairs to the tip; leaves thick, drying with $\pm$ pronounced transverse wrinkles, usually with appressed hairs at maturity (*var. muelleri* $\pm$ glabrous) 2. *P. muelleri*
 3. Perianth segments 10-13.3 mm long, outer surface with appressed hairs only in the lower half; leaves thinner, drying with at least some longitudinal wrinkles, glabrous or with just a few hairs near base at maturity 3. *P. gunnii*
 2. Prostrate mat-forming shrubs; leaves less than 1 cm long, often turned to one side (perianth segments 9-10 mm long; leaves fleshy, unwrinkled) 4. *P. moscalii*

Persoonia juniperina with its juniper-like foliage is a tall densely branched shrub, sometimes growing to 1.5 m tall. The leaves are variable, narrowly linear to acicular 1-3.5 cm long, and 0.1-0.15 cm wide, flat to concave above, convex and usually 3 ribbed below, the tip acute to acuminate. The yellow flowers are solitary in the axils of the upper leaves. The fruit is a deep reddish purple, ovoid 7-10 mm long, 5-7 mm in diameter, with a persistent style.

Key to Varieties of *Persoonia juniperina*

1. Leaves stiff, pungent, 1-2.2 cm long $\pm$ pubescent
 2. Leaves (1.5-) 1.8-2.2 cm long; hairs straight, $\pm$ appressed to the leaves
 3. Shrub 0.3-1 m tall; leaves straight and spreading at c.90 degrees to the stem, 0.9-1.1(-1.4) mm wide *var. juniperina*
 3. Shrub 1-1.7 m tall; leaves upwardly curved, 1.2-1.5(-1.7) mm wide *var. ulicina*
 2. Leaves 0.8-1.8 cm long; hairs on leaves $\pm$ crisped, spreading *var. brevifolia*
1. Leaves soft, acute but not pungent, (2.5-)3-3.5 cm long, $\pm$ glabrous when mature *var. mollis*

P. juniperina var. juniperina. The leaves are stiff and spreading at c.90 degrees to the stem, 1.8-2.2 cm long, more or less glabrous or only sparsely hairy. The floral tube is 7.5-8.5 mm long. This variety can be found in many parts of the main island and also on King Island and in the Furneaux Group.

P. juniperina var. ulicina. The leaves are stiff and more erect than *var. juniperina* and curved upwards towards the tip. They are longer and slightly broader, often distinctly flattened and 2-2.5 cm long by 1.2-1.5 mm wide. The floral tube is slightly larger, being 8-10 mm long. This variety is confined to coastal areas of the west, north-west and north-east.

P. juniperina var. brevifolia. As its name implies, the leaves of this variety are shorter, 0.8-1.8 mm long by 0.1 cm wide and spreading at about 90 degrees to the stem. They often have a fairly dense covering of hairs, giving the plant a greyish appearance. The floral tube is much smaller, being 5.8-8.3 mm long. This variety is more common in the south-east, especially in the Hobart area, but is also found on the east coast and in a few inland areas. In the northern part of its range it intergrades with *var. juniperina*.

***P. juniperina* var. *mollis*.** The word *mollis* means soft or pliant, so it's not surprising to find that the leaves of this variety are soft, spreading at first at 90 degrees from the stem then curving gently upwards, and quite long, 3-3.5 cm by 0.1 cm wide. The floral tube is 8.5 mm long. This variety is found almost entirely on the northern part of the east coast. See colour plates on pages 180 and 186.

A newly recognised species, ***Persoonia muelleri***, honours Baron von Mueller and has three varieties, which are mostly separated by their leaf characteristics. It is an erect shrub growing from 1 m to 4-5 m tall. The leaves are alternate, spreading to semi-erect, linear to oblanceolate or spatulate 1.8-5.0 cm long, and 3-10 mm wide, thick and drying with transverse wrinkles. The yellowish flowers are borne singly in the axils of the upper leaves, and differ from those of *P. gunnii* in being longer (15.5-19 mm) and covered in fine hairs on the outside for their entire length.

Key to Varieties of *Persoonia muelleri*

1. Leaves oblanceolate to spatulate, rounded at tip, with or without a small blunt apiculum
2. Leaves lax, oblanceolate, with appressed hairs when young, $\pm$ glabrous at maturity *var. muelleri*
2. Leaves densely crowded, spatulate, with appressed hairs remaining into maturity *var. densifolia*
1. Leaves linear to narrowly oblanceolate, $\pm$ acute *var. angustifolia*

***P. muelleri* var. *muelleri*.** The leaves are spreading to semi-erect, oblanceolate 2.7-3.5 cm long and 4-6 mm wide, rounded at the tip. This variety is confined to the highlands of the central plateau and the north east.

***P. muelleri* var. *densifolia*.** The name immediately suggests dense foliage — the leaves are crowded, spatulate, hairy 3-3.5 cm long by 8-10 mm wide. This variety is found only in coastal areas of the south and south west.

***P. muelleri* var. *angustifolia*.** This is very similar to *var. muelleri* but the leaves are semi-erect, linear to narrowly oblanceolate, 4-5.5 cm long by 3-5 mm wide, with a more or less acute tip. This variety is confined to altitudes of 300-350 m on the mid-western coast.

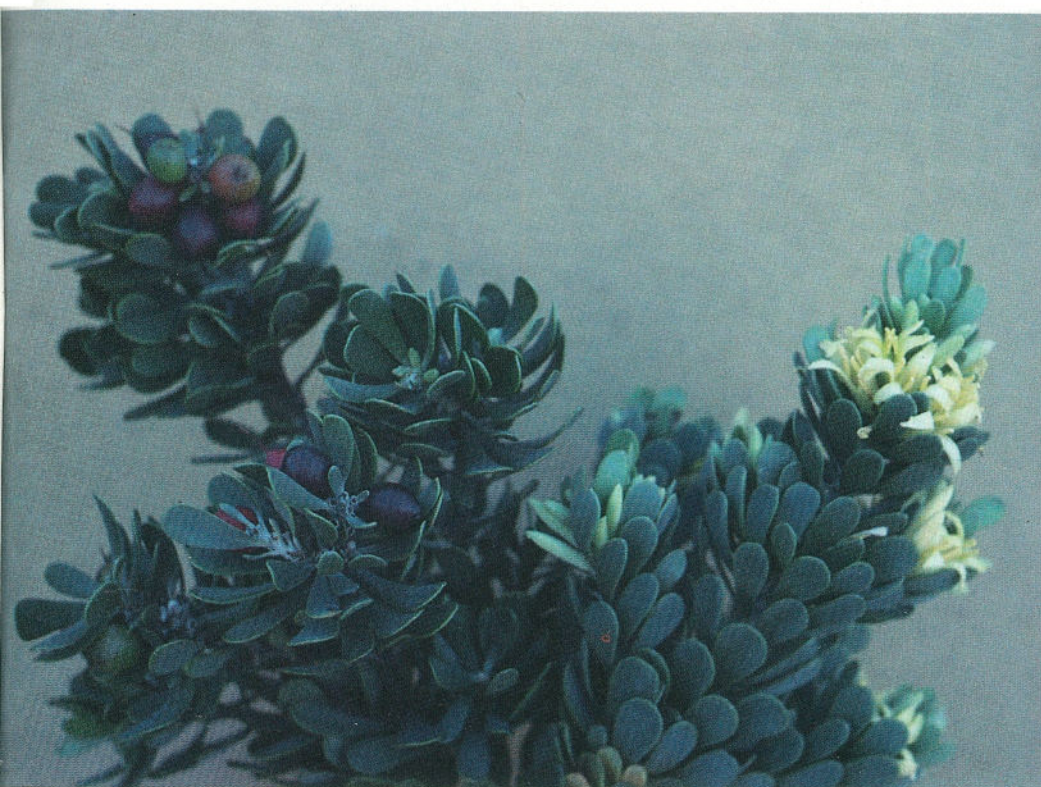
Persoonia gunnii is an erect shrub 0.6-3 m tall, usually smaller than *P. muelleri*. The leaves are alternate, spreading with an S-like curve and the tips erect, oblanceolate to ovate or spatulate, 1.3-4 cm long by 3-8 mm wide, rounded at the tip, thinner than *P. muelleri*, drying with longitudinal wrinkles, and often glabrous when mature. The flowers are borne singly in the axils of the upper leaves, they are shorter than *P. muelleri* (10-13.3 mm long), glabrous or with hairs only on the lower part of the outer surface. The fruit is a deep purplish-black, ovoid, 10-11 mm long by 8-9 mm in diameter, glabrous with a persistent style.

Key to the Varieties of *Persoonia gunnii*

1. Leaves obovate to spatulate, 1.3-2.5(-3.2) cm long, 3-8(-10) mm wide, spreading in a distinct S-like curve *var. gunnii*
1. Leaves oblanceolate, 3.5-4(-5) cm long, 3-7 mm wide, spreading in a weak S-like curve *var. oblanceolata*

***P. gunnii* var. *gunnii*.** The leaves are obovate to spatulate 1.3-2.5 cm long by 3-8 mm wide, spreading in a distinct S-like curve with erect tips. The creamy-white flowers are sometimes flushed with pink on the outer surface. This variety is found in the highlands of the central, western and southern parts of the state.

***P. gunnii* var. *oblanceolata*.** This variety differs from *var. gunnii* in having oblanceolate leaves, which are larger, being 3.5-4 cm long and 3-7 mm wide, semi-spreading and only slightly S-curved. The flowers are white and it is known at present only from three localities in the southern highlands.



Persoonia gunnii

Photography by J. Closs

***Persoonia moscalii*.** This species honors Tony Moscal, who discovered the plant and who carried out a detailed survey of Mt. Counsel in the far south-west of Tasmania to determine ecological and physical relationships between *P. muelleri* and this species. It is a prostrate shrub forming mats up to 1 m in diameter, the major branches closely appressed to the soil, but not rooting; lateral branches ascending at the tips, to 4-5 cm tall. The erect leaves are thick, obovate to oblanceolate, 6-8 mm long, 3-4 mm wide, rounded or blunt at the tip and tapering gradually to the base. The yellow flowers are borne singly in the axils of the leaves, near the tips of the young stems and are almost sessile. The floral segments spread almost from the base. At present the species is known only from Mt. Rallinga in the Melaleuca Range and from the vicinity of Mt. Counsel, both localities being in the far south-west.

REFERENCES:

- Bentham, G. 1870 *Flora Australiensis*, Vol. 5 (Reeve & Co., London).
 Curtis, W. M., 1967. *The Student's Flora of Tasmania*, part 3. (Government Printer, Hobart)
 Johnson, L. A. S. and B. G. Briggs, 1975. On the Proteaceae — the evolution and classification of a southern family. *Botanical Journal of the Linnean Society* **70**: 83-182.
 Orchard, A. E., 1983. The Tasmanian species of *Persoonia* Smith (Proteaceae) *Brunonia* **6**: 217-40.

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Mt Annan Native Botanic Garden and Arboretum

A new garden, a bicentennial project of The Royal Botanic Gardens, Sydney, is to be established near Campbelltown, NSW. This 500 hectare site includes stands of Narrow-Leaved Ironbark (*Eucalyptus crebra*), Forest Red Gum (*E. tereticornis*) and Grey Box (*E. moluccana*) shortly to be joined by many thousands of other wild plants from all parts of Australia. Congratulations to Premier Neville Wran without whom this magnificent project would not have been possible, and to Dr Lawri Johnson, Director, for a monumental achievement.