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This issue, in fact this new volume of Australian Plants, will be devoted to the cultivation of Australia's wildflowers, with special emphasis on information for beginners.

After looking through the issues I have produced over the last 21 years, I ask myself "so what is new?" I have used the same heading, even the same words, many times. Some have said that I have failed, for in many issues, one or two articles have been quite technical. They have even quoted back at me some technical words used that even I do not know the meaning of. I make no apology for this, and will continue to produce at least one article per issue that may appear quite technical. They are selected carefully. If you will take the time to read through the article, at times skipping the technical jargon, you will find that there is a very important point brought forward relating to cultivation. It is important that we have this interface between the scientist and the general public.

However, I have failed to produce enough information that is easily read and a clear guide to the beginner or the untrained trier. Every contribution in this category has been published, many of them following much prompting and writing by myself. Over the years we have published a huge volume of information in the easily read form and beginners would be advised to save up and purchase back issues.

This, however, has not been enough. The beginners do not feel they know enough to contribute. The experienced regard some of their procedures to be too simple or obvious and not worthy of reporting. The competent have reached the stage where there is so much they do not know, so many failures they cannot explain, that they hesitate to advise anyone. The result, no articles of the type in demand.

Having had considerable experience, in failure with the odd success, and reached the stage where I have found the gaps in my knowledge far exceed what I have learnt, I have decided to start from scratch and report to readers through this volume of my experiences.

As nobody will tell me where I go wrong, I decided I needed a lot of plants to experiment with. Hence step number one, propagate some plants. This first step is reported in this issue. No special facilities or experience are necessary. I hope many readers throughout Australia will follow my example and grow plants from seed so that the next volume can be devoted to reports of readers on their experiences.

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COVER PLATE: *Calothamnus sanguineus*

Photography by B. Crafter

The group of plants known as *Calothamnus* are the subject of this issue. *Calothamnus sanguineus* is described on page 7. An ideal hardy shrub for the garden.

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THE AUSTRALIAN FLORA

by W. H. PAYNE

The Australian Flora is a unique and bountiful array of natural splendour and an essential element for man's continued survival on this continent. The readers of this publication are concerned with more than just self survival. The quality of life depends on many things especially the environment in which we live and relax. We are concerned about the preservation of the Australian Flora.

Interest will vary from a quiet appreciation of natural splendour when in natural areas to an awakening of interest in plants and creatures. As with the group of plants known botanically as *Calothamnus*, readers of Australian Plants will be able to learn more about our flora. It is ridiculous to regard these articles as too technical for our purpose as many thousands of readers who take the time to study them will testify.

Some will desire to grow wildflowers in the home garden or see them in established parks and areas. Others will support a programme of selection and development of certain species as horticultural even exotic flowering plants. The cultivation and selection of plants is the principal theme of Australian Plants issues.

A common concern of all readers is the very survival of the Australian Flora. There is need for this concern. It is already too late for thousands of species and at this moment many precious and irreplaceable forms of life are quietly expiring. What is to be done? In our democratic society there is a great deal an individual can do if he or she feels concerned enough.

Western Australia, previously the wildflower State, now the State of Excitement, and if they do not change their course, when the excitement and dust settles, will be the Desert State. Victoria is about to receive propaganda to support devastation of their forests for the Japanese woodchip industry. In N.S.W. proposals to log the rainforests will mean the eventual extinction of the already diminished rainforests. Tasmania has a difficult problem to resolve over power requirements and its magnificent natural areas. Queensland is fighting to save Fraser Island and one of the world's wonders, The Barrier Reef.

Whom to blame? Without a doubt it is our politicians. But what of their problems? Why worry about the forests of Eastern Victoria tomorrow if by spending millions of dollars to ship our natural resources to Japan, we keep a few hundred people employed until there is nothing more to cut down. These few are voters and look to our politicians for work. A few dozen people can be employed chopping down the rain forest trees in N.S.W. until they are all gone but it at least keeps them off the politicians backs while they are busy in their devastation. Why not employ them to plant and grow trees?

It is time for all of us to look around and think. What can we do?

You can take an active interest in the various societies and action groups in your area. There are many groups concerned with conservation. These will advise you on how to assist your politician. First give the politician assistance and positive support for sane proposals before you decide on the "chop" if further action shows that they are completely irresponsible.

What is this publication and the Society doing? In the twenty-one years of publication, it is the first time we have used such strong words. We do not propose to do it again in the foreseeable future as voluble, active conservation issues are well catered for by the many active well-informed groups formed for this purpose. Our thrust will be towards education and research and active encouragement of people to become involved in conservation issues. We are vitally concerned with the future.

As pressures build up on our natural areas and reserves, there is no way that the bulk of the Australian Flora can survive without informed management. On the other extreme, no one seriously believes that we will save the flora from decimation by cultivation in home gardens, parks, etc. But! by continued efforts in learning to cultivate our wildflowers, by the continued support of this publication and by any activity we can encourage you to undertake, the Australian citizen can contribute to the preservation of the Australian Flora.

Are we really making progress with this challenge? After twenty years of publication have we proved anything other than that it is not easy to grow a large majority of the Australian Flora and that its eventual survival in the wild or managed areas will be a hit and miss affair with man's dominance and interference on the planet meaning its eventual extinction. Many who have tried and failed will say that we have contributed very little. I feel that we have created a lot of support, interest and general awakening to the critical stage our flora has reached. We have accomplished a great deal but this is just a start.

But let us face it. We, as largely an amateur group, are involved in a huge problem needing scientific study and research. Over the years we have been able to develop a valuable bridge between the scientist and the public which is proving vital to both. We have now succeeded in gathering the support of most competent scientists throughout Australia concerned with the Australian Flora, in a massive national project, The Australian Flora Foundation. During the World Botanical Congress year of 1981, this foundation will be formalised. More details will follow. ■



Pultenaea subalpina

Photography by H. A. Morrison

This magnificent peaflowered plant is endangered. What an incredible colour for a *Pultenaea*, plants that are normally yellow. A major part of this volume will be devoted to describing our peaflowered plants in a manner easily understood. We desperately need articles on their cultivation—Editor.



CALOTHAMNUS

The Genus, by T. J. Hawkeswood,
Department of Botany, University of W.A.

Part 1 — A review of the 4-merous species

The genus *Calothamnus* of the family Myrtaceae (sub-family Leptospermioideae, tribe Leptospermae, sub-tribe Calothamninae) is endemic to Western Australia. It is comprised of at least 25 described species, and research by the author and others at the W.A. Herbarium in Perth, suggests that there are some 10 further undescribed species. These are in Part 2, publication of which will be delayed until their descriptions have been published.



Calothamnus quadrifidus R.Br.

Photography by B. Crafte

This species is an erect, compact or spreading, multi-stemmed, variable shrub to mostly 1.5 m high. It usually has hairy, terete leaves, mostly 1.5-2 cm long, which are densely crowded. The flowers, as shown in the photograph, are arranged in dense, $\pm$ unilateral spikes 2-8 cm long amongst leaves or on portions of the branches from which the leaves have fallen. The fruit is sessile, almost ovoid in shape and has two of the calyx-lobes prominently thickened at the apex. The style is usually persistent in the fruit. *C. quadrifidus* is the most variable of the genus and grows in a wide variety of habitats from coastal and inland sandplains and is the only species in the genus to be found extensively through the jarrah forests of south-west Western Australia. It has one of the most widespread distributions of Western Australian plants from Shark Bay to Perth, east of the Darling Range to Hopetoun and commonly distributed to Cape Arid. This is the most commonly grown *Calothamnus* and adapts to a wide variety of soil types and conditions.

Calothamnus species are mostly tall, woody shrubs, occasionally low growing, with usually narrow, cylindrical leaves and showy red or purple-red flowers in small clusters or dense spikes. The genus is closely related to *Lamarchea*, but differs in having erect anthers which are attached at the base to the filament. The genus is also closely related to *Regelia* and *Eremaea*.

The generic characteristics include the following:-

Leaves: usually crowded, linear or sometimes oblanceolate, usually glabrous, oil glands mostly prominent.

Flowers: sessile, in small clusters or dense, (often unilateral) spikes on older stems from which the leaves have fallen, or amongst leaves (but not necessarily axillary).

Calyx-tube: somewhat campanulate, glabrous or pubescent, often immersed in the stems; lobes deltoid, usually thick with scarious margins, sometimes all or few persistent.

Petals: 4 or 5, obovate to elliptical, usually deciduous.

Staminal claws: equal or unequal (sometimes upper two fused and lower ones reduced), crimson to deep purple-red (yellow-brown in one species), usually with numerous filaments.

Ovary: inferior, 3-celled, ovules numerous.

Style: very slender, stigma small.

Fruit: a dry, sessile capsule, depressed globular to ovoid in shape; calyx-lobes absent or present.

Seeds: linear to narrow-obovoid, 1-4 mm long, usually darker in colour than the numerous sterile ovulodes.

The genus can be best divided into two sections, viz. those species which have floral parts in fours (4-merous) Part 1, the subject of this article and those which are 5-merous to be described in Part 2.

KEY TO THE 4-MEROUS SPECIES OF *CALOTHAMNUS*

A key to those species that have floral parts in fours is given on page 23. The following descriptions are in the order shown in the key.

1. *Calothamnus pachystachyus* Benth.

G. Benth. Fl. Austr. (1867).

An erect, much-branched, hairy shrub to 1 m high with thick, corky, pubescent branches. Young shoots pilose, the leaves mostly pilose on the margins, becoming glabrous with age. Leaves crowded, linear, flat, thick, 8-15 cm long, 4-6 mm wide, acuminate-acute, attenuate at the base. Flowers large, closely arranged in short spikes almost immersed in the corky, swollen rhachis. Calyx-tube c.5 mm long, shortly pubescent; calyx-lobes $\pm$ equal, acute, margins ciliate. Petals 6-7 mm long, broadly obovate, glabrous. Staminal claws unequal; the upper two broad, 6-8 mm wide, 25-30 mm long, brown-yellow (brown at base), marginal filaments 30-50; the two lower ones smaller, 20-25 mm long, c.3 mm wide at base, tapering, with one anther; anthers linear, c.2 mm long, dark brown, with a few short hairs. Style 25-35 mm long. Fruit a capsule embedded in the corky stem. Seeds — none available for examination at time of writing (January 1980).

This species has not been extensively collected and may have a limited distribution. It is presently known from Wannamal, Mogumber and Moora (north of Perth). Due to clearing for agricultural purposes, the distribution of this species may have been greatly reduced.

It grows in sandy soils in heath communities. Flowers August to October.

C. pachystachyus is closely related to *C. longissimus*, but it is distinctive in having flat leaves with pilose margins and staminal claws which are yellow-brown in colour. No other *Calothamnus* species has staminal claws of this colour.

The name *pachystachyus* comes from the Greek *pachys* meaning "thick" and the Greek *stachyus* meaning "flower spike", referring to the spike of flowers situated in the swollen, corky stems.

2. *Calothamnus longissimus* F. Muell. F. von Mueller, *Fragm.* 3:112 (1862)

A low, often straggly, bushy shrub to 1 m high, with thick, corky branches. Leaves sessile, crowded, terete, somewhat scabrous, 12-30 cm long, 1-1.5 mm wide, acuminate, not pungent, usually glabrous but sometimes retaining hairs at the base near the stem. Flowers 5-20 arranged in a short, dense spike amongst leaves. Calyx-tube 4-5 mm long, densely covered in short, silver-white hairs, embedded in the corky stems. Petals 7-10 mm long, pale brown. Staminal claws unequal; the two upper ones broad, 30-32 cm long, 3-4 mm wide, glabrous, deep red; marginal filaments 30-36; lower staminal claws sterile, short, 14-16 mm long, 2-2.5 mm wide at base, tapering; anthers 1.5-2 mm long. Style 25-35 mm long. Fruit sessile, truncate-conical, 6-7 mm long, 4-5 mm wide (apex), 8-9 mm wide (base), embedded in stems.

This species is presently confined to areas near Arrino, Three Springs, Eneabba, Dandaragan, Hill River, Badgingarra and Moora, all districts north of Perth. It grows in lateritic gravelly soils in low, shrubby heath communities. Its present distribution is very localized due to agricultural land clearing.

This species is most closely related to *C. pachystachyus*. Both species have thick, hairy corky stems and deep green foliage, with flowers (calyx-tube) embedded in the stems. It differs from *C. pachystachyus* in having long, terete leaves and red flowers (stamens).

The name *longissimus* comes from Latin and refers to the extremely long, terete leaves possessed by this species.

3. *Calothamnus sanguineus* Labill. Labillardiere, *P1. Nov. Holl.* 2:25 (1806)

An erect shrub 30-80 cm tall, either hirsute with long spreading hairs especially on the young shoots, or glabrous. Leaves crowded, nearly terete (biconvex in transection), linear, straight or often S-shaped, 1-2.5 cm long, c. 1 mm wide, acute but not pungent; oil glands usually prominent. Flowers large, often unilateral, in a small cluster or short spike with numerous flowers, not immersed in the stem. Calyx-tube 4-6 mm long (excluding lobes), shortly pubescent. Petals c. 5 mm long, broadly obovate, glabrous, brown. Staminal claws unequal, the two upper ones fused together to form a very broad, single claw, 20-30 mm long, 5-8 mm wide, with numerous filaments; the two lower ones narrow, linear, undivided, each with usually one sterile anther (some populations examined have up to three or four sterile anthers per lower claw), claws blood red. Style 15-25 mm long. Fruit ovoid to almost globular, 7-10 mm long, 5-8 mm wide, thick and woody, often smooth, with two opposite lobes thickened and persistent. Seeds few to many per fruit, c. 2 mm long, glabrous, dark brown; ovulodes numerous, pale brown. See Fig. 1 d, e, f.

C. sanguineus has one of the most widespread distributions of the *Calothamnus* species. It is found as far north as the Kalbarri National Park and is often a dominant species of low heath communities from Kalbarri through to Perth. In the south-west corner of Western Australia, the species appears to have a disjunct distribution. Specimens can be seen flowering for most of the year but its main flowering period is the spring months, August to October.

North of Perth, plants have been collected from the Kalbarri National Park, near Geraldton, Greenough, Dongara, Mingenew, Eneabba, Three Springs, Badgingarra, Hill River, Moora, Gingin, Yanchep and Toodyay. South of Perth, records show the species has been collected from Cape Naturaliste, the Stirling Ranges, and near Narrogin. It is possible that south of Perth, the species has a restricted but disjunct distribution. It is also likely that the species has been poorly collected in the south-west and/or that due to land clearing, the species has become restricted in distribution.

This is the type species for the genus. The first specimens were collected from Cape Naturaliste and named by the French biologist, Labillardiere in 1806 in the "Plants of New Holland".

Calothamnus sanguineus is distinctive in having the two upper staminal claws fused together, a feature not found in any other species of *Calothamnus*. The leaves are often curved in a shallow, S-shaped fashion, Fig 1(d).



***Calothamnus presissii* Schav.**—Above.

Photography by F. W. Humphreys

***Calothamnus homalophyllus* M. Muell.**

Opposite, top. Photo: H. A. Morrison

This species is an erect, compact or straggly, glabrous shrub to 2 m high. The leaves (as shown here in the photograph) are flat, erect or spreading, mostly oblanceolate, 2.5-5 cm long and coriaceous. The flowers are either in small clusters of 2-4 or in loose, interrupted, $\pm$ unilateral spikes 4-7 cm long with up to 30 flowers. The petals are deciduous, falling away as the flower opens (as in most other *Calothamnus* species). A distinctive feature of this species is the fruiting capsules which are almost globular in shape, with two thickened calyx-lobes at the apex, and are usually covered with large, prominent, round protuberances. (*C. homalophyllus* is closely related to *C. quadrifidus*). This species is largely confined to the Kalbarri National Park and the Murchison River areas.

***Calothamnus longissimus* F. Muell.**

Opposite, bottom. Photo: A. S. George

This species is a low, often straggly shrub to 1 m high, with thick, corky branches. The leaves are very distinctive in being slender, terete, somewhat scabrous and usually 20-30 cm in length, and are longer than any other species. The flowers, as shown here, are arranged in a short, dense, cylindrical spike amongst the leaves. This species belongs to a group of four species (*C. pachystachyus*, *C. sanguineus* and *C. torulosus* are the others), which have two, broad, upper staminal claws with numerous filaments while the two lower ones are much reduced. *C. longissimus* is most closely related to *C. pachystachyus* which has flat leaves with pilose margins and staminal claws which are yellow-brown in colour. *C. longissimus* is presently confined to areas near Eneabba, Badgingarra and Three Springs, all districts north of Perth. Its present distribution is probably very localized due to agricultural land clearing and is no doubt in need of protection.



The name *sanguineus*, from Latin, means "blood-red" and refers to the staminal claws of the flowers, which in most specimens are red, but an occasional yellow-flowered plant may be encountered. Another feature of this species is the habit of dropping the fruiting capsules when the seeds are mature. Compare the sketch below with the colour plate on the cover.

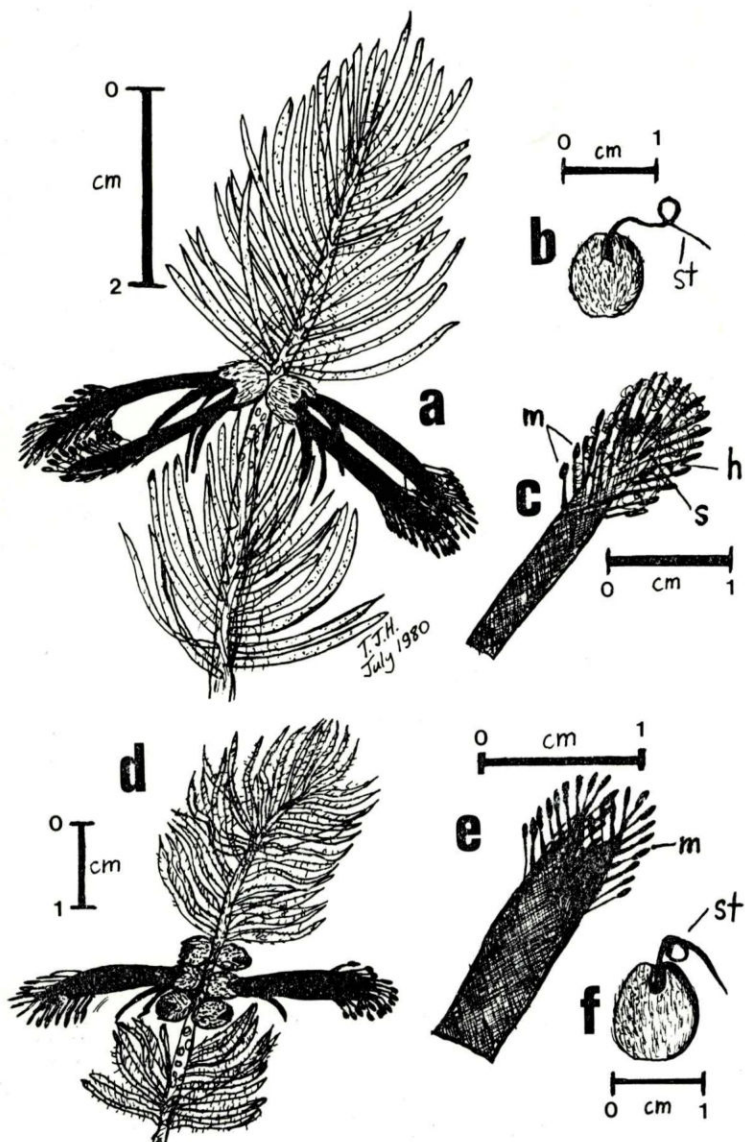


Figure 1. A-C. *Calothamnus torulosus* Schau.

A. Portion of branch showing two flowers. — B. Side view of shortly pubescent fruiting capsule with persistent style (st). — C. Underside view of one upper staminal claw showing arrangement of marginal (m) and sub-marginal (s) filaments and cobweb-like hairs (h) on the filaments and anthers.

D-F. *Calothamnus sanguineus* Labill.

D. Portion of branch showing cluster of flowers and showing arrangement of marginal filaments (m). — E. Underside view of fused upper staminal claws. — F. Side view of fruiting capsule with persistent style (st).

4. *Calothamnus torulosus* Schau. J. C. Schauer, Nov. Act. Nat. Cur. (1845)

A low, erect or prostrate, somewhat rigid or sprawling, multi-stemmed, $\pm$ glabrous, sometimes glaucous shrub to about 40 cm high with stems sometimes with irregularly distributed bulges. Leaves terete, crowded, erect, 2-5 cm long, 0.5-1.5 mm wide, shortly mucronate, slightly pungent. Flowers 2-5 together in short clusters hidden by the crowded leaves. Calyx-tube 2-3 mm long, covered with short, white hairs. Petals 7-8 mm long, orange-brown. Staminal claws unequal, the two upper ones broad, 22-35 mm long, scarlet, marginal filaments >30 ; two lower ones narrow, 20-25 mm long, 1.5-2 mm wide with 25-35 marginal filaments and sterile anthers; filaments and anthers covered in loose, coiled, cobweb-like hairs. Fruit few in number per plant, nearly globular, 5-8 mm long (and wide), densely pubescent, often hidden by the crowded erect leaves. Seeds numerous, 1.5-2 mm long, light chocolate-brown.

Data at hand suggests that the species has a disjunct distribution. The northern populations occur from near the Arrowsmith River to Eneabba Cockleshell Gully, Mt. Lesueur, Hill River, Badgingarra and to Mt. Misery. At the present time (January 1980), two records are known from near Perth, (Swan View and Crystal Brook Hill; specimens lodged in the W.A. Herbarium). There are no morphological differences between these plants and those from the northern populations. The absence of records from areas between Perth and Mt. Misery may be indicative either of lack of collections or the results of land clearing.

The species is characteristically a low, rigid, erect or sprawling, multi-stemmed shrub and is very common in deep, grey or light-coloured sand in low coastal heath (from the Arrowsmith River to Mt. Misery) and in rocky, granitic soils amongst scrubby heath (in the Darling Range east of Perth). Flowers September to October.

The species has a distinctive characteristic in having coiled, cobweb-like silver hairs on the anthers and filaments. Benthams (1867) mentions that *C. sanguineus* also possesses these hairs but in the specimens of *C. sanguineus* I have examined, the stamens have been glabrous.

This is another species which has the two upper staminal claws very broad with numerous anthers, and two lower ones which are much reduced. Plants often have glaucous foliage. See Fig. 1 a, b, c.

The name *torulosus* means "possessing irregularly distributed bulges", and probably refers to the occasional irregular thickenings on the branches. The name is probably a misnomer and perhaps the plant should have been given a name taking into account the rather strong odour which is produced by the flowers when plants are in bloom.

5. *Calothamnus lateralis* Lindl. J. Lindley, Swan River App. 9 (1839)

An erect, straggly, single-stemmed, glabrous shrub to 2.5 m high. Leaves terete, 10-35 cm long, 1.5-2 mm wide, obtuse or shortly mucronate. Flowers arranged in a unilateral spike mostly 7-10 cm long on portions of branches without leaves. Staminal claws equal, free, 20-25 mm long, glabrous, dark crimson, yellow-green towards base, marginal filaments four or five. Fruit depressed globular, 2-3 mm wide, embedded in the swollen, corky rhachis (the rhachis, after flowering has occurred, appears to be excavated with a number of holes). Seeds: None available for examination at time of writing (January 1980).

This species, like a number of *Calothamnus*, has not been extensively collected and it is likely that there are at least two subspecies or varieties (one with leaves 5-10 cm long, and the typical one with leaves 10-35 cm long).

Data available at present suggests that the species has a disjunct distribution in the south-west corner of the State. It grows in or near swamps amongst grass, sedges, melaleucas or other swamp plants. It has been recorded from Perth swamps, Dandalup, Banksiadale, Harvey, Muchea, Blackwood River, south of Northcliffe, Ravenswood, Scott River and Bridgetown. The type specimen was collected from a swamp in the Perth area.

Calothamnus lateralis is noted for its small flowers, many of which are arranged in a long, unilateral spike embedded in the corky rhachis.

The name *lateralis*, from Latin, refers to the arrangement of flowers on one side of the stem.



***Calothamnus blepharospermus* F. Muell.**

Photography by A. S. George

This is a member of the 5-merous species group (which will be dealt with later in another article on the genus). The flowers of all *Calothamnus* species appear superficially alike in that they are dark orange to deep red in colour, are arranged in clusters or spikes and usually the staminal claws hang downwards. The flowers of *C. blepharospermus* are little different from the others, apart from subtle features such as the number of staminal claws (5 in this species) and the number of anthers per staminal claw. *C. blepharospermus* is noteworthy in having yellow anthers (in most species they are orange-brown, brown or black) but this feature is also shared with *C. chrysanthrus*, another 5-merous species.

The leaves of this species are distinctive in being flat with the mid-rib prominent. They measure mostly 7-9 cm long and 5-9 mm wide, and are somewhat scabrous as shown. Several other species of *Calothamnus* have flat leaves similar to *C. blepharospermus* but they are not so large and scabrous.

As shown above the green/grey calyx-tube at the base of the flower, has very prominent, thickened lobes, a feature found in several other species. The orange-brown petals at the base of the stamen bundles are small and deciduous as in most species of *Calothamnus*.

Calothamnus blepharospermus is confined to the Kalbarri National Park, some 750 km north of Perth. Although little is known about this species, it appears to grow well in sandy soil in Perth gardens.

6. *Calothamnus affinis* Turcz. Turczaninow, Phys. Math. Acad. Petersb. (1852).

An erect, glabrous shrub to 1 m high with scattered leaves. Leaves linear, terete, 3-10 cm long, c. 1 mm wide, glabrous, shortly mucronate, oil glands often prominent. Flowers in tight clusters of three flowers forming an inflorescence which resembles a unilateral spike to 12 cm long. Calyx-tube c. 2 mm long. Petals 1-2 cm long, brown, deciduous. Staminal claws equal, deep red, with mostly five marginal filaments. Fruit crowded, small, depressed globular



***Calothamnus* species**

Photography by H. A. Morrison

This is a yet to be formerly described and named. It is related to *Calothamnus blepharospermus* but differs in having terete (cylindrical) leaves and smaller flowers and fruit. The photograph clearly shows the hairy calyx-tube which grows directly from the branches and are therefore sessile. All *Calothamnus* species have this feature. As with *C. blepharospermus*, the calyx-lobes are very thick and prominent, especially in the fruit.

As with all *Calothamnus* species the petals are small and usually orange-brown in colour. This species often has a tinge of scarlet in the petals. On the top right hand flower the petals are still surrounding the red stamen clusters, but they are deciduous and one petal on the lower left hand flower can be seen lifting off ready to fall. The prominent scarlet staminal claws are well illustrated being five in number in this species. As with all *Calothamnus* species they curve downwards displaying, for this species, the yellow anthers at the end of the numerous marginal filaments.

The lower left calyx tube has lost the staminal claws but the slender style is persistent. This is another feature common to *Calothamnus* and the dehydrated stype may be seen hanging out of the maturing fruit until it is eventually knocked off.

The above photograph also shows the characteristic habit of this species. Most are shrubs, stiff and upright in harsh but sheltered positions, but spreading in exposed or lush conditions.

3-5 mm diameter; two lobes prominently persistent. Seeds: none available for examination.

Turczaninow described *C. affinis* in 1852. Benth (1867) excludes this species from his list and key, but in his notes on *C. microcarpus* (described by Ferdinand von Mueller in 1862), he gives a brief one-line description of a "var. *teres*" and cites the type "Drummond 5th Coll. no. 182". This specimen is the type of *C. affinis*, hence Benth must have been unaware that Turczaninow had already described the species.

Specimens deposited in the Perth Herbarium and the University of Western Australia Herbarium have been collected near and from the Stirling Range, north of Albany. *C. affinis* has terete leaves, and, although *C. microcarpus* has flat leaves with two furrows above and below, it is possible that the latter taxon is merely a flat-leaved variety of *C. affinis*.

The most distinctive feature of this species is the flowers, which are arranged in clusters of three, and these clusters are grouped on the stem to form an interrupted spike up to about 12 cm long (and often longer in cultivated specimens). The staminal claws have mostly five marginal filaments. (The number of marginal filaments on the staminal claws has been an important character in distinguishing some species and species-groups). The mature fruiting capsules are depressed-globular, about 5 mm in diameter, and often crowded together on the stem.

7. *Calothamnus preissii* Schau. J. C. Schauer, Nov. Act. Nat. Cur. 21 (1845).

Decumbent shrub to 30 cm high. Leaves linear, terete, erect, straight or with a shallow S-shaped curve, (4-)5-7(-10) cm long, 0.6-0.8 (-1) mm wide, usually glabrous (young shoots often densely pilose), shortly mucronate, but not pungent. Flowers small in dense, cylindrical spikes 2-4 cm long. Calyx-tube 1-1.5 mm long. Petals 1-2 mm long, brown, deciduous. Staminal claws unequal, deep red to purple-red, the two upper ones with three to five marginal filaments, the two lower ones with one or two filaments. Fruit small, depressed globular, densely crowded, 2.5-3 (-4) mm wide; lobes persistent (two often absent). Fertile seeds narrow-obovoid to narrow-pyriform, c. 1 mm long, chocolate-brown.

This species appears to have a fairly wide distribution but has been poorly collected and it is likely that land clearing for agricultural purposes has resulted in it becoming scarce. It has been collected from south of Darkan, Tuttanning Reserve (30 km east of Pingelly), Cranbrook, Tambellup, Frankland and near Albany. It grows in sand in open heath communities or in *Banksia* woodlands. Flowers July to November.

The characteristic features of this species are flowers in dense spikes and the two upper staminal claws of each flower with three to five filaments and the two lower ones with one or two. The leaves appear susceptible to attack by gall-forming insects.

This species was named after Johann Preiss (1811-1883), who collected plants in Western Australia during 1839-1841.

8. *Calothamnus schaueri* Lehm. C. Lehmann, Del. Sem. Hort. Hamb. 7 (1842).

Low, often prostrate, spreading shrub to 0.2 m high. Flowers in a dense spike 2-3.5 cm long. Leaves terete or slightly flattened, mostly 12-20 cm long, 0.6-1 mm wide, pale green, finely acuminate, scattered or arranged in loose whorls. Calyx-tube 1.5-2 mm long. Petals 1-1.5 mm long. Staminal claws equal, (4-)5-6 mm long, 0.3-0.5 mm wide, deep red-brown; marginal filaments two or three; anthers oblong-elliptical, dark brown. Fruit densely crowded, conical to almost depressed globular, (2.5-)3-4 mm diameter, sometimes wrinkled. Fertile seeds few to many per capsule, 0.6-0.8 mm long, narrow-pyriform, dark grey-brown.

This species has a restricted distribution being found from Chester Pass in the Stirling Ranges to Mt. Barker and areas in the vicinity of Albany. It flowers mostly from October to December.

C. schaueri is related to *C. preissii* but differs by having longer leaves 12-20 cm long, and equal staminal claws mostly 5-6 mm long, deep red-brown

in colour with two or three marginal filaments. On the other hand, *C. preissii* has leaves mostly 5-10 cm long. The staminal claws are deep red to purple-red; the two upper ones with three to five marginal filaments, the two lower ones with one or two marginal filaments.

In both species the flowers are usually arranged in dense, cylindrical spikes but may be reduced to a unilateral arrangement.

This species was named after Johann Schauer (1813-1848) an early worker on Australian Myrtaceae, who provided the first full treatment of the genus *Calothamnus*.

9. *Calothamnus lehmanii* Schau. J. C. Schauer, Nov. Act. Nat. Cur. (1845).

A low, branching shrub to 40 cm high with scattered or densely crowded leaves. Young shoots usually pilose (sometimes glabrous); leaves and branches becoming glabrous with age. Leaves terete, erect or spreading, mostly 1-2.5 cm long, 0.5-1 mm wide, usually glabrous, shortly mucronate but not pungent. Flowers small in dense spikes (sometimes unilateral), mostly 2-4 cm long. Calyx-tube 1-1.5 mm long. Petals 1-2 mm long, brown, deciduous. Staminal claws unequal, deep purple-red, the upper ones broad with four or five marginal filaments, the two lower ones thinner with one or two filaments. Fruit small, depressed globular, densely crowded, 2.5-3 mm wide, lobes persistent (sometimes two absent or worn away). Fertile seeds narrow-obovoid to narrow-pyriform, c. 1 mm long, chocolate-brown.

Although this species has not been extensively collected, it is known from near Bowelling, Frankland, Tenterden and from the Stirling Ranges. It grows in sandy soil on laterite in open *Eucalyptus-Banksia* woodlands. The species is related in seed and fruit morphology to *C. planifolius*, *C. preissii* and *C. schaueri*, but can be distinguished by the very short leaves, mostly 1-2.5 cm long, and the two upper staminal claws with four or five marginal filaments, while the lower two staminal claws are reduced to one or two anther-bearing filaments.

The species was named after Charles Lehmann, an English botanist who described three species of *Calothamnus* (viz. *C. planifolius*, *C. schaueri* and *C. longifolius*; the latter species is synonymous with *C. lateralis*).

10. *Calothamnus planifolius* Lehm. C. Lehmann, Del. Sem. Hort. Hamb. (1842)

Erect shrub to 1.5 m high. Leaves flat, linear to linear-cuneate, mostly 4-5 cm long, 3-5 mm wide, glabrous, obtuse or shortly mucronate, mid-rib prominent on undersurface. Flowers in dense unilateral spikes 3-7 cm long embedded in the swollen corky rachis. Staminal claws $\pm$ equal, mostly 22-25 mm long, purple-red, yellow-green in lower half; marginal filaments usually 7; fruit depressed globular, 3-5 mm diameter, 3-4 mm long, densely crowded, covered by corky tissue. Fertile seeds pyriform, 0.8-1 mm long, testa dark grey-brown. Ovules numerous, 0.7-1 mm long, buff in colour.

Calothamnus planifolius grows in gravelly clay soil in mallee-heath vegetation in various localities in south-west Western Australia. Records are from Pingelly, Boyagin Rock, Kukerin and Kojonup. It is likely that land clearing has reduced populations of the species to existence in reserves, e.g. Boyagin Rock Reserve. It flowers mostly from September to November.

In fruit and seeds, the species is most closely related to *C. preissii*, *C. schaueri*, *C. lehmannii* but can be readily distinguished by the flat leaves with the midrib often prominent on the undersurface. It has been confused with *C. microcarpus* F. Muell. which also possesses flat leaves and which appears to be a variety of *C. affinis* Turcz. This taxon can be readily distinguished from *C. planifolius* by its leaves which have two longitudinal furrows adaxially and abaxially.

There is one specimen in the Western Australian Herbarium, from the Whicher Range, which matches the variety *pallidifolius* described by Bentham in 1867. It is likely that this taxon will be treated as a separate subspecies of *C. planifolius* although at the time of writing (March 1980) little is known about this *Calothamnus*. It differs from *C. planifolius* by having scattered,

oblanceolate leaves mostly 5-6 cm long, 7-10 mm wide (at the widest point), and pale green in colour.

The name *planifolius* comes from the Latin *planus* meaning "flat" and *folium*, "a leaf", referring to the flat leaves.

11. *Calothamnus rupestris* Schau. J. C. Schauer, Nov. Act. Nat. Cur. (1845).

Erect, much-branched, mostly glabrous shrub usually to 2 m high (occasionally a small tree to 3 m tall). Leaves linear, terete, sessile, glabrous, mostly 2-2.5 cm long, 0.5-1 mm wide, mucronate, pungent. Flowers 1-10 in scattered small clusters around stems or in dense, $\pm$ unilateral clusters usually on portions of stems from which the leaves have fallen. Calyx-tube 6-8 mm long, densely pubescent. Petals 5 mm long with a short claw 2-3 mm long. Staminal claws 30-35 mm long, pink, marginal filaments 20-26. Fruit almost ovoid, pubescent, becoming glabrous with age; two opposite lobes thick, deflexed, two other lobes thin, reflexed. Fertile seeds narrow, linear, 2.5-3 mm long, chocolate-brown. Ovulodes 2-2.5 mm long, yellow-brown. (Fig. 2, a-e).

This species has a limited distribution and is scarce within this range. The northern limit of this distribution is in the Red Hill area towards Toodyay, north-east of Perth; it then occurs along the Darling Scarp to the Gosnells area (east of Perth) and the Serpentine Dam. A disjunct population occurs at Boyagin Rock which is the easternmost range of the species.



***Calothamnus pinifolius* F. Muell.**

Photography by K. Newby

C. rupestris grows in rocky granitic soil in heath or semi-woodland often along water courses with species of *Grevillea*, *Dryandra*, *Daviesia*, *Xanthorrhoea* and *Hibbertia*, and flowers mostly from August to September. The name *rupestris* comes from the Latin *rupes*, meaning "rock" or "cliff" and refers to the habit of the species growing amongst rocks or in rocky soil.

In the Perth area, its survival is threatened unless reserves are set aside to protect the small, existing populations.

12. *Calothamnus pinifolius* F. Muell. F. von Mueller, *Fragm.* 3:153 (1862).

Erect, prickly shrub to 2 m high. Leaves linear, terete, crowded, mostly 1.8-2.5 cm long, 1-1.4 mm wide, mucronate, pungent, dark green, sparsely pilose. Flowers arranged in a short, sometimes unilateral but usually cylindrical spike to 6 cm long. Flowers usually hidden amongst the dense

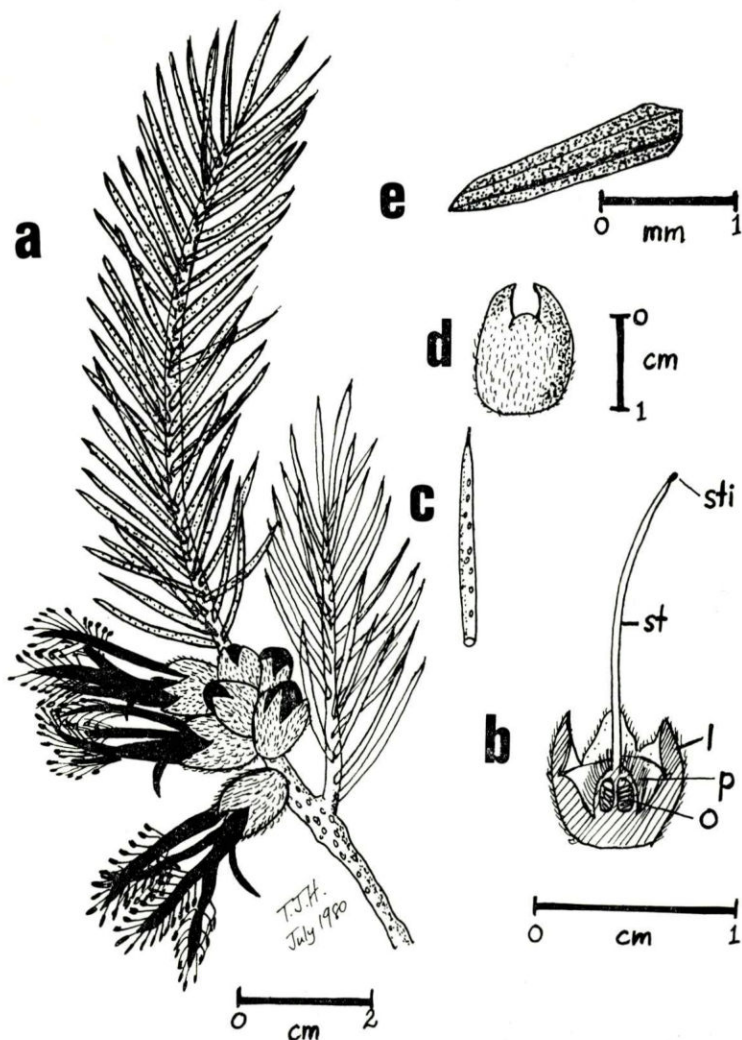


Figure 2. A-E. *Calothamnus rupestris* Schau.

A. Portion of branch showing cluster of flowers. — B. Half-flower diagram showing ovary (o), calyx-lobe (l), pubescent ovary (p), style (st), and stigma (sti). (Staminal claws and petals not shown). — C. Leaf of *C. rupestris*. — D. Side view of fruiting capsule. (C, D to same scale). — E. Enlarged view of a fertile seed.

foliage. Calyx-tube 4-5 mm long, densely pubescent. Staminal claws $\pm$ equal, 20-25 mm long, 1-1.4 mm wide, crimson; marginal filaments 12-15. Fruit ovoid to almost globular, 7-12 mm long (including length of two opposite, persistent

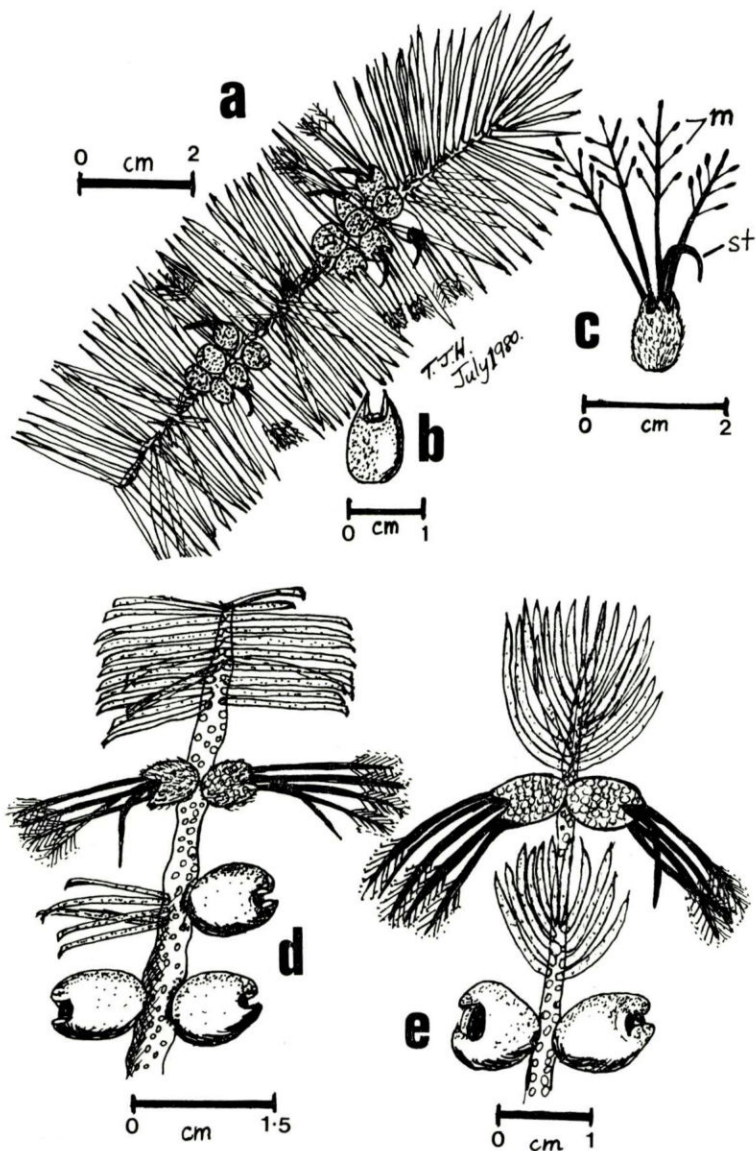


Figure 3. A-C. *Calothamnus pinifolius* F. Muell.

A. Portion of branch showing clusters of flowers and densely crowded leaves. — B. Side view of fruiting capsule showing acute calyx-lobes. — C. Close-up of a flower (side view) showing curved style (st) and staminal claws with marginal filaments (m).

D. *Calothamnus robustus* Schau.

D. Portion of branch showing perpendicular arranged leaves, two flowers and fruiting capsules.

E. *Calothamnus validus* S. Moore

E. Portion of branch showing erectly held leaves, two flowers with down-turned staminal claws, and two fruiting capsules.

lobes), 7-10 mm wide. Fertile seeds few per capsule, 1.2-1.5 mm long, linear-oblong, testa dark buff-brown. See colour plate on page 16.

This species is restricted to the Barren Range and adjacent areas west of Hopetoun where it is locally common growing in mallee-heath communities on sandy soil over quartzite. Flowers October to January.

The name *pinifolius* comes from the Latin, *pinus* meaning "pine" and Latin *folium* meaning "leaf", referring to the pungent leaves of the species which more resemble those of *Cedrus*. This species has affinities with the *C. quadrifidus* — *C. homalophyllus* — *C. asper* species group but can be regarded as a "group" on its own, intermediate between *C. rupestris* and the *C. quadrifidus* species complex.

The most distinctive feature of *C. pinifolius* is the densely crowded, pungent leaves which give plants a resemblance to some pungent-leaved conifers. The flowers are crowded in a spike almost hidden by the dense foliage. The number of fruiting capsules produced is low in comparison to the number of flowers. This is probably due to abortion of ovaries allowing only a few capsules per flowering spike to develop since space is limited on the branches due to occupation by leaves which do not drop off as in other species, e.g. *C. validus*, *C. robustus* and *C. villosus*.

13. *Calothamnus asper* Turcz. Turczaninow, Bull. Soc. Nat. Mosc. (1849).

Erect, much-branched, tall shrub to 3.5 m high. Flowers mostly 3-5 together in short, sessile clusters, usually amongst leaves at the ends of branches. Leaves sessile, erect, broadly linear, attenuate towards base, mostly 1.2-1.8 cm long, 1.4-2 mm wide, shortly and sparsely pilose, somewhat scabrous. Calyx-tube 5-6 mm long, verrucose, glabrous. Petals 5-6 mm long, elliptical. Staminal claws $\pm$ equal, mostly 22-28 mm long, 2-2.5 mm wide, blood-red; marginal filaments 27-30; anthers 1-1.2 mm long. Fruit nearly ovoid, widest in the centre, 9-12 mm long, 8-10 mm wide, grey with rounded bumps, two opposite lobes prominently thickened. Fertile seeds linear-cuneate, 1.5-2 mm long, chocolate-brown. See Fig. 4 g, h, i.

This is a rare species only known from the Wongan Hills, about 200 km north-east of Perth. It grows in red soil over laterite with species of *Melaleuca*, *Casuarina* and *Hakea* in shrubland vegetation. Flowers during September to March depending on climatic conditions.

Bentham in his redescription of *C. asper* noted that it was closely related to *C. quadrifidus* but differed in the foliage and in the large fruits. *C. asper* is certainly closely related to *C. quadrifidus*, but several characters justify the retention of *C. asper* as a separate species. *C. asper* has flat, pilose leaves (especially pilose on the margins), mostly 1.2-1.8 cm long, 1.4-2 mm wide, the calyx-tube is broadly campanulate, mostly 5-6 mm long, glabrous, and the staminal claws have 27-30 marginal filaments. The fruit is 9-12 mm long, 8-10 mm wide and the testa of the fertile seeds is chocolate-brown in colour. *C. quadrifidus* has slightly flattened to terete, pilose to hirsute leaves (sometimes glabrous), mostly 1.5-2 cm long, 0.8-1.5 mm wide; the calyx-tube is usually narrow campanulate, 3-4 mm long, glabrous or shortly pubescent; the staminal claws have mostly 18-20 marginal filaments. The fruit measures mostly 7-9 mm long and 7-8 mm wide, and the testa of the fertile seeds varies in colour from grey to light chocolate-brown.

Both *C. quadrifidus* and *C. asper* occur sympatrically in the Wongan Hills area and there is no evidence of hybridization occurring.

The conservation of the species should be assured in the Wongan Hills Reserve.

The name *asper* comes from Latin, meaning "rough to the touch", and refers to the scabrous leaves.

14. *Calothamnus validus* S. Moore S. Moore, J. Linn. Soc. (Bot.) (1921).

Erect, rigid, much-branched, glabrous shrub to 2 m high, the branches with prominent leaf scars. Leaves linear, terete, rigid, erect, 1.5-3.5 cm long, 0.5-1 mm wide, slightly pungent, oil glands prominent. Flowers mostly three together in a small, sessile cluster amongst leaves. Calyx-tube 3-7 mm long,

glabrous or finely pubescent. Petals 4-5 mm long, deciduous. Staminal claws $\pm$ equal, 22-32 mm long, 1.5-3 mm wide, rich crimson or orange-red; marginal filaments 12-20; anthers 2 mm long. Fruit almost globular to nearly ovoid, 12-15 mm long, 10-13 mm wide, with thickened, persistent lobes. Fertile seeds numerous, 2-2.5 mm long, chocolate-brown. (Fig. 3 e).

This species is confined to the Mt. Barren Range in the Fitzgerald River National Park and neighbouring areas where it grows on rocky quartzite hills in heath. Flowers July to October.

The distinguishing features of this species are as follows: (a) flowers mostly three together in a cluster; (b) petals with a short claw; (c) crimson staminal claws; and (d) globular to almost ovoid fruit with four dry lobes at first, but two of these become persistent and thicker, the other two wearing away with age.

This species is closely related to *C. robustus* Schau., but can be readily separated from the latter by usually having a glabrous or sometimes finely pubescent calyx-tube. In *C. robustus*, the calyx-tube is densely pubescent. The leaves of *C. robustus* are almost invariably held perpendicular to the stem and usually have an oblique acuminate tip, whereas the leaves of *C. validus* are usually held more or less erect. *C. robustus* is presently only known from Cape Riche.

The preservation of this species is assured in the Fitzgerald River National Park. The species appears to grow well in Perth suburban gardens.

The name *validus* is Latin and means "strong and stout", and refers to its habit.

15. *Calothamnus robustus* Schau. J. C. Schauer, Nov. Act. Nat. Cur. (1845).

Small, erect, much-branched, compact shrub to 1 m high, branches with prominent leaf scars. Leaves terete, rigid, mostly 1.3-1.5 cm long, c. 1 mm wide, glabrous, obliquely acuminate, crowded at the ends of branches, pale green. Flowers 2-8 in a cluster. Calyx-tube 3 mm long, densely pubescent. Petals obovate, 4-5 mm long, orange-brown. Staminal claws $\pm$ equal, 25-28 mm long, 1.2-1.5 mm wide, dark crimson; marginal filaments 18-20. Fruit almost ovoid but rounded and widest in the middle, sessile, 9-11 mm long (including lobes), 8-10 mm wide, pubescent but becoming glabrous with age, two opposite lobes thickened at apex. Fertile seeds linear, 1.5-1.8 mm long, testa dark brown. Ovulodes linear to linear-clavate, yellow-brown. (Fig. 3).

This species is presently only known from the Cape Riche area where it grows on rocky quartzite soils in shrubby heath communities. It is only locally common and occurs sporadically on the hills overlooking the Cape.

The most distinctive feature of this species is the leaves which are mucronate, have an obliquely acuminate tip and are positioned more or less perpendicular to the stem. Bentham in 1867 included *C. robustus* as a synonym of *C. villosus* R.Br. and stated that Schauer (who described *C. robustus* in 1845) had apparently examined a specimen which was "accidentally" 4-merous. (*C. villosus* is 5-merous). However Schauer did not make a mistake and so the author has retained *C. robustus* as a separate species. The only character of note which is shared by these two species is the densely pubescent calyx-tube of the flowers.

The name *robustus* comes from Latin meaning "robust" or "strong" and refers to the species habit.

16. *Calothamnus homalophyllus* F. Muell. F. von Mueller, Fragm. (1862).

Erect, compact or straggly, glabrous shrub to 2 m high. Leaves sessile, flat, erect or spreading, mostly oblanceolate, 5-10 mm wide, glabrous, coriaceous, narrowed into a prominent, short, acute apex, scattered or crowded on younger branches. Flowers in small clusters of 2-4 on stems from which leaves have fallen or in loose, interrupted, $\pm$ unilateral spikes 4-7 cm long numbering to 30 flowers. Calyx-tube campanulate to almost cylindrical, 3-4 mm long, verrucose. Petals obovate oblong, 4-5 mm long. Staminal claws $\pm$ equal, 20-32 mm long, 1-2 mm wide; marginal filaments 20-25; anthers 0.8-1 mm long. Fruit almost globular, 8-10 mm long, 8-9 mm wide, usually

crowded, with large, prominent, rounded protuberances, two opposite lobes prominently thickened at top of fruit, slightly reflexed. Fertile seeds linear-oblong, 1.5-2 mm long, angular, testa light grey-brown. See Fig. 4 and Page 9.

This species is distributed from about 80 km north of Galena to the Kalbarri National Park and the Murchison River to Geraldton. It grows in sandy soil in heath communities with species of *Hakea*, *Grevillea*, *Casuarina* and *Phymatocarpus*. Flowers mostly from August to October.

C. homalophyllus is closely related to *C. quadrifidus* with which it has been confused. The two species overlap in the area between the Kalbarri

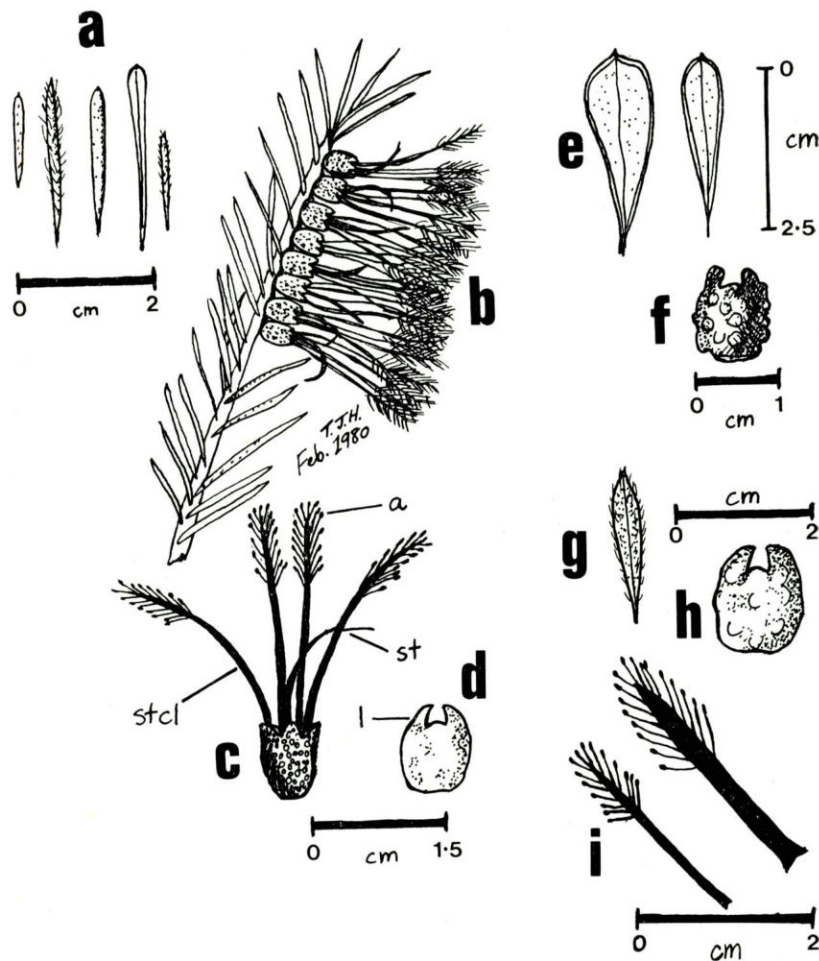


Figure 4. A-D. *Calothamnus quadrifidus* R.Br.

A. Showing variation in the leaf. Most are $\pm$ terete, either glabrous or slightly hirsute. — B. Spike of flowers at end of branchlet. Flowers may be unilateral (as shown here) or arranged around the stem in a cylindrical arrangement. (A, B to same scale). — C. One flower showing staminal claws (stcl) style (st) and anthers (a). — D. Side view of fruit showing thickened calyx-lobes (l). — (C, D to same scale).

E-F. *Calothamnus homalophyllus*. F. Muell.

E. Showing variation in the leaf. — F. Side view of bumpy fruit.

G-I. *Calothamnus asper* Turcz.

G. Leaf which is scabrous and usually $\pm$ hirsute. — H. Side view of fruit which is slightly larger than that of the other two species. (G, H to same scale). — I. Comparison of staminal claws of *C. quadrifidus* (lower) and *C. asper* (upper).

National Park and Geraldton and there are specimens in various herbaria which are intermediate with short, flat, narrow-oblongate leaves 1-1.5 cm long and 1.5-2 mm wide. Such plants have a wiry, straggly habit in the field and possess small flowers in scattered, loose clusters or short, $\pm$ unilateral spikes to 2 cm long. It is possible that some hybridization has occurred between the two species in the Geraldton-Kalbarri region.

Typical plants of *C. homalophyllus* have thick, oblanceolate, coriaceous, glabrous leaves mostly 2.8-5 cm long and 5-10 mm wide, usually scattered on branches. The flowers are usually in clusters of two to four (or occasionally in a unilateral spike of up to 30 flowers), the staminal claws have 20-25 marginal filaments and the testa of fertile seeds light grey-brown. *C. quadrifidus* has terete to sometimes flat, usually pilose or hirsute leaves mostly 1.5-2 cm long, 0.8-1.5 mm wide, flowers usually in dense unilateral spikes 2-8 cm long, staminal claws with 17-22 marginal filaments and the testa of the fertile seeds is chocolate-brown.

The name *homalophyllus* comes from the Greek *homalos* meaning "even, level" and the Greek *phyllon* meaning a "leaf", probably referring to the flat leaves often held perpendicular (or nearly so) to the branches.

17. *Calothamnus quadrifidus* R. Br. R. Brown, Ait. Hort. Kew. 4:418 (1812).

Erect, compact or spreading, multi-stemmed, much-branched, usually pilose, variable shrub to mostly 1.5 m high. Leaves linear, terete or slightly flattened, 1.5-2 cm long, 0.8-1.5 mm wide, shortly acuminate but not pungent, usually pilose to hirsute, densely crowded. Flowers mostly in dense unilateral spikes 2-8 cm long. Calyx-tube 3-4 mm long, usually glabrous or finely pubescent. Petals 3-5 mm long, deciduous. Staminal claws 25-30 mm long, 1-1.5 mm wide, scarlet; marginal filaments mostly 18-20. Fruit sessile, almost ovoid, mostly smooth, 7-9 mm long, 7-8 mm wide (widest in centre), two opposite lobes prominently thickened at apex. Fertile seeds linear, 1.2-1.5 mm long, truncate, angular, testa grey to light chocolate-brown. See colour plate on page 5 and Fig. 4 for details.

This species is the most variable of the genus and grows in a wide variety of habitats from coastal sandplain heaths in sand, lateritic soils amongst rocks, mallee-heaths in sand over laterite and occasionally in Jarrah (*Eucalyptus marginata*) forests in gravelly lateritic soil. It is usually a dominant species in these habitats. Flowers mostly from August to October.

Distributed from Shark Bay with scattered records to Geraldton, then to Perth, east of the Darling Range to Hopetoun and common to Cape Arid.

C. quadrifidus occurs sympatrically with *C. asper* in the Wongan Hills, *C. homalophyllus* in the Kalbarri National Park, *C. sanguineus* from Geraldton to Perth and two new species from Shark Bay and Peak Charles.

C. quadrifidus is related to *C. asper* and *C. homalophyllus* and the distinguishing features are outlined in the discussions on these species.

C. quadrifidus is regarded by the author as a variable species which has adapted to a wide range of habitats, climate, soil type and topography.

The conservation of the species is assured since most of the National Parks in south-west Western Australia contain this species as do most of the Wheatbelt Reserves. It is one of the most commonly grown native garden plants in the Perth area.

The name *quadrifidus* is from Latin, which means "split into four parts". Robert Brown described three *Calothamnus* species, two of which, *C. villosus* and *C. gracilis* are 5-merous, *C. quadrifidus* being 4-merous, hence the specific epithet.

The flowers (staminal claws) are usually scarlet or orange-red in colour, but some specimens from near Toodyay (about 32 km north-east of Perth) possess yellow stamens. This phenomenon has also been found in *C. sanguineus* from near Mt. Peron and there are yellow-flowering plants of *C. homalophyllus* in Kings Park, Perth.

Key to the 4-merous species of *Calothamnus* Labill.

- A. Two upper staminal claws broad, flat; two lower ones narrow and usually without anthers (except in *C. torulosus* Schau. and some populations of *C. sanguineus* Labill.)
 - B. Calyx-tube entirely immersed in the thick, swollen rhachis
 - C.* Leaves flat, 8-15 cm long 1. *C. pachystachyus* Benth.
 - C.* Leaves terete, 15-30 cm long 2. *C. longissimus* F. Muell.
 - B.* Calyx-tube not immersed in the rhachis (rhachis not prominently swollen).
 - D. Two upper staminal claws fused; filaments and anthers glabrous; leaves mostly 1-2 cm long, terete or biconvex in transection, usually with numerous spreading hairs; shrub 30-80 cm high
 - 3. *C. sanguineus* Labill.
 - D.* Two upper staminal claws free; filaments and anthers covered in long, cobweb-like hairs; leaves mostly 2-4 cm long, terete, with few spreading hairs (or glabrous), somewhat scabrous; shrub 20-45 cm high
 - 4. *C. torulosus* Schau.
- A.* Staminal claws free, $\pm$ equal, (or the two lower ones small and reduced to a single stamen as in *C. lehmannii* Schau. or 1 or 2 as in *C. preissii* Schau.)
 - E. Calyx-tube (at time of flowering) $\pm$ immersed in the rhachis or rhachis somewhat dilate at base of calyx-tube
 - F. Rhachis swollen; leaves terete, 10-30 cm long; flowers in unilateral spikes 4-10 cm long 5. *C. lateralis* Lindl.
 - F.* Rhachis not swollen
 - G. Leaves usually terete
 - H. Staminal claws more than 1 cm long
 - I. Staminal claws $\pm$ equal, with usually 5 marginal filaments; leaves terete or flat; shrub to 2 m high
 - 6. *C. affinis* Turcz.
 - I.* Staminal claws not equal, the two upper ones with 3-5 filaments, the lower ones with 1 or 2; leaves terete; shrub to 40 cm high
 - 7. *C. preissii* Schau.
 - H.* Staminal claws less than 1 cm long
 - J. Leaves mostly 10-20 cm long; staminal claws $\pm$ equal, each with 2-4 filaments
 - 8. *C. schaueri* Lehm.
 - J.* Leaves mostly 1-2.5 cm long; staminal claws unequal, the lower ones reduced to a single stamen 9. *C. lehmannii* Schau.
 - G.* Leaves flat; 2.5-3 cm long, narrow oblanceolate or linear-cuneate 10. *C. planifolius* Lehm.
 - E.* Calyx-tube not immersed in the rhachis
 - L. Fruit capsule retaining all lobes (two of which are reflexed and prominently thickened, the other two less thickened, deflexed) 11. *C. rupestris* Schau
 - L.* Fruit capsule retaining two lobes which are prominently thickened and reflexed (other two lobes may be much shorter or absent but never reflexed)
 - M. Leaves pungent, densely crowded, flowers hidden by the dense foliage
 - 12. *C. pinifolius* F. Muell.
 - M.* Leaves not pungent (although may be shortly mucronate)
 - N. Flowers 3-5(-8) together in a small cluster amongst leaves
 - O. Leaves flat, short, 1.5-2 cm long, narrow oblanceolate
 - 13. *C. asper* Turcz.
 - O.* Leaves terete
 - P. Calyx-tube usually glabrous, (sometimes finely pubescent); flowers mostly 3 together in a cluster
 - 14. *C. validus* S. Moore
 - P.* Calyx-tube densely hirsute; flowers 3-5 in a cluster
 - 15. *C. robustus* Schau.
 - N.* Flowers usually arranged in a dense spike (sometimes flowers also 2-4 together, as in *C. homalophyllus* F. Muell.)
 - Q. Leaves mostly oblanceolate to narrow oblanceolate, glabrous
 - 16. *C. homalophyllus* F. Muell.
 - Q.* Leaves linear, usually with spreading hairs (sometimes glabrous)
 - 17. *C. quadrifidus* R. Br.

WILDFLOWERS FROM SEED

by W. H. Payne

This is Part I of a series in which a study of many aspects of cultivation will be reported upon. To study the growth of plants it was first necessary to acquire a large number of plants. No special facilities or experience are required and it is hoped that many beginners will follow the simple procedures used and report results.

Wildflowers are easy to grow from seed!

This statement does not apply to all wildflowers, but it does to such a huge range that anyone can be assured of plenty of plants for their gardens with a little effort.

Reference to previous issues will show that I have made this statement many times. Did I really get the message across? Were more people growing their own plants? Many readers have advised of their success, but not enough.

During the spring of 1979, I tried some seed using the crude methods I had recommended and the results were almost zero. A complete disaster. Many excuses can be found, but the principal reason was a slack method of care and watering. I had also planted too late in the year.

I feel it is essential to use methods that anyone can follow without special equipment, so I tried again from late May, 1980. Now I have hundreds of plants and here is how I did it.

Equipment Used

Some papier-mache egg cartons to pre-germinate the seed.

Small plastic pots, 3 cm diameter, to germinate and nurse the seedlings in a sterile sand until they produce their second pair of leaves.

Small plastic pots, 4 cm diameter, to nurture the seedlings on to vigorous little plants.

Plastic pots, 10 cm diameter, to grow on the plants for planting out.

Plastic trays. Because I had so many pots, hundreds of them, a method was needed for ease of handling. The trays used were those used by commercial nurserymen to raise annual seedlings and hold 70-3 cm pots. On a smaller scale I would suggest you use plastic ice cream trays with holes punched in the bottom.

Large 4 litre plastic ice cream trays with pieces of wire arched up from opposite corners to hold up the sides of a large plastic bag in which they are placed, to become a miniature hot house.

The Pre-Germination of Seed

For seed large enough to be individually handled I pre-germinated the seed using the egg carton method described in a previous issue of Australian Plants. The papier-mache type of egg carton is used, either the one dozen box with two rows of 6 recesses, or the 1½ dozen box with three rows of 6 recesses. When originally described the top of the egg cartons was formed similarly to the bottom, the top being torn off and inverted so as to fit into the bottom. These days you need two bottom sections of the cartons. After placing the seed to be germinated in each of the recesses provided to hold an egg, another bottom section can be placed on top pressing the seed down onto the bottom of the recess and sealing the sides of the recess, neatly holding the seed in place. You will find that by getting the egg cartons damp before putting in the seed, you have enough moisture to germinate the seed.

These cartons had the advantage that a marking pen that will resist water can be used to write on the outside of each egg recess, the name of the seed in that recess. Write the name on the top and bottom carton so that you always replace the top the same way around each time you remove it or you could end up mixing seed that sticks to the top section. As I wanted to try different methods of pre-treating seed, the rows of recesses were an advantage.

With all hard testa (outer coat) seed, I used two methods of treatment. Half of the seed was placed in a cup and boiling water poured on to fill the cup and the seed left to soak for 3-7 days. The other half of the seed had a small piece of the outer coat cut off each seed using a razor blade followed by soaking in warm water for a few days. With the two-row egg cartons one

marked A, the other B, I was able to number the pairs of recesses and compare the progress of seed of a species using the two different pre-treatments.

The results will be given in table form in a later issue, but were as I expected. Seed that had had its outer coat pierced to let in moisture, germinated first. It is not easy to do this with small seed and took many hours of work. Inevitably some seed was damaged by my clumsiness. Some people recommend filing or rubbing between sandpaper, but how they do that is beyond me.

But! The seed that copped the boiling water germinated as well. Not hot, but boiling water. Some people claim the seed would get cooked. I guess you can overdo it, but my results show that water boiled in an electric jug and then immediately poured on seed in a cup, filling the cup, does not harm the seed. I did find that some seed did not germinate, but after two weeks in the egg carton, without germination, I removed the seed, washed off the sticky substance that seemed to have formed, soaked in warm water and replaced in a fresh egg carton. Success, good germination followed.

For seed that is not generally regarded as having a hard outer coat, I used the three-row 1½-doz. egg boxes with rows labelled A, B or C. The seed was divided into three portions, one treated with boiling water, one with warm water and the remaining third consigned to an egg box recess without treatment. The results were very variable and will be given in detail in a later issue. Pending further study, soaking in warm water is recommended.

For seed that is too fine to be handled individually, such as *Callistemon* (bottle brush) or *Eucalyptus*, I used the mini-hot-house.

***Calothamnus*, *Callistemon*, *Eucalyptus*, From Seed**

The miniature hot house simply comprises a four litre plastic ice cream container with two pieces of fencing wire, 25 cm long, arched between opposite corners in such a way that when the container is slid into a large plastic bag the plastic sheet is held off the top of the container in the shape of a dome. With a little water in the bottom of the container and the end of the bag tucked under the container so that it sits on the opening making it air tight, you have an automatic glasshouse. Its success varies with position and time of the year. Used in mid-winter and placed to receive full sun, it is a winner. The sun draws the moisture up to form a film over the inside of the bag, which in turn reduces the penetration of the sun in the heat of the day. As the sun's warmth drops off during the day, so does the water film, allowing more heat penetration. I have not used this method in summer, but previous issues give reports from others who have.

The seed is sown as sparsely as possible, preferably only a few seeds, onto a clean, coarse sand in 3 cm. pots and covered with a sprinkle of sand. About 14 pots fit into one container. Inspect every few days and remove those pots immediately that have seedlings appearing. The pots are then treated as other pots below that have seedlings in them, first under glass and then with increasing to full exposure.

For *Eucalyptus* seedlings, immediate removal of the pots with seedlings more than 0.5 cm. high is wise as these are sensitive to high humidity.

The high humidity could encourage multiplication and dominance of all sorts of small beasts keen to suck the life out of plant tissue, so cleanliness is important. What appears more important is to do this work in winter when pests do not seem to be active. More on cleanliness and pest control later.

The Mini Hot-house for Cuttings

While on the use of this mini hot-house, I must report on its success with cuttings in winter. I have not had much success with cuttings prepared between April and August each year. This year Brian Crofter of Adelaide was generous enough to give me some rooted cuttings and also some foliage of *Lechenaultia biloba*. The foliage yielded 14 cutting pieces, 8 cm. long from which I removed ¾ of the leaves. With each piece in its separate 3 cm. pot immersed 3 cm. deep in clean coarse sand, the 14 pots being placed in the mini hot-house, I was successful in raising 12 plants. My rooted cuttings also grew in pots with clean sand in which was mixed some sphagnum moss. From now on I shall continue with winter propagation by cuttings using this method.

Pre-Germinated Seed in Egg Cartons

What a super method this is. Sowing seed direct in a medium leaves you wondering if the seed will germinate, or if some does, will there be more to come. Using the egg cartons you can study progress every few days and take further action if results are not satisfactory.

Place seed in the bottom of the recesses of a damp egg carton and cover with the recessed half of another carton so that the top sits snugly into the bottom, pressing the seed down and sealing off the sides, as described above. Thrust the double egg carton into a plastic bag and seal to make it airtight. The dozen egg box size fits neatly into a sliced bread plastic bag with just enough end to tie a simple knot sealing the bag. The bag is then placed on a window sill or a bench, indoors, to receive as much direct sunlight as possible. When warmed by the sun moisture will cloud the inside of the bag.

Every few days open up and see how the seed is going. Some seed needs only a few days. Other seed can take up to 6 weeks. You will see the root separate from the seed and grow. When it is half a cm. in length it is time to plant out. Do not let the root get too long as it will be more difficult to handle without damage. It may even commence to grow into the soft egg carton wall and be difficult to remove.

If there is no growth after two weeks, wash the seed in warm water and place in a clean carton for another try. If still no result, try hot water again or some other treatment. When the seed begins to absorb moisture it usually swells but even with seed of the same species, the amount of swelling is quite variable and not a sure guide. A good guide is whether it sinks or floats in the warm water when washing. Good seed that is not of the type that has a hairy or fluffy coating, will sink. Squeeze seeds that float and you will find the centre is rotting away.

Sometimes a fungus growth seems to envelope the seed. Often it is not damaging. However, wash it off and place the seed in a clean carton. There will be more comment on difficult seed later. This project was confined mainly to seed of the legume families, *Acacia* (wattles) and pea flowered plants. As these have smooth hard coated seed, germination is usually in 4 weeks. ■

CULTIVATION OF AUSTRALIAN PLANTS.....Editor

There is now a great deal of literature on the growing of wildflowers, certainly enough to confuse everybody. In the issues of this volume it is proposed to review for the reader what is known. The best references:

1. *Australian Plants* — Past issues are available as advised in this issue.
2. *A Horticultural Guide To Australian Plants* — A series of leaflets comprising a large full colour plate with descriptive details of the plant illustrated. Details for purchase are given in this issue. Set 7 has just been released and is also available as a bound book as well as loose leaflets for selective filing, at \$6.00 posted. Orders from the Editor, Australian Plants.
3. *Growing Native Plants* — A series of booklets produced by the National Botanic Gardens as advised in this issue and available by mail.
4. *Encyclopaedia of Australian Plants* — Vol. 1 — a book by Rodger Elliott and David Jones. A review was given in the last issue. It may be ordered by mail through the Editor, Australian Plants. \$33.00 post free, the retail price being \$37.50 and \$2.00 postage. This book has presented the best practical advice I have yet seen on all aspects of cultivation of our wildflowers. Unfortunately the publisher has "pinched pennies" in using some black and white photographs but the book is illustrated in good colour. What is more important is that it is quite the reverse from the pretty picture books with the usual vague details. The text is detailed, practical and more than adequate on all aspects affecting cultivation of wildflowers in the home garden. The practical competence and experience of the authors shows in every page. It is yet to be seen what Volume 2-5 are going to be but Volume 1 is excellent in its own right. ■

— FRIENDS AND FOES —

Pest Control of *Calothamnus* and *Callistemon*

by the Editor from notes by F. D. Hockings

Maintaining plants in a pleasing healthy condition is an essential feature of horticulture. To achieve this it helps to know what blight has attacked your plants and how to frustrate it. Thankfully there is a growing awareness that we must consider the total ecology of this planet of ours and change the attitudes in the past where every creature that offended us must be exterminated by the many deadly chemicals we have evolved.

It is possible that the "wog" we are exterminating is a "friend" who keeps in check the many "foes" we have managed to breed because of our interference with nature. It is probable that the "foe" that is annoying us may be simply dealt with without the use of chemicals, or its depredations are finished, or of minor importance; so why not "let live."

Friends and Foes of Australian Gardens

Friends and Foes Of Australian Gardens by F. D. Hockings (available from the Editor for \$23 post free — normal price \$24.95 plus \$1.35 post) has been produced by the Society for a better understanding of garden pests. While all the examples given are for native plants the same "foe" may be attacking your garden plants. It is proposed to refer to this book in each issue so you need a copy.

CALLISTEMON and CALOTHAMNUS — some common PESTS.

The following pests are found on *Callistemon*. The sawfly is the one to watch for most. All can be easily dealt with. *Calothamnus* usually has finer needle-leaves and is less subject to pests but can suffer most of these especially the scale insects, the moth borers and the root weevil. The following is quoted from the book.

Blossom Caterpillar — Order Lepidoptera

Colour plate 15 shows the head of a caterpillar among a group of flower buds and the caption reads "This small caterpillar is one of several different moth larvae that feed on or in the buds and flower spikes. They are hard to see because they tunnel in and around the buds". Remove physically with a pin, if necessary forcing them to the entrance of the hole by spraying any liquid from kerosene to flyspray.

Capsule Case Moth — *Bathrotrema constrictana*, family Tortricidae

This tiny caterpillar eats the contents of immature *Calothamnus* or *Callistemon* capsules and joins two capsules together to make a portable case for itself. Plate 16 shows two capsules on a leaf that strangely, move. Look inside. It becomes a small moth. It can scarcely be regarded as a pest. You may lose a few flowers but, so what?

Callistemon Long-Tailed Sawfly — *Pterygophorus insignis*, family Pergidae

These very destructive caterpillar-like larvae quickly reduce leaves to mere skeletons. Plate 31 (a) shows the skeleton of leaves and a group of seven "caterpillars" rapidly reducing another leaf to a skeleton. The larvae feed side by side as shown. When disturbed, they bend their heads and tails over their backs and they regurgitate to repel attackers. The wasp-like adult shown in colour in plate 31 (b), slits the edge of a leaf with its saw-like ovipositor, and inserts the eggs. Freshly inserted eggs into the leaf, are illustrated besides the adult. This species is a serious pest and should be removed. It is easily done with a gloved hand or by squashing using two flat stones. Be on the lookout for disappearing leaves in winter or you will lose them all.

Leaf-Spotting Mirid Bug *Eucercoris suspecta*, family Tingidae.

The blighting of new shoots and young leaves by this delicate shy bug is out of all proportion to the size of the insect and the number of bugs that can be found on severely affected plants. Its saliva is extremely toxic to plants. Plate 63 (a) shows this yellow bug (adult length 1 cm), surrounded

by spots of dead tissue everywhere it has pierced the leaf surface. Plate 63 (b) shows why these prettily marked, delicate, shy nymphs are hard to find and the extensive spotting they cause to young leaves. Plate 63 (c) shows severely blighted new growth typical of leaf-spotting bug attack. Because of the small number of bugs per tree and the difficulty in finding them, chemicals are rarely applied for this bug. A close inspection and squashing with a gloved hand is all that is necessary.

Pimple Psyllid *Trioxa eugeniae*, family Psyllidae.

The pimple-like distortions shown on young *Eugenia* leaves in plate 66 (a) are caused by nymphs of a tiny psyllid. Sometimes young stems are also distorted. The insect also attacks *Eucalyptus*. Plate 66 (b) shows the first stage yellow nymphs moving freely on leaves, but they settle down in one place and become scale-like and embedded in the leaf or stem causing the characteristic distortion as shown by the black "bumps". Eventually, they hatch into winged adults. Note one adult has just hatched and is drying its wings. The white wax has been secreted by the nymphs. Infestations are soon attacked by predators such as lady bird beetles, but not before new growth has been deformed. The control story here is to encourage the predators see "Less Harmful, Harmless and Beneficial Small Animals" below. The lady bird beetle mentioned above is described and illustrated in plates 127 (a), 127 (b) and 127 (c) with its life cycle and busy devouring pests.

White Fly — Family Aleyrodidae

The nymphs in an early active stage with some settled to a scalelike existence — Plate 75 of the book with caption provides details.

Scale Insects — Families Diaspididae and Coccidae.

The Red scale, plate 76; Mussel scale, plate 75; Pink Wax scale, plates 79 (a) and (b).

Callistemon Tip Bug — *Pomponatus typica*, family Coreidae.

The brown bug is shown plate 88. Remove by hand.

Melaleuca and Baeckea Psyllid *Ctenarytaina* sp., family Psyllidae.

Plate 90 (a) shows characteristic evidence and plate 90 (b) shows the creature in stages.

Callistemon Leaf-Rolling Thrips *Teuchothrips* sp., family Phlaeothripidae.

Plate 99 (a) shows severe distortion of leaves and plate 99 (b) the orange nymph and adult.

Callistemon Tip-Borer Order Lepidoptera

Plates 102 (a), (b), (c) and (d) show the damage and culprit in life cycle stages.

Spittle Bug *Philagra* sp. Family Cercopidae

Plates 152 (a), (b), (c) and (d) show damage and bug cycle. Hosing is recommended.

Dieback Borer *Platyomopsis armatula*, Family Cerambycidae

Spectacular plates 167 (a), (b), (c) and (d) show the story of die back, grubs and beetle.

Moth Borer Order Lepidoptera

Plate 174 shows the home of this caterpillar that also attacks *Grevillea*, *Hakea*, etc.

Root Weevil *Aterpus griseatus*, Family Curculionidae

Sudden death just before blooming. Plates 190 (a), (b) and (c) tell what to look for.

Pest Control

Study the beautiful clear colour plates in the book and take a quiet stroll through the garden now and again. A watchful eye eliminates the need for chemicals and the birds will come back to live with you. For those who are desperate, the book defines the correct chemical for use on each type of bug.

Less Harmful, Harmless and Beneficial Small Animals

Why didn't we produce this book years ago. I have been killing off my friends and feeding the foes.—Editor, W. H. Payne.

Winter Flowering In My Garden

by Kevin Fluris, Para Hills, South Australia.

My garden basically revolves around a back and front lawn. The front lawn and the driveway to the garage at the rear are surrounded by narrow strips of shrubs and semi-climbers.

Like most S.G.A.P. members I tend to be more of a collector than a landscape type gardener. My block is on the side of a hill, the fall being east to west, and faces north-south.

The soil type is calcareous red clay, the alkalinity of which I guess would be 7.5 to 8.

When I started to grow native plants I already had a back and front lawn, so I started to build up sand beds around the borders. The edges are flat rock, mainly from places where our Electricity Trust blasted for pole holes. The local rocks are a nice golden brown colour. I added peaty acid soil (2 tons) to a section near the back door, neutral sand from Highbury to the remainder of the back yard, supplemented by trailer loads of red Enfield sand.

At various times I have added small amounts of iron-stone gravel and use organic mulch when available. Rocks have been used as stepping stones and straight lines avoided where possible.

A small raised bed in the front of the house is at present dominated by two *Correa* 'Mannii' plants and an upright 1 metre tall, bushy *Correa pulchella*.

Pandorea jasminoides

Photography by M. Hodge

The creeper pictured above is not the one growing in Kev. Fluris's garden but of a plant in Queensland. What a versatile showy plant it is. Given plenty of water it will grow vigorously to cover an area if needed. Given sparse watering it is less rampant and can be relied on for a good showing.



The *Correa pulchella* has large pastel pink flowers which hang down on the underside of the branches. Just now they are in great numbers, and this plant is a good foil for the hybrid plants which show their bright red flowers well clear of the leaves, literally by the square metre.

Two plants of a dwarf form of *Correa pulchella* with pastel pink flowers along the centre section of the branches would make a fine pot plant. These grow in the narrow borders around the front lawn.

A semi-prostrate *Correa* hybrid to be named *Correa* 'Marion Beek' is growing just inside the front fence. It is a hybrid between *Correa backhousiana* and *Correa reflexa*. The flower tube is about the size of *Correa backhousiana*. Pink at the base with a yellowish tip. It is not spectacular but quite showy, gradually flowering upwards along the branches.

In the back garden is *Correa backhousiana* which has been flowering since late summer. *Correa calycina* with green ageing to red flowers. *C. schlehtendalii* a rusty red flowered form and *C. megacalyx* with green flowers, are coming to the end of flowering. *Correa pulchella*, the form known as *C. minor*, is in for the first time. It is 30 cm tall x 50 cm wide. The flowers are short and bright orange; there are several leaf types, all growing in Whalers Way, below Pt. Lincoln, S.A.

At the front of the house in a specimen position on the front lawn, a bushy pink flowered *Templetonia retusa* is beginning to flower for a second time. On the western side of the house *Pandorea jasminoides* continues to flower along a weldmesh lined fence over a 4-metre length. The flowers are 5 cm in diameter and quite a deep pink as the winter wears on.

A large plant of *Grevillea* 'Poorinda Constance' has blossom all the year, being massed with flowers in spring and summer. It covers an area of 2 metres x 3 metres and blocks off the rear of the house from the side and front.

To reach the shrubbery down the back, cross over the back lawn which has a fair covering of trees and specimen shrubs. The shade in this section enabled me to plant a metre wide fernery along the side wall of the garage.

Grevillea ilicifolia, 2 m tall is behind the garage. The flowering seemed to have been set back by a dry period but the buds are now opening. *Grevillea lavandulacea* (Waitpinga form) and *G. aquifolium* are in bud. The grey leafed form of *G. lavandulacea* is a graceful plant covering three square metres. The Mount William form of *G. lavandulacea*, a good red, has started to flower and won't stop until late spring. *Grevillea olivacea* is a large shrub 2½ m x 1½ m growing next to the back fence. The flowers are large hemispherical orange. *Grevillea banksii* is in flower and has been nearly all the year. It is just over 2 metres tall with a trunk of 80 cm before branches start. *Grevillea* 'Golden Sparkle' is flowering lightly and *G. alpina* is in bud.

Melaleuca incana, planted near my peach tree is now 3 m tall and in flower.

Templetonia retusa, a red flowered narrow shrub is in bud and will flower prolifically.

Hypocalymma robustum is in bud, although a plant less than 30 cm tall. Acid sand from Golden Grove was added to this section to try to grow *darwinia oldfieldii* — this plant is very healthy.

Eucalyptus lansdowneana ssp. *albopurpurea* is beginning to flower. It is a specimen tree here, approximately 7 metres tall with a 3-metre S-shaped trunk. The flowers are violet. ■

Preservation By Cultivation By A Beginner

At last I got a reader to send a simple article on cultivation. There could be more details about the advice Kev. would give beginners to set up a new garden. Hopefully Kev. will now develop areas confined to good garden soil, sand, sand with gravel and soil with limestone and observe results. Other readers could take this advice and experiment with conditions to see what gets the best results. Try various fertilisers such as blood and bone, osmocote, fowl manure, etc. There is so much an amateur can do to help. Time is running out. This is one practical way you may be able to make a significant contribution to the future preservation of the flora. Wake up! Start now! Editor

Australian Plant Cultivars

An official release by the Australian Cultivar Registration Authority.

The Australian Cultivar Registration Authority has been established to formally register the names of plants derived from the Australian Flora, that are regarded as having significant horticultural value. The plants need not be hybrids but may be forms of naturally occurring species found by chance or developed by breeding. This will allow growers to acquire plants with the confidence that they will produce the special characteristics claimed. Not every plant registered can be recommended as the best for the feature claimed but market demand will ensure the eventual survival of the best plants. What other way can we assure the proper selection and survival of the best forms of our wildflowers?

***Callistemon pachyphyllus* 'Smoked Salmon'**

Origin:

Callistemon pachyphyllus 'Smoked Salmon' is a selected, naturally occurring, pink flowered form of *C. pachyphyllus*. It was found growing amongst a large stand of the normal red flowered form in the Runaway Bay area of the Gold Coast. It was brought into cultivation in 1976 by Mrs. Joan Barton.

Description:

In cultivation the cultivar is slightly more compact than the type and attains a height of 1.5 metres. All morphological characteristics of the cultivar are as for *C. pachyphyllus*.

The flowers are a salmony pink to shell pink in colour and are ± 8 cm long by ± 6 cm wide. It is stated that in Brisbane this cultivar has some flowers for most of the year with two main flowering peaks, in summer and from autumn to early winter. The flowers during the summer months are slightly paler in colour.

Diagnosis:

The cultivar tolerates both moist and dry situations and is highly adaptable in cultivation.

The cultivar differs from the normal red and green flowering forms of *C. pachyphyllus* in the salmon pink to shell pink colour of its flowers.

Colour Code:

Filaments: near red 50C; Style: yellow-green 149D.

Reference Specimen:

Accession No.: 180; Applicant, Mr. & Mrs. J. Barton, Buderim, Qld.

***Callistemon citrinus* 'Austraflora Firebrand'**

Origin:

C. citrinus 'Austraflora Firebrand' was a seedling raised by Austraflora Nursery and planted in their grounds at Montrose in 1973. The original seed came from an unknown source. (Colour photographs on page 32.)

Description:

This cultivar grows to ± 60 cms in height with occasional arching branches to ± 90 cms by 2.5 metres in width, thus making it basically prostrate in habit.

The cultivar is multibranched with many branches having a prostrate habit. Some branches are semi-ascendant but then weep towards the ground. The other foliage characteristics are as for *C. citrinus*.

Flowering is profuse and the inflorescences are ± 9 cms long by ± 4 cms in diameter. The flowering season is from early November to late December in Melbourne. The flowers are a rich crimson-pink in colour, the other characteristics are as for *C. citrinus*. This cultivar differs from normal forms of *C. citrinus* in its semi-prostrate habit.

Other Notes:

This cultivar responds well to tip pruning. A synonymous name is *Callistemon* sp. 'Austraflora Firebrand'.

Colour Code:

Flower head: close to red group 53D.

Reference Specimen:

Accession No.: 191. Cultivar received by the Authority on the 28th November, 1979. Applicant: Molyneux Nurseries Pty. Ltd., Montrose, Vic.





***Helichrysum bracteatum* 'Cockatoo'**

Colour plate above.

Origin:

Helichrysum bracteatum 'Cockatoo' is a spontaneous hybrid between *Helichrysum bracteatum* 'Dargan Hill Monarch' and a white flowered perennial form of *Helichrysum bracteatum* which arose in Mr. D. M. McKenzie's garden at 3 Pearl St., Ocean Grove, 3226, Victoria.

Description:

This cultivar forms a bush that is compact and very dense and grows to ± 1 metre tall by ± 1 metre wide.

The leaves are covered with fine hairs which gives them a greyish bloom. They are oblanceolate in shape and vary from 6 to 12 cms in length. The stems are also covered in fine hairs.

The inflorescence is large, averaging 7 cms in diameter. The ray florets are very numerous and are ± 2.5 cms long. They are a light lemon yellow in colour, with odd flowers showing mottled ray florets of a deeper yellow colour. The disc florets are a golden orange. The flowers are displayed well on long stems held some 12-15 cms above the foliage. The flowering period is spread over spring, summer and autumn but some flowers are found all year round.

***Callistemon citrinus* 'Austraflora Firebrand'**

Opposite — upper plate

This cultivar is described on page 31. A good form of a species is selected.

***Callistemon pallidus* 'Father Christmas'**

Opposite lower plate

This unusual form of *C. pallidus* may be found in a gully off the Moruka Road about 25 km upstream from Valencia Creek, Victoria, and then along the Valencia Creek bed for several kilometres down stream. I selected the best form and Jean Galbraith called it 'Father Christmas'. It has been marketed since 1960 under that name, Bill Cane. It is hoped that Bill will formally register this name.

The cultivar differs from its parents in the colour of its inflorescence and the size and shape of the shrub. Its perennial habit is the same as for both parents.

Other Notes:

This cultivar has been grown for 8 years and tried in most situations. It performs best in a full sun situation. Propagation is quick (2-4 weeks) from cuttings of new growth. The bush tolerates regular pruning which helps to improve its form and flowering potential. Pruning also helps to rejuvenate older plants. It is a perennial plant as is *H. bracteatum* 'Dargan Hill Monarch' though not long lived, and is best replaced after a few years. The name 'Cockatoo' was selected as the shape and colour of the ray florets resemble the wing feathers of the sulphur crested cockatoo.

Colour Code:

Disc Florets: near yellow-orange group 23A; Ray Florets: near green-yellow group 1D.

Reference Specimen:

Accession number 189. Cultivar received by the Authority on the 26th November 1979. Applicant is Mr. D. M. McKenzie of 66 Adco Grove, Ocean Grove, Victoria.

***Boronia megastigma* 'Virtuoso'**

Description:

Boronia megastigma 'Virtuoso' is a colour form of *B. megastigma* differing from the norm in the very dark to near black coloured outside of the petals, anthers and carpel. The flowering period and form of the cultivar in all other respects is the same as for *B. megastigma*.

This cultivar has been recognised by the nursery trade for many years. It was described in a Boddy's Eastern Park Nursery catalogue (13th edition, 1966).

Colour Code:

Outside Petal: near greyed-purple 187A; Inside Petal: near yellow 6B; Anthers and Carpel: near brown group 200A.

Reference Specimen:

Accession No.: 162; Applicant: National Botanic Gardens. Previous publication: Boddy's Eastern Park Nursery catalogue (13th edition, 1966).

***Boronia pinnata* 'Spring White'**

Origin:

B. pinnata 'Spring White' is a white flowered form of *B. pinnata* selected from a naturally occurring plant.

Description:

This cultivar is very floriferous, bearing clear white flowers $\pm$ 1.3 cms in diameter. All other features of the cultivar are as for *B. pinnata*.

Other Notes:

This cultivar strikes readily from cuttings and grows in cultivation under the same conditions acceptable to *B. pinnata*. It is able to withstand reasonably dry conditions once established. It is frost hardy. Young plants flower 2 or 3 times per year but as the plant matures it has one main flowering during spring.

Colour Code:

Petals: white group 155D; Filaments: white group 155A; Anthers: yellow-green group 154C.

Reference Specimen:

Accession No.: 186. Cultivar received by the Authority on 24th September, 1979. Applicants are Ian and Elaine Slade, Peats Ridge, New South Wales.

***Grevillea* 'Poorinda Peter'**

Origin:

Grevillea 'Poorinda Peter' is said to be a hybrid between *G. acanthifolia* and *G. longifolia*. (Colour plate on page 36).

Description:

This cultivar is a large spreading shrub growing to a height of about 3 metres by 3-4 metres wide.

The leaves are very deeply lobed, occasionally with secondary lobes. The individual lobes are pungent, and 15 mm by 4-5 mm wide. The upper leaf surface is smooth and shiny whilst the underside is covered with dense silvery hairs. The leaf edges are rolled under. The new foliage has purple to bronze tonings.

The flowers are of the toothbrush type and are borne terminally in the upper leaf axils. The perianth is about 10 mm long and is covered with dense hairs. These hairs mask its deep purple colour. The reddish purple style is about 20 mm long.

Diagnosis:

This cultivar differs from *G. acanthifolia* in that each lobe is usually entire compared with the usually sub-divided lobes of *G. acanthifolia*. The leaves are different from *G. longifolia*, they are much more deeply lobed.

Other Notes:

This cultivar is extremely vigorous and retains a very dense habit. The flowering period begins in late winter and continues through spring and sometimes into summer in Canberra.

Colour Code:

Inner perianth: near purple 79B; Style: red purple 63A.

Reference Specimen:

Accession number 82. Cultivar received by the Authority on the 21st Oct., 1975. Applicant is Mr. Leo Hodge, 'Poorinda', Mt. Lookout Rd., Bairnsdale, Vic.

"Upon further continuing close examination of specimens of *Grevillea* 'Poorinda Peter' growing at the National Botanic Gardens it has been found that not all specimens have dense silvery hairs on the underside of the leaves. It appears that this characteristic can vary slightly from specimen to specimen in differing situations. For this reason this characteristic should not have too great an emphasis placed upon it when determining this cultivar."

***Grevillea* 'Poorinda Miriam'**

Origin:

Grevillea 'Poorinda Miriam' is a seedling from *G. 'Poorinda Blondie'*.

Description:

This cultivar is a tall, dense spreading shrub that grows $\pm$ 3 metres high by $\pm$ 4 metres across.

The leaves are deeply lobed and are $\pm$ 115 mm long x 25 mm wide at the widest point. The individual lobes are pungent and 2 to 3 mm wide. The upper surface of the leaves are light green whilst the underside is covered with dense silky hairs. The leaf edges are rolled under.

The flowers are of the "toothbrush" type and are borne in the leaf axils. The perianth is red and 5 mm long whilst the prominent light pink styles are 25 mm long with a yellow green stigma. The receptacle is slightly villous, and the peduncle is covered with light brown hairs.

Diagnosis:

This cultivar differs from *G. 'Poorinda Blondie'* in that its leaves are more deeply divided, only half as wide, and the flowers are a deeper red.

Colour Code:

Style: orange-red group 34D; Style Tip: yellow-green group 153A; Perianth: yellow group 4D.

Reference Specimen:

Accession number 71. Cultivar received by the Authority on the 21st October, 1975. Applicant is Mr. Leo Hodge of "Poorinda", Mt. Lookout Road, Bairnsdale, Victoria.



Grevillea baueri (above)

Grevillea 'Poorinda Peter' (both photographs below)





***Grevillea* 'Pink Star'**

Colour plate above.

Origin:

Grevillea 'Pink Star' is a hybrid that arose in cultivation at the National Botanic Gardens, A.C.T. One of the parents is *Grevillea baueri* and the other parent is uncertain.

Description:

This cultivar grows to a height of 2 metres with a spread of 2 metres.

Leaves are crowded and scattered around the stems. They are glossy green on top and pale beneath. The leaf margins are recurved downwards. Mature leaves are $\pm$ 15 mm long by 3 mm wide. Leaves on the lateral branches are smaller and more crowded, more or less 10 mm in length.

Flowers are borne terminally on the short lateral branches in short racemes. Perianth segments are pink and cream and the styles are pink and silky hairy. The flowers are $\pm$ 25 mm long and 5 mm wide at the widest point. The cultivar is very floriferous, the main season being spring, with odd flowers being found all year round.

Diagnosis:

The cultivar is distinguished from *Grevillea baueri* in that its leaves are much narrower and the leaf margins are recurved. *Grevillea baueri* is generally a more compact shrub than *Grevillea* 'Pink Star'.

Colour Code:

Perianth: Red group 54A; Limb: Yellow group 4C; Style: Red group 53B.

Reference Specimen:

Accession No.: 179; Applicant: National Botanic Gardens.

Grevillea* 'Honey Gem'*Origin:**

This cultivar is said to be a hybrid between *Grevillea pteridifolia* and *Grevillea banksii* (red form). The plant was obtained as a *Grevillea pteridifolia* seedling by Mrs. Cherrel Jerks, 64 Hillsdon Road, Taringa, Qld. It is a robust plant that will grow approximately 6 metres tall.

Description:

Leaves are very deeply pinnately lobed i.e. as deep as the midrib. Each leaf is ± 29 cms long and ± 24 cms wide. Individual lobes of the leaves are 18 cms long and from 2-4 mm wide. The upper surface of the leaf is dark green and the underside is covered with silky hairs. The leaf margins are rolled under. Young stems are covered with silky hairs.

Flowerheads are apricot with yellow styles, borne on a spike 16 cms long by 8 cms. Individual flowers are ± 4 cms long and set fertile seed.

Diagnosis:

Grevillea 'Honey Gem' is distinguished from its parents in that the leaves are intermediate between the two parent species with a bearing towards *Grevillea pteridifolia*. The flowers are whorled around the flower spike as in *Grevillea banksii* and not one sided as in *Grevillea pteridifolia*.

Grevillea 'Sandra Gordon' is a hybrid that has a common parent with G. 'Honey Gem'. The common parent is *G. pteridifolia*. These cultivars differ from one another in that *Grevillea* 'Sandra Gordon' has flower racemes to 12 cms long and the individual flowers are densely packed on the raceme. The flowers are a bright yellow and the deep lobes of the leaves are generally wider than G. 'Honey Gem'.

G. 'Honey Gem' has a raceme 16 cms long and the individual flowers are borne relatively loosely on the racemes. The flowers are a brownish-orange to apricot colour. The leaves are wider and longer but the individual lobes are generally narrower than those in G. 'Sandra Gordon'.

Colour Code:

Perianth tube: near greyed-orange 167B; Perianth limb: greyed-orange 163C; Style: yellow orange 23A.

Reference Specimen:

Accession No.: 178; Applicant: Mrs. C. J. Jerks. ■

***Grevillea* 'Honey Gem'**

by Cherrel Jerks

This is a superb shrub and by registering it with a cultivar name, I hope that it will be widely grown and give as much pleasure to others as it has to myself. My tree is more dense than *Grevillea pteridifolia*, darker green and with slightly wider leaves. The underside of the leaves are more silver underneath with silky hairs, and the leaf margins are rolled under.

The flower spike is quite large, some up to 17 cm long the average being 14 cm, and up to 8 cm wide. Each flower in the head is 4 cm long and whorled almost right round to form a spike but is slightly flatter on the underside. They have a much more apricot coloured appearance than *G. pteridifolia* with yellow styles.

The tree is 5 years old and is 2.4 metres high. It grew very rapidly and bloomed at 2 years old. It sets fertile seed and a plant raised from this seed is similar to the parent but with flowers slightly smaller. The tree was given to me as a seedling of *Grevillea pteridifolia* and is a spontaneous hybrid. ■

Pomax umbellata

Further notes by T. J. HAWKESWOOD, University of W.A., Nedlands, W.A.

Since my article on *Pomax umbellata* was published (Aust. Plants, 1977, 9(2): 87-89), I have undertaken growing *Pomax* by seeds and cuttings. The results of my investigations are recorded below:—

(a) *Seeds*. A large number of viable seeds are produced by a single plant. A high percentage of germination occurs, but the seedlings are susceptible to damping off.

(b) *Cuttings*. Branch tips which were not too soft (young growth), or too woody (old), were chosen as cutting material. Cuttings 3-4 cm long were placed in fine river sand to a depth of about 1 cm after being treated with a commercial hormone solution (as directed on the labels). It is likely that cuttings root just as well without application of hormones. Most cuttings rooted within four to six weeks and small bushy plants resulted within 4-6 months of growth (this was during winter in outdoor conditions). Plants seem to prefer a shady situation with a moderate amount of water and adequate drainage. The species appears to grow well in cultivation, but occasionally individual plants may suddenly die without warning or apparent causes.

In my previous article I stated that *P. umbellata* was not found in the Northern Territory. Dr J. H. Willis has directed my attention to the paper by Chippendale (Proc. Linn. Soc. N.S.W., 1971, 96(4): 207-267) in which it is listed from the Northern Territory. I have recently been able to examine specimens in the Western Australian Herbarium (Perth) collected from the Northern Territory, Western Australia and South Australia. These plants differ in many characters from the plants from eastern Australia. The range of *P. umbellata* in the eastern States extends from about 250 miles SW of Rockhampton, then east to Maryborough, south to the Brisbane region, New England Tablelands, Gunnedah, Dubbo, Blue Mountains, A.C.T. and to north-east Victoria. In South Australia, specimens have been collected from the Eyre Peninsula and the Flinders Range. In the Northern Territory collections have been made from near Alice Springs, the Macdonnell Ranges and from the Petermann Range. Specimens from Western Australia have been from the Robertson Range, Laverton district and from the Robe River (the last in north-west W.A.).

Much confusion has resulted in the past about the taxonomy of *Pomax*. Previously there have been about eight different names applied. However, Burbidge and Gray (1970, Flora of the Australian Capital Territory) state there is only one species which is "polymorphic".

After examination of dried specimens in the Perth Herbarium, it appears that there are at least four entities, differing in growth habit, leaf shape, morphology and position of hairs on the leaves and stipules, the inflorescence and seed morphology. The New South Wales form differs markedly from the South Australian and Northern Territory form in some of these characters. These two forms in turn differ from the entity from the Robe River (between Onslow and Roeburne) in north-west Western Australia. The last "form" is most probably a separate species. It appears then that the "species" now called *Pomax umbellata* is in fact comprised of at least three subspecies or species which have evolved and speciated out across Australia under the influence of differing climatic conditions and soil types. Further research (including study of more collections) should show whether *Pomax* is a monotypic genus (with a variable species), or whether there are three or four species present. I feel that the latter will prove to be the case.

I would also like to correct a slight error in my article on the genus *Melichrus* (Aust. Plants, 1978, 10(1): 36-39). In section A of the key to species, the line should read: "Leaves ciliate, sprinkled with longish hairs; flat, finely pointed but not pungent to touch, 12-28 mm long, 1.2-4 mm wide, linear-lanceolate. . . ."

Birdscaping Your Garden

by C. M. Adams

This is the title of a new book available for \$12.95 post free from the Editor—Australian Plants, and the title is well chosen. It is a practical guide to those people who wish to encourage the wild birds into their garden, to feed and to nest. This is not a picture guide to all our native birds. For that you will need "Birds Of Australia" available from the editor for \$19.35 plus \$1.65 post., a new book "Birds Of Australian Gardens" by Klott & McCulloch, available for \$29.95 plus \$1.65 post. or "Masterpieces Of Australian Bird Photography" by Peter Slater for \$19.95 plus \$1.65 postage.

The first section of the book describes bird habitats and behaviour and gives precise details of how you can provide or make nesting sites, boxes, etc. One table gives the dimensions of nest boxes unique for each group of birds, such items as diameter of entrance and height above the floor of the box being critical for such birds as the kookaburra. Another table gives a calendar of flowering times of over one hundred species of native plant to ensure all year round natural feeding, and the latter section of the book describes these plants, which species of bird they will attract, and how to cultivate them. If you are interested only in a garden for birds, this is the only wildflower book you need. *Calothamnus* and *Callistemon* are excellent plants for bird feeding. One of the many beautiful colour plates shows a New Holland Honeyeater probing the flowers of *Calothamnus quadrifidus* for nectar. The colour plates are not meant for bird display. You will find other books with possibly better photographic studies of birds. The colour plates show a wildflower, flowers, leaves, etc., picturing the bush as well as the bird busily feeding. — Review by the Editor.

Spiders Of Australia — A Field Guide — Mascord

Available for \$16.95 post free from the Editor this small book is a treasure for those keen to identify spiders. The 294 colour plates of 215 species of spider are grouped in families on the right hand pages of the book with excellent but simple and clear descriptions opposite. Being a field guide, the book is kept to a page size of 18 x 13 cm in 128 pages. Also in this series is "A Field Guide To Australian Shells" by Wilson & Gillett @ \$ post free from the Editor.

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by Ivan Holliday \$16.95 plus \$1.05 post.

At last we are in a position to supply by mail, the excellent books in this series. The latest on eucalypts is of special value. The book flowers the excellent pattern of a page devoted to each species with a good simple description, where it is found naturally and advice on cultivation and illustrated by a good clear, not flattering colour plate. Others in this series including "A Field Guide to Banksia's" are also available by mail from the Editor, Australian Plants for the same price.

Growing Native Plants

National Botanic Gardens.

The National Botanic Gardens produces a series of booklets that define their experiences in the cultivation of various wildflowers. These gardens, your gardens, are providing an extremely valuable service to the survival of the Australian Flora, its cultivation and the competent recording of activities. A special effort to visit these gardens will be well rewarded.

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Gardening With Australian Plants: Trees by Thistle Harris. \$25.00 + \$2.00 post postage.

This is the final volume of a three part series by the well-known author of many books on Australia's wildflowers over the last 30 years. Other books in this series are "Shrubs and Gardening With Australian Plants" and "Gardening With Australian Plants: Small Plants and Climbers". The final book in the series will not find as wide an appeal as the two previous volumes also available from the Editor at \$25.00 each.

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Society Activities

The Society comprises largely autonomous societies in each State or Region as listed above. Within these regions members in a local area have formed local groups and there are scores of them across Australia. As well as the usual society activities, the society is also active in:

The Development Of The Flora For Horticulture

Founder and active supporter of The Australian Cultivar Registration Authority, National Botanic Gardens, Canberra. If you know of an exceptional horticultural form of a wildflower, then register it with a cultivar name so that it may be enjoyed by others.

The Publication Of Literature On The Australian Flora

We produce literature of special and lasting value that is not produced by commercial publishers because it is not in the pretty picture, little information category.

The Preservation Of The Australian Flora

For active participation in conservation issues, members are encouraged to join the specialist "action" groups conversant with the details. The society concentrates on long range plans for the preservation of the flora.

The Australian Flora Foundation

The Society has gathered the leading scientists in Australia into a co-operative group pledged to research on biological and cultivation aspects of the Australian Flora.

Research or Study Groups

Study groups comprise people maintaining contact by mail through a leader, who share an interest in a special group of plants. They exchange experiences, seed, cuttings, and engage in simple projects aimed at the better understanding of the cultivation requirements of their special interest. If interested, send \$2.00 to one of the following:—

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PLANTS USED BY ABORIGINES

Ipomea costata

Photography and comment by P. J. Latz

An attractive shrub to 1 metre high, it is common in disturbed sites e.g. burnt areas or roadsides, of the Northern 'spinifex' country of central Australia. It is most commonly seen on the side of the Stuart Highway between Aileron and Tennant Creek.

It is not a true shrub as such, but more a stiff vine, as its branches often creep along the ground for considerable distances. The large trumpet shaped flowers are very attractive, but often close under a hot sun as do most of the 'morning glory' of which *I. costata* is a member.

In the same genus as the sweet potato it also produces a yam formerly much sought after by aborigines in the area. Elaborate corroborees were conducted to ensure a good crop of yams and great distances were travelled into the dry deserts to collect them.

A closely related species *Ipomea pes-caprae* (L.) Sweet, is found on the beaches of most tropical countries.

NGURRU MANINJA KURLANGU — Nyurnu Yapa Kurlangu.

Bush Medicine

This unusual book, available only from—The Secretary SGAP, Box 945, Alice Springs, 5750, for \$3.00 plus 80c postage — records the bush medicine used by the Aboriginal people of Yuendumu over the ages. The plants described both in English and in the dialect of the Yuendumu are mainly found around Yuendumu, Walkulpu, Lurnpa, Kurlangu and Kerridy Creek, N.T., but most may be found throughout Central Australia. Easy to prepare and well illustrated by sketches this small book is an important record of Aboriginal folk law.