



Mini-Myrts

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Contents

Editorial and introduction	Hazel Dempster	99
Mini Myrtles	Greg Keighery and Barbara Rye	100
Starflowers Diversity and Identification Guide	Francis Nge	118
The pomegranates – Balaustion and Cheyniana	Jim Barrow	124
Hypocalymma – the myrtles	Jim Barrow	127
Rinzia – my special choice	Hazel Dempster	131
Seed propagation of 'Mini Myrtles'	Bob Dixon	133
Mini Myrtles: grow from cuttings	Hazel Dempster	139
Myrtle Rust Impacts in Eastern Australia	Neil Marriott	141
Myrtle Rust Impacts in Western Australia	Hazel Dempster	143

Cover: *Malleostemen costatus*. Malleostemens grow in the outer northern WA wheatbelt and beyond. This one is "Priority 2" conservation status and grows near Kalbarri. (Photo: Sally Page).

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Editorial and introduction

Hazel Dempster

Recipient of the Australian Plants Award, Life Member of the WA Wildflower Society and an Ad Dip Horticulture. Hazel continues to strive to promote WA flora for horticultural purposes in gardens and amenity landscaping, with her daughter Sue, through Western Wildflower Gardens.

This 'Mini Myrtles' edition, of *Australia Plants*, is about some of the most colourful species of our plants, all with great horticultural potential. We all know the large myrtles such as the Eucalypts and the Bottle-brushes but the smaller, more-delicate shrubs of the Myrtle family, and their potential for horticulture is not yet fully appreciated.

The Spring 2017 (Vol 29 No 23) issue dealt with one important group: the Feather-flowers and the Copper-cups. This issue mainly concentrates on many of the very colourful and bright-massed flowering genera on the south west corner of WA. It covers a section of *Myrtaceae*: *Chamelaucieae* which has undergone major name changes over the last few years, right up until 2019 with the recent publication of an interactive key on the WA Herbarium Flora base. There are many new genera to come to terms with and some old friends to say goodbye to. Many major decisions about other colourful groups are still in the pipeline. These include *Verticordia*, *Chamelaucium* and *Darwinia*.

This issue begins with an article in which Greg Keighery and Barbara Rye describe several new genera. It continues with articles on *Calytrix*, *Balaustion* and *Cheyniana* (the Pomegranates), *Hypocalymma* and *Rinzia* (two related genera), considers production from seeds and from cuttings, and concludes with a grim warning about Myrtle rust.

Our authors include four scientists: botanists Barbara Rye and Greg Keighery, soil scientist Jim Barrow (the latter both retired), and Francis Nge, a new-generation scientist who has developed a love of our flora and wants to know what they all are, and how to identify them; horticulturist/scientist Neil Marriott; and two horticulturists, Bob Dixon and me.

A map depicting the regions of Western Australia and some principal towns is included on P4 of the insert.

Once again, I am very grateful to our authors who always willingly give their time, expertise and knowledge to help us all understand the importance of what we have in this country, and of course Jim Barrow who with his patience and expertise, helps edit the issue and puts the layout together.



Mini Myrtles

Greg Keighery and Barbara Rye

Greg Keighery was a Research Scientist in the Western Australian Department of Biodiversity, Conservation and Attractions. He was a botanist in the biogeography program, responsible for regional scale surveys. Greg has published over 500 papers and articles on the biology, ecology and taxonomy of native and weedy plants of Western Australia. He is a specialist on Weeds, Lilies, Carrot Family and shrubby Myrtaceae (especially *Darwinia*) of Western Australia.

Barbara Rye is a scientist in the Western Australian Department of Biodiversity, Conservation and Attractions. She has undertaken and published numerous taxonomic revisions of many iconic Western Australian groups, including *Pimelea*, *Trachymene* and *Trymalium*. Currently she is working on completing the review of the taxonomy of the subtribe *Chamelaucinae* of the Myrtaceae.

“Mini Myrtles” refers to those small-flowered Myrtaceae that were previously referred to affectionately, and occasionally in frustration, as the “STABMS” (*Scholtzia*, *Thryptomene*, *Astartea*, *Baeckea* and *Micro-myrtus*). This confusing group of small-flowered Myrtles, centred in Western Australia, has recently had more changes in generic placement than there are shirts in most closets. Previously, all these genera keyed out together in Blackall and Grieve (1980) as this was the only workable method to arrive at a species name.

In the past, generic limits were defined by morphology, and the often remarkable intuition of incredibly observant botanists, such as Robert Brown, giving us most of our modern families and well-known genera. However, there are examples in Australia, where the generic limits were based on simple, striking features that have major biological drivers, but not directly related to taxonomic relationships. For example, when the bird-pollinated Sturt Desert Pea (*Swainsonia formosa*) was described, it was first placed in the New Zealand genus *Clianthus*, which has large red flowers and is also bird pollinated, but they are not at all closely related. Another example was the use of an obvious dispersal adaptation, the fringed sepals of *Verticordia* to unite apparently divergent groups, that may have evolved this system independently (*Genetyllis*, *Homoranthus* and others currently in *Verticordia*).

Most of these problems, especially in the Southwest, relate to the large, rapid and apparently recent diversification of flowering plants, giving rise to many closely-related lineages, that are difficult to define morphologically. This issue is compounded by having too few systematic botanists studying such a diverse flora over time.

In the 1980s, it was recognised that Bentham (1867) in his monumental work on the Flora of Australia, had a very broad concept of the genus *Baeckea*. A process of re-instating old, submerged genera and naming new segregate genera, was commenced by Trudgen (1986, 1987),

and has continued up to the present. During this process, all eastern Australian species, and over 25 Western Australian species, have been formally reassigned, while many others have been newly named in their correct genera. These studies are still underway, as 75 (13 named and 62 phrase names) Western Australian species remain in *Baeckea* pending generic placement.

All of these species have anthers with an oil gland attached to the connective (= the connective gland) and the pollen is contained in oil as with all members of the subtribe *Chamelaucinae*. In the genera *Actinodium*, *Chamelaucium*, *Darwinia*, *Homoranthus* and *Verticordia*, oily pollen is secreted by the anthers in the bud onto hairs on the style. The Mini Myrtles, which belong to subtribe *Baeckinae sensu* Bentham, extrude pollen onto the surface of the anthers when the flower opens.

All Mini Myrtles have colourful, scented, nectar-producing flowers. Although small, the flowers are often presented in dense clusters at the tops of plants; and flowers last for several days. Cross pollination between plants usually results in significantly higher seed set. As in most Myrtaceae, the flowers are typically protandrous (anthers mature before the stigma), assisting cross pollination. Species are largely pollinated by solitary native bees. Wasps also play a significant role here, but flies and butterflies are less important.

Recently, an interactive key to the group [A key to the Western Australian species in the *Chamelaucieae* tribe of Myrtaceae] has been made available on the Florabase website. Unfortunately, because of the nature of the rapid bursts of differentiation and speciation that has occurred in this group, as noted before, genera remain difficult to separate without microscopic examination of floral, fruit and seed characters, and the key does not indicate all the proposed genera.

The changes have been driven by a close examination of the floral and fruit morphology of this group largely by Barbara Rye and Malcolm Trudgen; and the new wave of genetic data, aligned with morphological studies by Matthew Barrett and Peter Wilson. Taxonomic research is likely to continue for many years to come, altering the number of genera recognised within the entire Australian Myrtaceae, especially those genera centred in Western Australia.

Current State Of Play

With over 200 species of “Mini Myrtles” in over 20 genera, we can only give a taste of the typical species in the group, to illustrate their diversity and horticultural potential. The papers listed (although technical) in the references, are readily available on the Florabase website or by the Biodiversity Heritage Library website for older issues.





Eastern Australia

There are 6 genera of Mini Myrtles that are only found in eastern Australia. Others centred in Western Australia, but extending elsewhere, are covered in the Western Australian section.

Genus: *Baeckea*

Flower Colour: white.

There are 13/14 species.

Differences: Typical *Baeckea*s have a single flower per peduncle, gland- tipped anthers opening by long slits (Figure 1,a), 3-25 ovules per cell, and a 1-3 celled capsule (usually 2-celled) with very small seeds.

Comments: Now considered to extend from southern China south to Tasmania, with most species occurring on the east coast of mainland Australia and with no representatives in Western Australia. Other members of the genus *Baeckea* from Eastern Australia have been placed in the following 5 genera.

Genus: *Harmogia*

Flower Colour: White.

One species, it occurs in NSW & Qld.

Differences: *Harmogia* differs from *Oxymyrrhine* in having its seeds flattened at the base, rather than curved at both ends like the segments of an orange, and has a seed coat of flat to concave cells which are much larger than the cells on seeds of *Oxymyrrhine*. It also shows subtle differences in its anther morphology, with its connective gland extending dorsally, not only well beyond the anther cells, but also down beyond the top of the free part of the filament. A more obvious difference is its tendency to have very dense clusters of leaves on its lateral branchlets.

Comments: Previously placed in *Babingtonia*.

Genus: *Kardomia*

Flower Colour: white flowered.

Six species occur in NSW & Qld.

Differences: Solitary flowers, the hypanthium rugose, rarely smooth, a 3 locular dehiscent capsule with flattened seeds.

Comments: Previously species were placed in *Baeckea* then *Babingtonia*.

Genus: *Ochrosperma*

Flower Colour: white.

Six species, ranging from the Northern Territory to NSW.

Differences: Differ from *Baeckea* in having kidney shaped, arillate seeds (Figure 1) and 2 ovules per cell. They have 5-9 (usually 5) stamens opposite the sepals with slender terete filaments with the anthers opening in long slits.

References: Trudgen, (1987) & Bean, (1995).

References: Trudgen, (1987) & Bean, (1995).

Comments: Previously species were placed in *Baeckea*.

Genus: *Sannantha*

Flower Colour: white flowers.

There are 16 species; 12 in Vic, NSW & Qld and 4 confined to New Caledonia.

Differences: *Sannantha* has three to nine flowers per peduncle opposite leaves, 3 locular capsules, a smooth hypanthium, hammer shaped anthers and flattened seeds.

Comments: Previously in *Baeckea* or *Babingtonia*. The very commonly cultivated *S. similis* (previously called *S. virgata*, which is now a New Caledonian endemic) from NSW, is perhaps the most widely grown of all species, previously placed in *Baeckea*, and has a number of named cultivars.

Genus: *Triplarina*

Flower Colour: white.

Five species from NSW & Qld.

Differences: anthers opening in long slits, small, kidney shaped arillate seeds and 8-13 ovules per cell.

Comments: Previously placed in *Baeckea* then *Babingtonia*.



Western Australia

The Mini Myrtles are now allocated to 21 genera in Western Australia and these are now briefly described in alphabetical order.

Genus: *Aluta*

Flower Colour: White or pink.

Five species, which range from WA to the Northern Territory and South Australia.

Differences: Separated from *Thryptomene* by its stamens having a large rearwards-facing gland (Figure 1, b) and prominently reticulate-pitted floral disc and fruits.

Comments: *A. appressa* (Mt. Jackson to Salmon Gums), *A. aspera* (Gascoyne River to Wongan Hills and east to Kalgoorlie), *A. maison-neuvei* (Meekatharra to NT and SA), *A. quadrata* (Pilbara) and *A. teres* (Sandstone).

References: Rye and Trudgen (2000).

Genus: *Anticoryne*

Flower Colour: white.

Three species confined to south west.

Differences: Closely related to *Babingtonia* but has very dark seeds, large flowers, 12-45 anthers, with a connective gland that is not obvious as a distinct structure, and pollen released by pores.

Reference: Rye (2017).

Comments: The large white flowers give this genus horticultural potential. *A. diosmoides* (Fitzgerald River Nat Park), *A. melanosperma* (Hyden to SE of Narrogin), *A. ovalifolia* (Near Ravensthorpe).

Genus: *Astartea*

Flower Colour: White or pink.

Currently 22 species are recognised, confined to the south West.

Differences: Closely related to *Cyathostemon* and *Hypocalymma*. The most obvious character of *Astartea* is the arrangement of the stamens into bundles opposite the sepals with the longest on the margins. Seeds are small, thin walled, with a finely reticulate smooth surface. Another difference is the preference for members of the genus to occur in wet habitats and to flower in summer rather than spring.

References: (Rye, 2013a).

Comments: The most variable of the Western Australian members of the group in habit ranging from dwarf shrubs to small trees. Previously most of these species were lumped under *Astartea fascicularis*, which is now found only in the extreme east of the range of the genus, near Esperance and the Recherche Islands. The genus remains taxonomically difficult, as many important characters are not often apparent on herbarium collections (lignotuberos or not, seed characters etc.).

Members of the genus are easy to cultivate from seed or cuttings, both as container plants and in soil. As they mainly flower in summer and autumn with both white and pink flowering species, they provide attractive garden subjects. Some species have a lovely weeping habit; for example, the erect to weeping *A. pulchella*, or the tall *A. leptophylla*, the small, delicate, red weeping-stemmed *A. onycis* from Scott River. There are the large white-flowered *A. affinis* and *A. glomerulosa* which is usually pink, but also has autumn flowering variants from Lake Muir. The final example is, the bright-green-foliaged *A. granitica* from the wet forests.

Members of the genus often co-occur and there is evidence of hybridization between species. There are a number of commonly-grown cultivars including *Astartea* "Winter Pink", which itself is a hybrid selection.

Genus: *Astus*

Flower Colour: White or pink.

Four species occur along the coast from just east of Albany to Point Culver on the Great Australian Bight, and inland to Wyalkatchem and east to near Coolgardie.

Differences: has a five-angled hypanthium, without a true rib on the angle, reniform seeds and a multi-locular fruit. The fruit is a derivative of a capsule, usually with two dehiscent and one indehiscent cell. Members of *Astus* have the most-common anther type in the Myrtaceae: one with an external connective gland and dehiscence by two parallel slits.

References: Trudgen and Rye (2005).

Comments: *Astus subroseus* has pink flowers, and the more inland distribution, occurring over a quite large area in the Avon, Mallee and Coolgardie biogeographic regions. *A. tetragonus* occurs along the south coast. The other two species, *A. duomilius* occurs on sand dunes in a salt lake, and *A. wittweri*, disjunct from Mt Ragged, where it is associated with granitic rocks, to Point Culver.

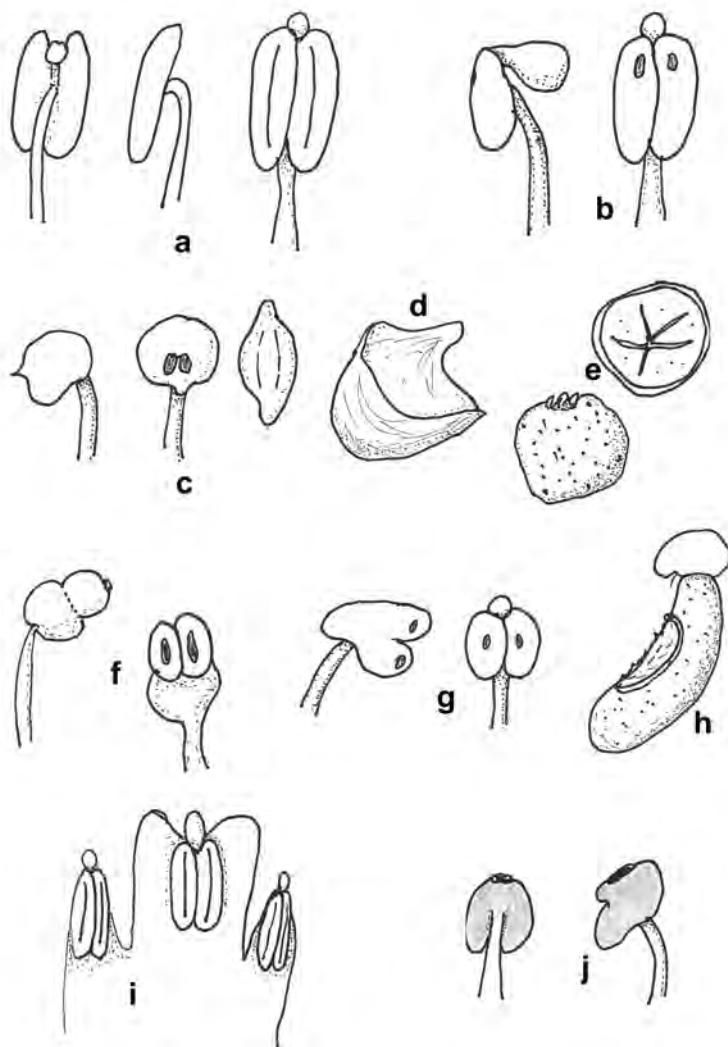


Figure 1: Characteristics of the anthers are crucial in understanding generic boundaries in the Myrtaceae. The primitive anther type (Figure 1, a), found in some members of all tribes, is dorsifixed and versatile (with the filament narrowly attached on the back of the anther body and an easily moveable anther), and has parallel cells (also known as thecae) that open longitudinally. One of the defining characteristics of the Myrtaceae is the presence of a connective gland, protruding from the connective tissue above the point of attachment of the filament. This connective gland is most obvious in young anthers prior to dehiscence. Various modifications of the anthers characterise particular genera. A selection of these are illustrated in Figure 1. Some defining seed types and the fruits of *Enekbatus* are also illustrated. (Continued opposite.)

Genus: *Babingtonia*

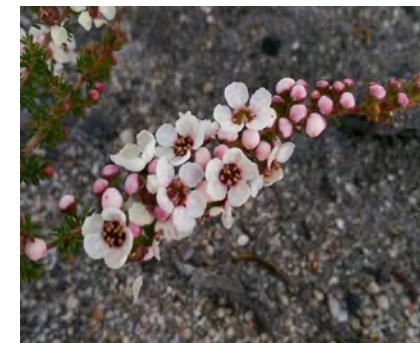
Flower Colour: White or pink.

There are 11 species confined to south west.

Differences: distinguished from *Oxymyrrhine* by their more-compressed stamen filaments, by their helmet-like anthers, which dehisce by pores (Figure 1, c), and which vary from compressed-obovoid to deeply divided into two divergent lobes and which often have two longitudinal lateral grooves, and by their longer and much thicker seeds with a more-flattened base and more-angled summit (Figure 1, d). Closest relation is to *Anticoryne* which has a single flower per peduncle and very dark brown or black seeds.

References: Rye (2015c).

Comments: Species are found from north of Geraldton to near Mount Barker. Perhaps the best known species is *B. camphorosmae* (previously *BaECKea*). This species, known as Camphor Myrtle, Liquorice Tea or Native Tea, was used for making bush tea. *Babingtonia grandiflora*, with large white or pale pink flowers occurs from Northampton to Gingin. It is possible that the diagnosis and spread of the genus may be expanded in the future.



B. camphorosmae. Photo, Hazel Dempster.

- a: Anther of *BaECKea*, note small connective gland on top; LHS rear view, centre side view, RHS front view.
- b: *Aluta*, RHS side view showing large rear facing connective gland, RHS front view showing pores.
- c: *Babingtonia*; RHS side view of anther, centre: front view showing pores, LHS top view showing "helmet shape."
- d: *Babingtonia* seed.
- e: *Enekbatus* fruit, top Cross section showing cells.
- f: *Hysterobaeckea*; Anthers; LHS side view showing fused gland, RHS front view showing pores.
- g: *Malleostemon*; Anthers RHS showing hammer shape, RHS; front view showing pores.
- h: *Rinzia*; showing reniform seed, with oil rich aril on top.
- i: Anthers of *Rinzia*; showing very flattened filaments.
- j: *Tetrapora*; Anthers, LHS showing dark anther from behind; RHS anther from side, showing pore.





Genus: **Baeckea**

Flower Colour: White, pink.

There are 75 species.

Comments: Several species remain in *Baeckea* in Western Australia; they will all be placed in other genera, some of which are still to be formally described (although they are mentioned in the recent keys to genera). These include some spectacular species such as *B. grandibracteata*, *B. grandis*, *B. muiricata*, *B. robusta*, *B. sp. Dwarda*, *B. sp. Koonadgin*. Most of these species occur on sandy soils in the Wheatbelt.



Baeckea sp Eurardy. Photo, Hazel Dempster.

Genus: **Balaustion**

Flower Colour: Red.

One species - from Kirkalocka Station west to Latham and south to east of Hyden.

Differences: *Balaustion* is very similar to the manuscript genus *Tilophloia*, having stamens in a single circular series, broad filaments and seeds with a large concave hilum. Distinguished by its basifixed anthers, prostrate habit with adventitious roots and large orange flowers.

References: (Rye, 2009a).

Comments: see article on pages 124 – 126.

Genus: **Cheyनिया**

Flower Colour: Orange red/green, pink.

Two species confined to South West.

Differences: Possibly closely related to *Ericomyrtus* or to W.A. '*Baeckea*' species with rather globular anthers that dehisce by pores. Distinguished by its woody indehiscent multi-ocular fruits.

References: (Rye, 2009a).

Comments: see article on pages 124 – 126.

Genus: **Corynanthera**

Flower Colour: yellow.

One species, *C. flava* with bright yellow flowers grows on sandy soils between Watheroo and Eneabba.

Differences: Named in 1979 it is very closely related to *Micromyrtus*, both of which have indehiscent fruits. *Corynanthera* has two features that distinguish it from *Micromyrtus*: its anther type, and its dispersal unit. The highly-modified anthers in *Corynanthera*, have a long-stalked gland, with the anther dehiscing by a single central pore. The fruit of *Corynanthera* is a highly compressed and laterally-winged structure, that includes the bracteoles and peduncle, and encloses a single, very compressed seed. This lightweight "winged" fruit is wind dispersed aided by the very wispy habit of mature plants which overtop the surrounding shrubs.

Comments: Likely to be placed back into *Micromyrtus*.

Genus: **Cyathostemon**

Flower Colour: Normally white flowered, some pinkish.

Seven named species and five to seven informal names. These informal names are in species complexes, which require extensive field and herbarium work to resolve, as members of the genus frequently hybridize in the wild making allocation of collections difficult. Occurs in south west and adjacent desert.

Differences: Flowers superficially reminiscent of *Rinzia* but differ in having basifixed anthers. Closely related to *Astartea* and *Hypocalymma*. It has 8-30 stamens united at the base in a petaline ring, and the seeds are somewhat reinform.

References: Trudgen and Rye (2008, 2012 & 2014).

Comments: Members occur mainly in the eastern wheatbelt and associated interzone, extending east of Kalgoorlie. This is essentially east of the main distribution of *Astartea* and *Rinzia*. Probably the best known is *C. heteranthus* (previously *Astartea heteranthera*).

Genus: **Enekbatus**

Flower Colour: white, or pink.

Ten species are recognised. The genus extends from north of Geraldton to south of Merredin, and inland to the western part of the Great Victoria Desert.

Differences: Related to *Rinzia* and several other genera, all of which



have an unmodified anther type, a multi-celled ovary and reniform seeds. However, the indehiscent fruit (figure 1,e) of the new genus readily separates it from the other members of this group.

References: Trudgen and Rye (2010).

Comments: Seven are newly-described as *Enekbatus bounites* (Morseby Range), *E. cristatus* (Kalbarri National Park), *E. dualis*, (Mullewa east to near Wurarga and south to Mellenbye Station), *E. eremaeus*, (Diamond Well Station south to Boulder and from near Meekatharra east to Rason Lake), *E. longistylus*, (Tardun south-east to the Perenjori), *E. planifolius*, (Morawa), and *E. sessilis* (north of the Murchison River south-east to Wongan Hills and to just east of Burakin). The new combinations *Enekbatus cryptandroides*, (Sandstone south-east to Kurnalpi and east of Kalgoorlie), *E. clavifolius*, (Koorda east to near Campion and south-south-east to Bruce Rock), and *E. stowardii* (Perenjori area south-east to Cowcowing), were made for three species that were previously included in *Baeckea*.

As with other groups, little is known about the biology of this group, including fruit dispersal of the unique fruits.

Genus: *Ericomyrtus*

Flower Colour: White.

Four species are recognised in *Ericomyrtus*, which is widespread in the South-west, extending from Yuna south to near the south coast, south-east to the Balladonia area and inland to the Kalgoorlie area.

Ericomyrtus
serpyllifolia.
Photo, Hazel
Dempster.



Differences: Have very reduced, more or less globular anthers. Members of the genus are related to *Oxymyrrhine* which differs in the broad cavity in the summit of its fully inferior fruit and in having its stamens in a full circle, rather than in groups opposite the sepals. Its closest relative may be *Cheyनिया* which differs in its woody indehiscent fruit.

References: Rye, (2015a).

Comments: The genus contains *E. drummondii* (Ballidu–S of Borden–Frank Hann NP), *E. parviflora* (Tammin area–Collie–Perup River–Ravensthorpe area), *E. tenuior* ((Yuna–Perth area–Yoting–Muntadgin- previously part of *Baeckea crispiflora*), *E. serpyllifolia* (Walkaway– Morawa–Cheyne Bay–Kalgoorlie–S of Balladonia, previously part of *Baeckea crispiflora*). Normally this species is cultivated under the name *Baeckea crispiflora*.

Genus: *Euryomyrtus*

Flower Colour: White or pink.

Seven species. The genus occurs across southern Australia, with five species only in the South West.

Differences: Has parallel veining visible on leaves, possesses visible opposite petals, anthers of the ancestral kind (connective gland free, dehiscence by 2 long slits), light brown arillate seeds, and persistent bracteoles. Members of *Ochrosperma* and *Triplarina* from Eastern Australia, differ from *Euryomyrtus* in having stamens opposite the sepals.

References: Rye and Trudgen (2001).

Comments: Comprises. *E. denticulata* (NSW), *E. inflata* (Sandstone), *E. leptospermoides* (Merredin to Southern Cross), *E. maidenii* (Cunderdin to Payne's Find to Cunderlee to Bremer Range), *E. patrickae* (Yalgoo), *E. ramosissima* (SA, VIC, NSW, Tas) and *E. recurva* (Wubin to Lake Annean).

Genus: *Hysterobaeckea*

Flower Colour: Flower buds are often purplish or reddish on the hypanthium and sepals, with the exposed parts of the petals commonly deep pink. After the flowers open the petals are usually white inside (sometimes yellow-flowered in *H. ochropetala*), but with a splash of pink retained on the outside of the outer petals.

There are 12 species. The genus extends from inland parts of the South West Botanical Province of Western Australia east to near Bendigo in





Victoria and inland to the MacDonnell Ranges of the Northern Territory. Of the 12 species recognised here, nine are endemic to Western Australia and three occur further east.

Differences: Has hammer-shaped anthers with the connective gland extending well below the anther cells which dehisce by pores or short slits (Figure 1,f).

References: Rye (2015b).

Comments: There is considerable horticultural potential of many of the large flowered members of this genus.



Hystobaeckea sp. Photo, Hazel Demster.

Genus: ***Malleostemon***

Flower Colour: White, pink.

There are 14 species named in the genus but there are still several unresolved phrase named taxa. It is endemic to Western Australia, extending from near Minilya Bridge in the Carnarvon area south-east to near Hyden and inland to Raeside Soak, south-east of Leonora.

Differences: Has hammer-shaped stamens (hence the generic name, Figure 1, g), single-celled ovary, a somewhat exocentric style, insertion indehiscent fruits with 3-8 ovules. The genus is closely related to *Anticoryne*, *Babingtonia*, *Scholtzia* and *Tetrapora*.

References: Rye, (2016).

Comments: There is a diversity of species between Shark Bay and Geraldton and in the Goldfields and most occur on sandy soils in heath. Little is known about the biology of members i.e. response to fire, co-occurrence of species and hybridization.

Genus: ***Micromyrtus***

Flower Colour: flowers that are pink or white and occasionally yellow.

Fifty species, ranging from shrubs to small trees. Members are of the genus are found in all mainland Australian states.

Differences: Has a slender habit, somewhat elongated, indehiscent fruits with 5 to 10 ribs, always with one seed although there are 2-10 ovules. There are 5 stamens opposite the sepals and sometimes also 5 stamens opposite the sepals, anthers dehisce by long slits. *Coryanthera*, which differs in having a stalked connective gland may need to be included in the genus.

Comments: Perhaps the best known is *Micromyrtus ciliata* (Fringed Heath Myrtle) from Victoria and NSW which has red buds, masses of flowers that can be white, flushed pink or red.

Currently 32 species are found in Western Australia, south of the Pilbara. Seventeen of these are found in the deserts, including the yellow flowered *M. flaviflora* and *M. sulphurea*, the others are concentrated on the northern sandplains of southern Western Australia. Probably the species with most horticultural potential are *M. imbricata* (South Coast), *M. navicularis* (Fitzgerald River National Park) and *M. racemosa* (Northern sandplains).

Genus: ***Oxymyrrhine***

Flower Colour: White

Four species currently placed in *Oxymyrrhine* occur in the southern part of the South West Botanical Province of Western Australia, from the Darling Range to Cape Arid National Park.

Differences: Characterised by a deep and distally expanded depression in the summit of the mature dried fruit, which remains fully or almost fully inferior.

References: Rye (2009b).

Comments: Species currently included in *Oxymyrrhine* differ from all other species currently provisionally placed in the group by Bentham (1867) in the arrangement of the stamens in a complete ring rather than just opposite the sepals. The precise limits of *Oxymyrrhine* have yet to be determined.





Genus: **Rinzia**

Flower Colour: white or pink.

Most of the 19 *Rinzia* species are found in the South West, but several extend to the adjacent desert, one species, *R. polystemonea* (Desert Rock-Myrtle) extends to the Northern Territory and two are restricted to SE Australia,

Differences: The anthers dehisce by long parallel slits and the style base is in a depression. The dehiscent fruit has kidney shaped seeds, often with an aril (Figure 1,h). Many *Rinzia* species have distinctive flowers with the 10 anthers dorsifixed opposite the petals and adnate to the flattened surface of the filament(Figure 1,i).

References: Trudgen (1986) and Rye (2017a).

Comments: *Rinzias* in the higher rainfall zones are generally low-growing, rather inconspicuous plants, but those occurring inland are more shrubby. There are white or pink-flowered forms such as in *R. fumana* (Polished *Rinzia*) or the lovely *R. oxycoccoides* (Large Flowered *Rinzia*) from the Barren Ranges, has pink flowers. These have horticultural potential. See also p 131.

Genus: **Scholtzia**

Flower Colour: White or pink.

Fifty five named and phrase-named species, making it the largest genus of the group. The genus, like *Pileanthus*, has diversified on the northern sandplains, and is largely found between Perth and Carnarvon. Confined to Western Australia.

Differences: Has a 1-3 celled ovary with either 1 ovule per cell or two ovules arranged one above the other, and an indehiscent fruit with usually only a single seed, which has a thin seed coat and is unfacetted. Flowers are one to many per peduncle, often aggregated. The genus is closely related to *Anticoryne*, *Babingtonia*, *Malleostemon* and *Tetrapora*.References: Rye (2019.)



Scholtzia parvifolia. Photo, Jim Barrow.

Comments: Most species lack a lignotuber and are killed by fire. Some are tall shrubs to over 3 metres. Over 15 species are found in the Kalbarri National Park yet, unlike the situation in *Astartea*, the species rarely co-occur and there are no records of hybrids from Kalbarri. This would be a very interesting field of study.

Many species would make ideal garden subjects including the newly described *S. calcicola*, a species found on coastal limestones between Dongara and Jurien Bay, *S. capitata* (Pom Pom *Scholtzia*) from Tamala to Port Gregory, *S. corrugata* coastal limestones from Shark Bay, *S. laciniata* Lancelin to Moore River on limestones or yellow sand, may be prostrate or erect, *S. prostrata* yellow sands east of Walkaway.

Genus: **Seorsus**

Flower Colour: White.

There are 4 species, 2 in Borneo, one Northern Territory and one in South West.

Differences: Differs in having stamens in fascicles opposite the petals, anther cells diverging, but fixed in position at the base with the oil gland in front of the cells not on top, and having distinctly facetted seeds.

References: Rye and Trudgen (2008).

Comments: *Seorsus* (previously *Astartea*) *clavifolia* is found on sand dunes around salt lakes between Pingrup and Lake King.

Genus: **Tetrapora**

Flower Colour: White.

There are five named species all found in the South West, and also several known by phrase names under '*Baeckea*'.

Differences: has globular anthers (Figure 1,j) dehiscent by pores, and often many flowers per peduncle. It differs from the related *Oxymyrrhine* in a partially superior fruit. The genus is closely related to *Anticoryne*, *Babingtonia*, *Malleostemon* and *Scholtzia*.

References: Rye and Trudgen, (2012.)

Comments: The five species are: *T. floribunda* (Morawa to Goomalling), *T. glomerata* (Collie to Ravensthorpe), *T. preissiana* (Three Springs-Coolgardie Salmon Gums-Stirling ranges), *T. tenuirama* (Bencubbin – Hyden) and *T. verrucosa* (Cape Riche to Esperance).





Genus: *Thryptomene*

Flower Colour: White, pink.

A large genus of 50 species which is mainly concentrated in the south-west, but extends north to the Pilbara and through the desert into South Australia and the Northern Territory. It has representatives in all states.

Differences: like *Aluta*, *Micromyrtus*, *Malleostemon* and *Corynanthera* has slender indehiscent fruits. Differs from *Aluta* in having the ovary ribbed, smooth or rugose, the connective gland, compact and directly above the anthers and facing inwards. The floral disc is smooth or has prominent oil glands.

References: Rye & Trudgen (2001) and Rye (2014).

Comments: Normally species have masses of small pink flowers near the ends of the branches. Some of the more-colourful or better known are *T. australis* (Hook Leaved Thryptomene), a large shrub with pink or white flowers, which tends to grow around granite rocks or heavy soils from Trayning east to Norseman and west to the Darling Range, the newly named prostrate *T. repens*, with pink flowers from Shark Bay, *Thryptomene saxicola* either prostrate or erect forms, normally with white flowers on granite rocks, from Dunsborough to Cape Arid. *Thryptomene strongylophylla* is an erect shrub with small mauve, pink flowers on sands from near Geraldton to Shark Bay.

Conclusions

Generic re-arrangements in Eastern Australia have already been made. In Western Australia, genera with the ancestral anther type with a free connective gland and dehiscence by two long slits (*Astartea*, *Rinzia* and their relatives) are settled in their scope and definition, and some large genera with indehiscent fruits (*Scholtzia*, *Thryptomene*, *Micromyrtus* and *Malleostemon*) are largely settled, although there may be many new and redefined species. However, generic boundaries among capsular genera with derived anthers, especially those with a fused connective gland, are mostly far from resolved and will change over time. Some genera may enlarge, some may be placed under existing genera and some new genera are foreshadowed in the current keys to accommodate those species remaining in *Beackea*.

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Starflowers (*Calytrix*) – Diversity and Identification Guide

Francis Nge

Francis is currently undertaking a PhD on plant systematics at the University of Adelaide, with a focus on a few case study groups of the Australian temperate flora. His project focuses on the discovery of new species, evolution of the Australian temperate flora, and mechanisms that drive their diversification.

The Australian native starflowers (*Calytrix*; Myrtaceae) is a diverse genus with over 90 species, all of which are endemic to Australia. Craven (1987b) completed a taxonomic revision of the genus, following which additional new species have been described by various authors (Craven, 1990, 1991; Keighery, 2004; Barrett et al., 2009; Rye, 2013; Nge et al., 2017). The majority of the species are found across temperate Australia, most of which are endemic to the southwest Western Australian biodiversity hotspot. A wide range of floral and leaf morphology is evident across the different species within the genus (Fig. 1). The majority of *Calytrix* species are small to medium shrubs, a few species grow into small to large trees (e.g. *C. exstipulata* and its allies in northern Australia).

Homalocalyx has been recognised as been closely related to *Calytrix* based on their morphological characters (Nieden zu, 1893; Craven, 1987a). Their close evolutionary relationship was confirmed in Lam et al. (2002), where *Homalocalyx* was determined to be sister to *Calytrix* in the molecular phylogeny. The two genera can be distinguished by their embryo morphology, where *Calytrix* possesses a straight embryo and *Homalocalyx* has a curled embryo with two short cotyledons at the apex of the hypocotyl (stem of a germinating seedling, below the cotyledon and above the root radical) (Craven, 1987a).

The identification of *Calytrix* species focuses mainly on several key floral characters, as well as a few leaf characters such as their standard morphology (i.e. length, width, shape) and shape outline of the transverse sections of the leaves (Fig. 2). Indumentum (hairs, present or absent) characters are also critical in identifying many of the species within the genus. Floral morphology of this genus is quite variable, with many species having bright purple flowers which is not commonly found in Myrtaceae (Fig. 1). Other floral colours found in the genus include pink, yellow, white, and cream (Fig. 1). The majority of species have five petals, only a few have four and these are all found in southwest Western Australia (*C. ecalycata* and *C. pimeleoides*) (Fig. 3). A compre-

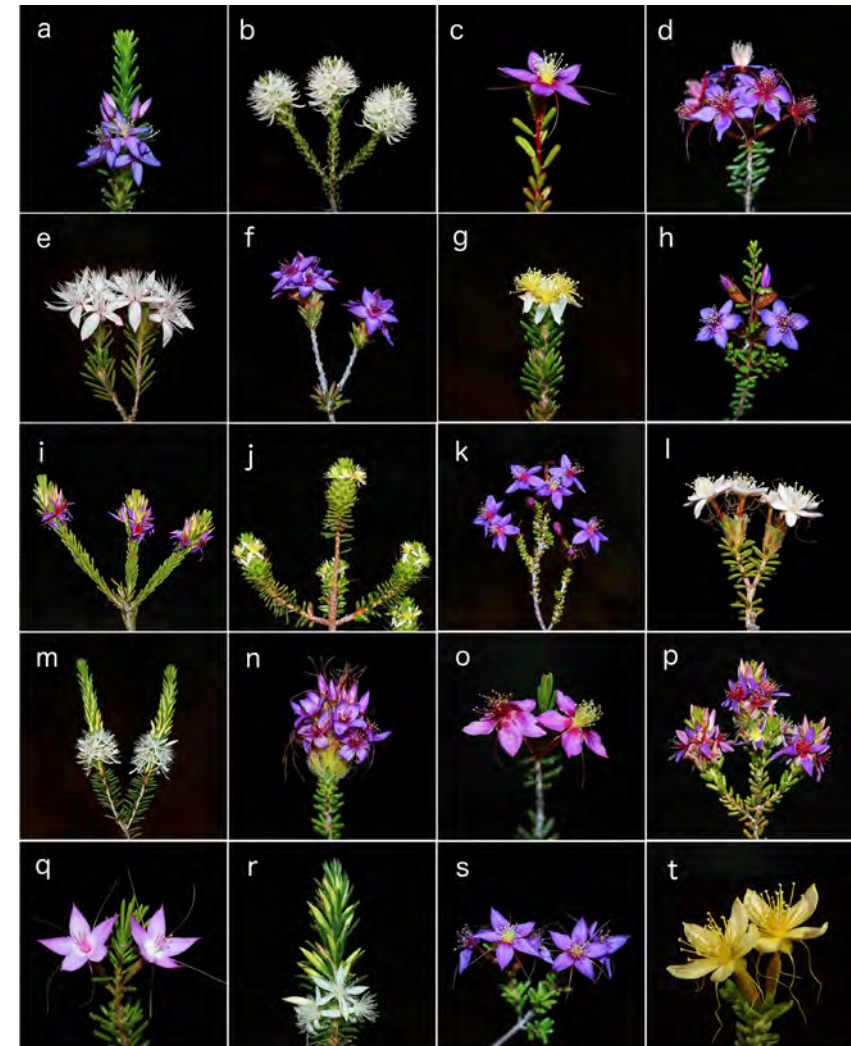


fig. 1 Representative diversity of *Calytrix*: a) *C. sylvana*; b) *C. cravenii* 'Calingiri form'; c) *C. breviseta*; d) *C. gracilis*; e) *C. tetragona*; f) *C. violacea*; g) *C. ecalycata* subsp. *brevis*; h) *C. oncophylla*; i) *C. purpurea*; j) *C. pimeleoides*; k) *C. leschenaultii*; l) *C. involucreta*; m) *C. hirta*; n) *C. sapphirina*; o) *C. gracilis*; p) *C. harvestiana*; q) *C. glutinosa*; r) *C. acutifolia*; s) *C. breviseta* subsp. *breviseta*; t) *C. angulata*. Photos a–s by: Francis Nge, t by Kevin Thiele.

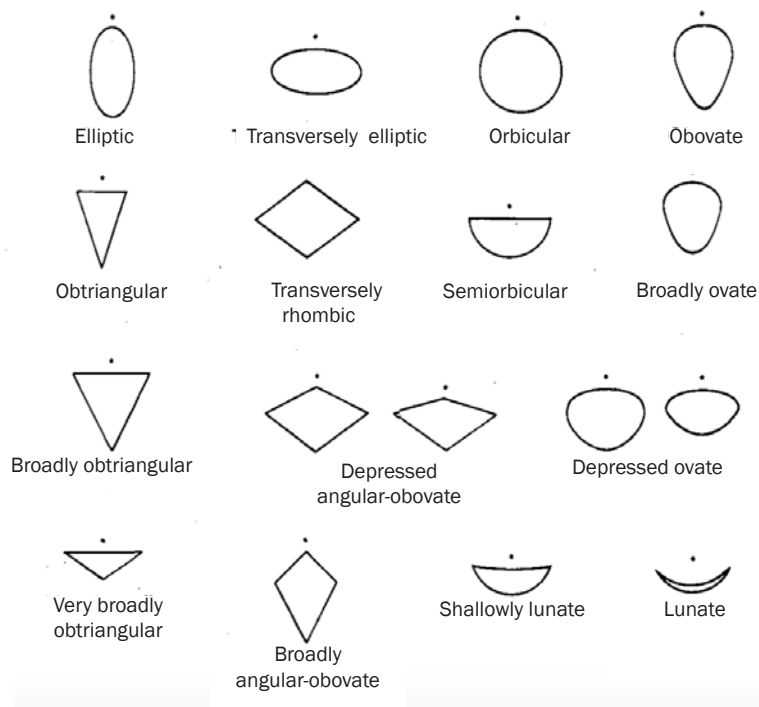


Fig. 2 Shapes of transverse sections of leaf blades of *Calytrix*. Reproduced from Craven (1987b) with permission from CSIRO Publishing.

hensive identification key can be found in Craven's (1987) taxonomic revision of the genus, along with keys specific to subgroups that are allied with the species that were described after Craven's revision.

Several of the floral characters used to delimit the species are specific to the genus. Namely, the morphological variations of the calyx (sepal), bracteoles (cheiridium), and hypanthium structure (Fig. 4). These structures are persistent on plants even when they have finished flowering, and hence can be used for the accurate identification of many species within the genus. The corolla (petal) and staminal morphology (e.g. length, width, shape) are also used to separate several species. However, the number of stamens per flower is quite variable even for just one individual specimen and therefore this character is not particularly useful. Many *Calytrix* species have calyx awns that make up the calyx apex (Figs. 4 and 5). The presence or absence of calyx awns is an important feature for distinguishing *Calytrix* species. Several species including all members of the *C. acutifolia* alliance lack calyx awns (Fig. 5b) (Nge et al. 2017). Species that lack calyx awns can be further distinguished by the shape of their calyx apex lobes. Some

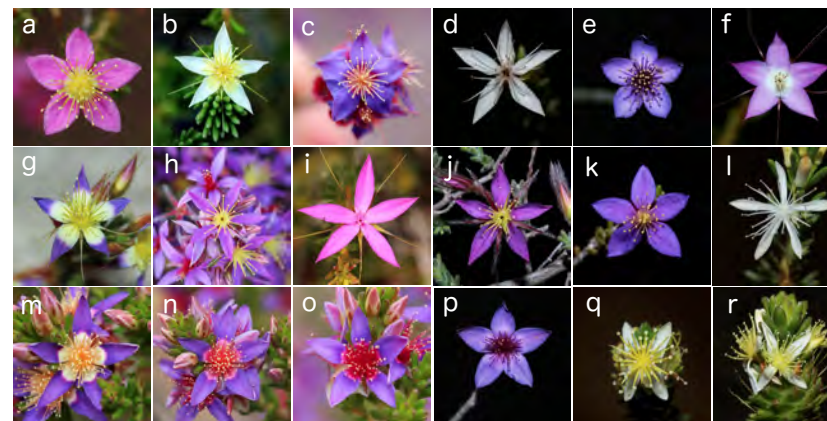


Fig. 3 Representative diversity of *Calytrix* floral morphology: a) *C. brevifolia*; b) *C. angulata*; c) *C. leschenaultii*; d) *C. tetragona*; e) *C. oncophylla*; f) *C. glutinosa*; g) *C. depressa*; h) *C. strigosa*; i) *C. decandra*; j) *C. strigosa*; k) *C. leschenaultii*; l) *C. cravenii*; m-o) *C. harvestiana*; p) *C. violacea*; q) *C. ecalycata*; r) *C. pimeleoides*. Photos by Francis Nge.

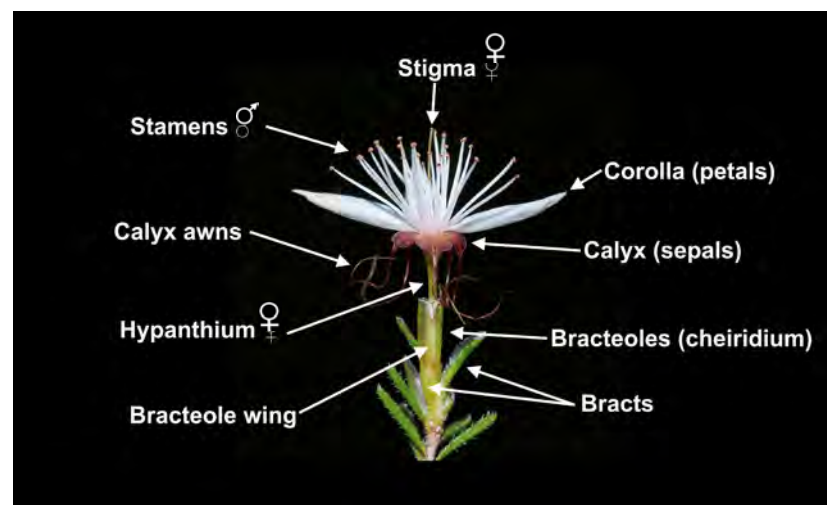


Fig. 4 Floral anatomy of *Calytrix* that are useful for identification.

species such as those from the *C. acutifolia* alliance have emarginate to obtuse margins, others have truncated to rounded apices (*C. smeatoniana*), emarginate to truncate (*C. purpurea*, *C. sylvana*), rounded to obtuse (*C. violacea*), acuminate (*C. harvestiana*) etc. (Craven 1987b). Members of the genus also have a pair of bracteoles (cheiridium) that subtends the hypanthium with translucent bracteole wings (Fig. 4). In some cases, the bracteoles completely cover the hypanthium (e.g. Fig. 5a,b,c) whereas for other species they cover half of the hypanthium



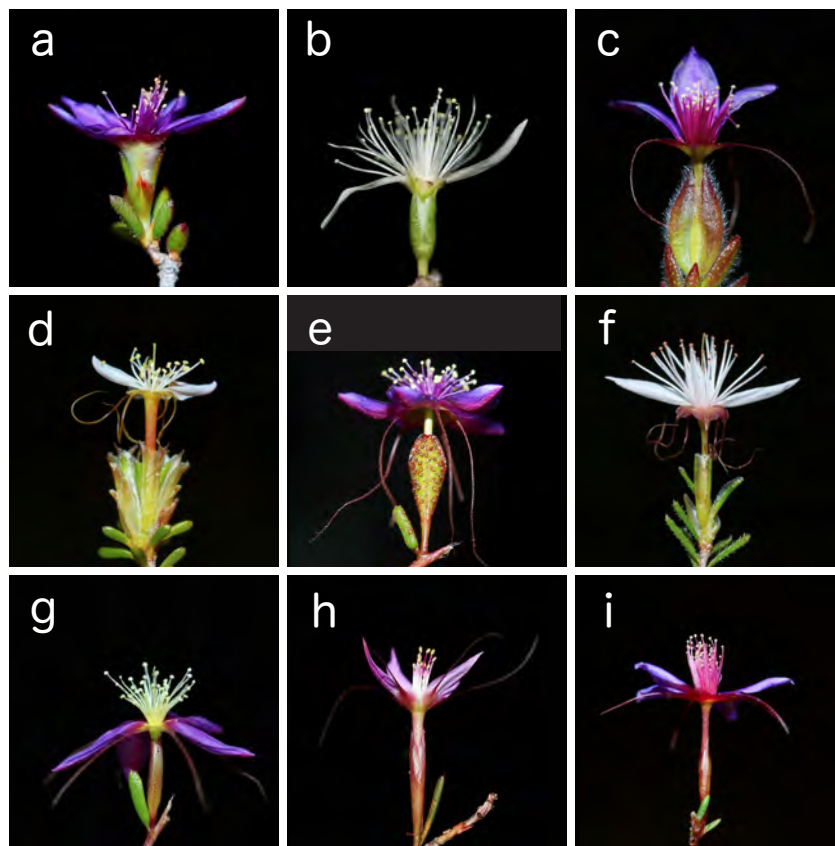


Fig. 5 Transverse floral view of a) *C. violacea*; b) *C. acutifolia*; c) *C. sapphirina*; d) *C. involu-crata*; e) *C. oncophylla*; f) *C. tetragona*; g) *C. breviseta* subsp. *breviseta*; h) *C. glutinosa*; i) *C. gracilis*. Photos by Francis Nge.

(Fig. 5d,f,i). The surface texture of the bracteoles and hypanthium is also another useful character. Some species e.g. *C. violacea* (Fig. 5a) have a hairy hypanthium. Others have noticeably rugose (spotted) hypanthium e.g. *C. oncophylla* and *C. retrorsifolia* (Figs. 5e and 6). The number of ribs of the hypanthium (indentations or protrusions along the hypanthium body) is also a useful definitive character. The presence and absence of indumentum (hairs), their length, and orientation (e.g. erect, perpendicular to or reflexed) on the flowers, leaf and stems of different species are also useful characters for identification. Some species are completely glabrous, whereas others have ciliate leaf margins, others have stems that are densely covered with fine indumentum. All these characters can be easily identified out on the field for anyone with a botanical hand lens. For those who would like to examine the morphology further and have

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APS Victoria Inc

13th FJC Rogers Seminar

Mint Bushes and Allied Genera
LAMIACEAE, Subfamily Prostantheroideae



Prostanthera lasianthos Miriam Ford.



Quoya atriplicina (Prev. *Ptyrodia*)
Kevin Stokes.



Dasymalla terminalis Maree & Graham
Goods.

Prostanthera lasianthos, so redolent of the Australian Bush and many others will feature at the 13th FJC Rogers Seminar, *Mint Bushes and Allied Genera*, being run by APS Yarra Yarra at the Eltham Community and Reception Centre, Melbourne on the last weekend in October 2020.

The subfamily Prostantheroideae of the Lamiaceae has 17 genera some with as few as two known species, some, such as *Prostanthera*, with up to 100. We will focus on *Prostanthera* and *Westringia* and bring in some of the species within other genera such as *Hemiandra*, *Hemigenia*, *Dasymalla* and *Ptyrodia*. Many of the species in the Allied Genera come from WA, and are quite woolly and not so disposed to growing well in the wetter, more humid climate of the Eastern States. However, given the changes we are experiencing who knows, some experimentation may be warranted.

As per previous seminars, we will have available a large range of species that are otherwise difficult to obtain anywhere else. Our approach has been informed and supported by *The Cradle of Incense* by George Althofer, the now lapsed Study Group newsletter *The National Mint* and many of those within the APS NSW Mint bush fraternity amongst others. To register your interest, send your name and contact details to: fjcrogersseminar2020@gmail.com or phone Miriam 0409 600 644.

24 & 25 October 2020.

Eltham Community and Reception Centre, Melbourne. Victoria





Goulding, P M. (2014), *Generalised Regions of Western Australia*. Department of Agriculture and Food, Western Australia, Perth.

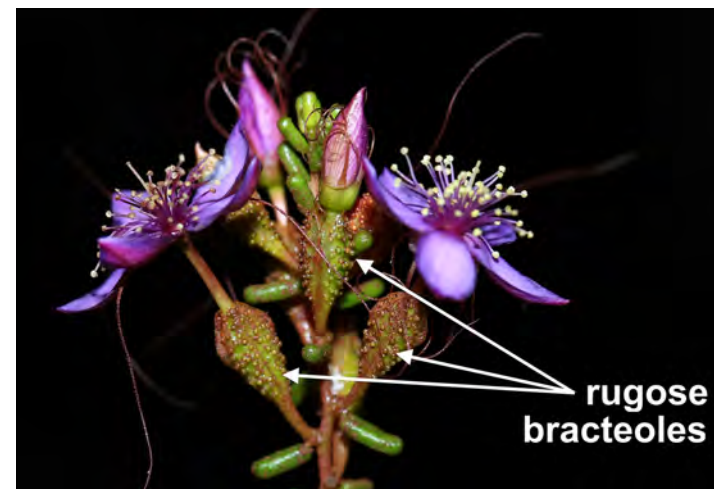


Fig. 6 Rugose bracteoles (cheridium) of *C. oncophylla*.

access to a microscope and dissecting equipment, the hypanthium can be dissected to determine its type. This is done to determine the extent of the free region of the hypanthium (where it joins to the style) (see Figure 3 in Craven 1987 for further details). In summary, the characters listed here have proved to be useful for separating the diverse number of species within *Calytrix*, by paying attention to these key characters one should be able to accurately and confidently identify these beautiful starflowers and appreciate their diverse morphology.

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The pomegranates – *Balaustion* and *Cheyniana*

Jim Barrow.

Jim “retired” from CSIRO as a Chief Research Scientist in 1992. Since “retirement” he has published about 45 scientific papers in refereed international journals as well as devoting much of his time to the Wildflower Society of WA. His contribution is acknowledged by the Wildflower Society Award. He has also written many articles for Australian Plants.

The true *pomegranate* (*Punica granatum*) is native to Iran and northern India. It is important in symbolism: the many seeds in a single fruit have come to stand for prosperity. The ancient Greeks regarded it as the symbol of life, marriage and rebirth. It is also important in the Australian lexicon; the most plausible explanation for our favourite word for an English person is that it derives from the jingle: immigrant, jimmigrant, pomegranate. The word itself means “grainy apple” as is obvious from the German translation “Granatapfel”.

The similarity of our plants to pomegranates was obvious from the beginning. In 1850, James Drummond wrote: ‘I found several remarkable Myrtaceae plants; one appears to be a new genus, with flowers (though smaller) as handsome as those of a pomagranate which they resemble in shape and colour.’ This is also apparent in the naming of the plant. The name *Balaustion* has priority. It was applied by Hooker from the name used by Dioscorides for the flowers of the wild pomegranate. Shortly afterwards, and therefore invalidly, it was also given the name *Punicella*, this time referring to the genus name of the pomegranate. Drummond had wanted to call the plant *Cheynia* after George McCartney Cheyne (1790–1869) and his wife, who were pioneers in the Albany area and who had shown him warm hospitality, but that name was published later and is therefore invalid.

Two different plants have been referred to as native pomegranates. *Balaustion pulcherrimum* (the specific name means very beautiful) is a low shrub with a maximum height of about 20 cm. Long, prostrate stems radiate from the centre of the plant with a series of erect branchlets arising from each stem. The stems are commonly anchored by a single thick adventitious root below one of the erect branchlets. The flowers are large and colourful with a diameter of up to 25 mm and with a smooth, tubular, brightly-coloured hypanthium. They seem to be well adapted for bird pollination with the birds standing on the ground. It often occurs on yellow sandplain in the outer wheat belt and beyond into the pastoral country.



Flowers of the native pomegranite lying on the ground like discarded urns - very colourful ones.

For a long time *Balaustion pulcherrimum* was the only bird-pollinated species within the related group of plants. When a second bird-pollinated species was discovered in the 1920s, Charles Gardner, the government botanist, had no hesitation in allocating it to the same genus, giving it the name *Balaustion microphyllum*. As it occurs in a more-northerly area, inland from Geraldton, he regarded it as evolving in an area isolated from the other species. Actually it only bore a superficial similarity; it differed in the shape of the anthers and of the filaments, the way the fruit dehisces and in the seed morphology.

In 2009, Barbara Rye decided from morphological and DNA evidence that it was a case of convergent evolution and transferred it to a new genus. She honoured the name preferred by Drummond but, as it was invalid, modified it to *Cheyniana*. Thus *Balaustion microphylla* became *Cheyniana microphylla*. It is a shrub up to 45 cm high and can be as wide as 1 m. The flowers tend to be carried on the outside of the plant and are available for bird pollination. She also thought that it should be given a distinct common name and suggested Bush Pomegranate because the flowers are similar but it has a more bushy habit. Because it often occurs close to the wreath leschenaultia, it is probably seen, if not noticed, by more tourists than the other species.





Flowers of the bush pomegranite, showing the hairy hypanthium, suspended from the plant.



And showing the many flowers on the outside of the shrub.

Barbara Rye also decided that a previously-unnamed plant also belonged to this new genus. She named it *C. rhodella* from the Greek *rhodellus* (rose-coloured, pale pure red), referring to its beautiful pink flowers. In contrast to the other two species, it appears to be insect pollinated. With the tendency for bird pollination evolving many times in many different groups it is not uncommon in the south-west for genera to include superficially different plants, with some insect pollinated and others bird pollinated. This is well expressed in *Darwinia* and in several of the pea genera especially *Gastrolobium*.

Hypocalymma – the myrtles

Jim Barrow

The name comes from the Greek, *hypo*, meaning under, and *kalymma*, meaning a veil, an allusion to the calyx falling off like a veil or a cape.

It was recognised early by Endlicher first as a section of *Leptosperma* in 1837, and then as a genus in 1840. He described two species: *H. angustifolium* and *H. robustum*. Since both were published at the same time, it wasn't clear which was to be considered is the type species; *H. robustum* was subsequently chosen because it was closer to the specification of the genus.

It is one of the “good” genera: not only does it come from W.A. but it is regarded as monophyletic; that means that all the species are thought to have a common ancestor and so it is not under threat from the splitter's axe. It is thought to be related to *Rinzia* but it has more, larger stamens with basifixed anthers and terete not flattened filaments. You can see that in many of the photos herewith.

Many of the species are quite prominent and were recognised early with dates mostly in the 1840s and 1850s. Several further species have been added this century. Most of these are rare and many are classified as critically endangered or threatened. One is about as rare as you can get. It is only known from an individual plant displayed at a wildflower show in Perth in September 1935. It was not then identified as a *Hypocalymma* and only exists as a herbarium specimen from which many of the leaves and most of the flowers and fruits have fallen from the stems. But it now has a name: *H. connatum*.

You would think that with all the recent activity, all of the species would now be named. But not so; there are several species listed on Flora base with “manuscript names”. This means that the specimens have been tentatively identified as belonging to this genus, but the work required before they can be assigned a name has not yet been done.

The type species (*H. robustum*) is prominent in bushland near Perth. Its official common name is “Swan River Myrtle” but is usually referred to by Perth people as “Pink Myrtle”.

H. angustifolius is easily the most widespread species occurring from Eneabba in the north to Ravensthorpe in the south and spreading inland as far as Wagin. This wide distribution is accompanied by quite a bit of variation. As you can judge from the name, the leaves are supposed to be linear and sharply three-angled but flat leaf forms sometimes occur. Variable leaf shape is not uncommon in the genus. This species is widely cultivated with a form with pink and white flowers known as “Coconut Ice”. (Hands up those who remember Coconut Ice!)





Swan River Myrtle or Pink Myrtle (*H. robustum*) photographed in John Forest NP.



Coconut Ice, a cultivated form of *H. angustifolium* photographed in a garden in the Grampians, Vic.



H. tetraptera occurs in the northern sandplains and is often in nurseries



H. xanthopetalum occurs in low heath in the northern sandplains from Mingenew to Muchea



H. philipsii occurs only on some peaks of the Stirling Range.



H. strictum occurs in damp places from Augusta to the Ravensthorpe Range.



H. gardneri is restricted to a small area of open sandplain heath near Mt Lesueur.
All photos on this page by Hazel Dempster.



H. asperum occurs along the southcoast from the Stirling Range National Park, inland to Lake Grace and east to Cape Arid





H. elongatum was formally a subspecies of *H. strictum*. It is confined to a small area in Stirling Range NP.



Two plants with manuscript names: left, *H. sp. Cascade* comes from a small area near Esperence; right, the location of *H. sp. Lake King* is apparent from its name.

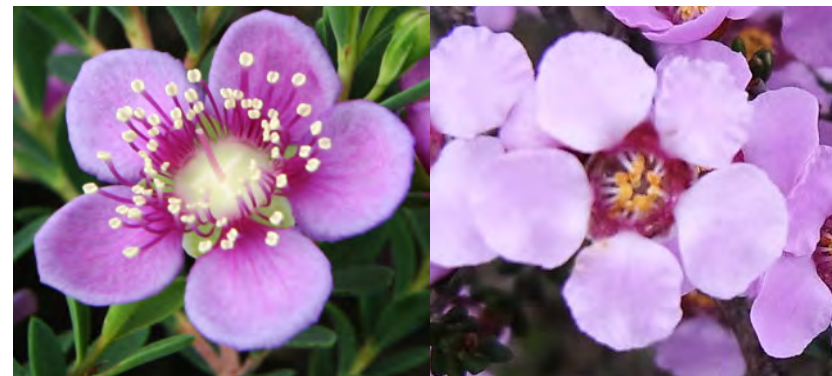
All photos on this page by Hazel Dempster.

***Rinzia* – my special choice amongst the many.**

Hazel Dempster

Rinzia is my favourite genus of the mini Myrtles. The perfection of the flowers of this genus has always attracted my attention when wandering through our fabulous Western Australian flora habitats. They always present themselves in a showy way. The fact that they are usually low-growing or mini shrubs, to me, is an added attraction for horticultural use, especially for today's diminishing garden sizes.

One of my first visions of a *Rinzia*, was around Boyup Brook in WA, amongst the Wandoo trees, where I came across perfect little mounds about 6 cm high and 30 cm across, covered with these perfect pink flowers over the whole surface, without a green leaf to be seen. My perfect plant. I have taken to the *Rinzia* genus since, and love to grow them from cuttings and enjoy their varying winter-spring displays each year the garden.



Compare *Hypocalymma* sp. Lake King (left), with *R. fumana* (right) Photos, Hazel Dempster.

Hypocalymma and *Rinzia* are thought to be closely related. Both have kidney-shaped seeds, anthers that open as slits, and similar fruit morphology. They differ in that *Hypocalymma* has more stamens, the filaments are round in cross-section and the anthers are attached to the filaments at their bottom end. In contrast *Rinzia* has flattened filaments and the anthers are attached in their middle. There are other species with flattened filaments but they do not have kidney-shaped seeds.

There are 17 species in WA, with 7 species having conservation priority. They are small, open, sometimes self-layering shrubs, with most species much less than 1 m, hiding under larger shrubs and in sheltered places. The perfectly-flat, bright flowers seem to show off and give their hiding place away. Their foliage is usually held close to the stems.





They were named after Sebastian Rinz, 1782-1861, and his son Jacob, 1809-1860, both horticulturists from Frankfurt, who introduced many exotic plants to Germany. The species they grew, was named by Schauer in 1843, as *Rinzia fumana*, and this is regarded as the type species. In common with several other plants in this broad group, they have had a complex classification history. For a long time the genus disappeared. The species were put into *Baeckea* in 1867, and later into *Hypocalymma*. The genus reappeared when it was reinstated in 1986.

Further reading.

M. Trudgen Reinstatement and revision of *Rinzia* Schauer (*Myrtaceae*, *Leptospermeae*, *Baeckeeinae*), *Nuytsia* 5:415-439(1986).

B. Rye An expanded circumscription and new infrageneric classification of *Rinzia* - *Myrtaceae: Chamelaucieae* *Nuytsia* 28:39-93 (2017),



Rinzia fumana, the type species, is a prostrate shrub found in the southern Wheatbelt extending into the Great Southern region of Western Australia where it grows in sandy-loam to clay-loam soils.

Rinzia communis is a spreading, straggly shrub found on hills in the southern Wheatbelt, Great Southern and Goldfields-Esperance regions where it grows in sandy to loamy soils. The flattened filaments are well developed.



Seed propagation of 'Mini Myrtles'

Bob Dixon

Bob, now retired, was employed at Kings Park and Botanic Garden for 35 years. There he specialised in managing natural ecosystems, environmental weed control, growing and translocating declared rare flora back into natural and degraded ecosystems.

Introduction

The small Myrtaceae are traditionally grown from cuttings. However, there are exceptions; some species are extremely difficult to grow; sometimes cutting material is not available. At such times you may have to resort to growing them from seed. This will not appeal to some people as it can take longer to produce a flowering plant. However, seedling genetic diversity can produce plants with different flower colour or even prostrate plants from upright growing parents. This genetic diversity is also very important if you are using plants for revegetation purposes as there may well be forms which are also more resistant to insect predation and certain plant diseases. When grown from seed they may also produce a much better root system, including a good tap root, enabling the plants to withstand harsher growing conditions; a good trait in a drying environment.

Collecting your own seed

This can be very easy as long as you have basic knowledge: just common sense really. Plants differ in the way they hold their seed. In the Myrtaceae, the fruit are woody and are of different shapes; some are imbedded in the branches; some are extended. Extended fruit are easy to see. Plants may hold on to their seed for years or seed may be shed annually. This makes it a lot more difficult to collect, as good timing is essential. However, you can bag (using seed sleeves) immature fruit and collect the seed later. Before harvest, make sure the seed is mature by just scraping the fruit. If it is green it is too immature; brown usually indicates it is mature. Make sure the fruit has no tell-tale signs of predation such as small holes in it. When you have multiple years of fruit on the plant, go for fruit that is not too old. A large proportion of old fruit may be predated. Plentiful fruit indicates a good seeding year. Some species may be harvested by cutting off the individual mature fruit; others may have to be harvested by cutting off mature stems and discarding the foliage and small branches. If only slightly immature fruit is available, this can sometimes produce viable seed if you cut off the stems with leaf material on them, and immediately store in airy, dry, cool conditions reducing the risk of fungal diseases (the seed of some species will keep





Different Myrtaceae fruit types, bottom left *Baeckea comphorosmae* and middle *Thryptomene stenophylla* release their seed on maturity whilst other species can retain their seed for many years



Some of the basic equipment, seed sleeves, that can be used for seed collection. The jewellers bag can only be used for terminal bearing seed. You can cut off the end of the branch if necessary to cover the developing seed.

maturing within the fruit). However, slightly immature seed which is a lighter colour than mature seed will not store and needs to be sown as soon as it is released from the fruit. Seed of some species can be shed within days, others may take weeks depending on the species and storage conditions. Always keep an eye on it, as soon as possible, clean the seed of any rubbish using a range of sieves, and sow or store it, making sure there are no insect pests amongst the seed. Before you store or sow the seed, check its viability. Under a hand lens or microscope, cut into the seed with a scalpel or razor blade. If it's white, it should be viable. Note there are environmentally-friendly seed treatments available to control insects such as clay-based materials, basically a dust that literally dries out any insects amongst the seed (treatment sometimes used in wheat bins for control of weevils etc.). The seeds of most Myrtaceae will not store for long periods unless they are properly dried, humidity reduced, then stored in a freezer.

Preparations for seed sowing

When sowing seed, the name of the game is 'keep the scene clean'. It is imperative to use a good quality seed sowing mix which is free-draining and is preferably pasteurised to eliminate any pathogens, particularly fungal spores which will germinate and attack germinating seedlings, and weeds. There are several ways you can clean up 'home made' seed-sowing mixes; check ways of doing this on the internet. Hydrogen peroxide leaves no toxic deposits. Or you can microwave it; make sure there are no fertilisers in the mix before you do this. It is easy to add fertilisers afterwards by placing small quantities of seed mix, plus fertilisers, in a large polythene bag and rolling it around to mix it; don't do it on the floor or dirty benches. The seed is often very small and very difficult to handle. Fresh seeds of most Myrtaceae are easy to germinate without any pre-treatment, but before sowing, older seed may need to be stimulated into germination. The best way to do this is by using aerosol smoke, if available, for 1 hour. It is best applied after the seed has been sown in punnets or pots, as the smoke deposits may stick the seed together. Probably the easiest way, for most people to treat the seed is by soaking it in smoke water 1 part to 10 parts of water (some commercial smoke water may require different ratios). You can do this for about 3 or 4 hours but I prefer to just do it overnight 10 or 12 hours. Then you need to drain off the excess smoke water and place the seed on kitchen towel to quickly dry it out to make sowing much easier as it tends to stick to your fingers.





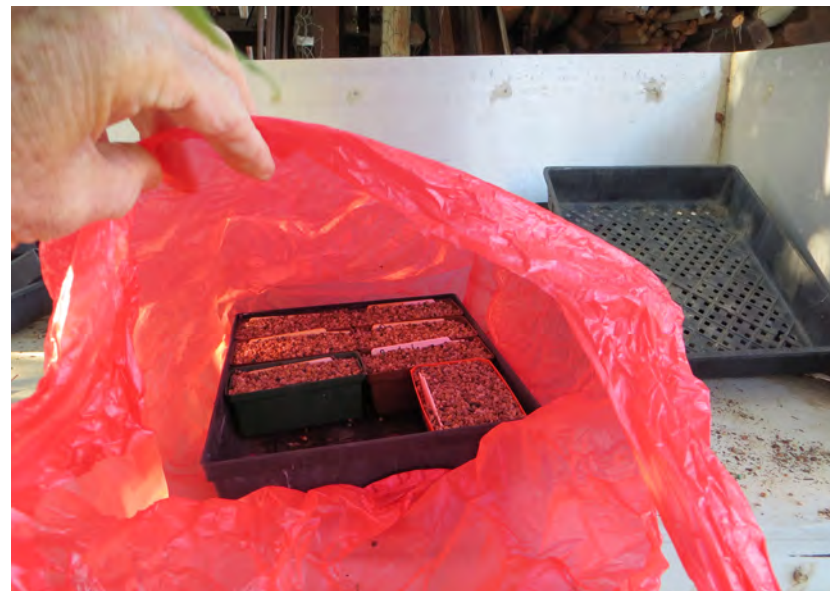
Seed sowing and care

I prefer to sow seed of these species in either early autumn, when it cools down a bit, or mid spring looking at day time temperatures of about 18°C as they need to grow quickly once germinated. Sowing in winter is not a good idea, as seed take much longer to germinate, and you invariably have major problems with too much water. This tends to cause rot; seedlings often succumb to fungal diseases or just die due to waterlogging. Whether you use punnets or pots for sowing, make sure they are also sterilised. Fill up your containers to the top and skim off the excess. Now use a press to firm up the mix and produce a flat sowing surface so the seed can be evenly spread, and the seed will not sink into the mix when watering. When smoke-water treated seeds are dry, if the seed is tiny, I use a small brush to sweep them off the paper and onto the seed-sowing mix. Then cover with a thin layer of sterilised, washed coarse sand (rock) or crushed granite 2–3 mm grist.



Seed sown and crushed rock covering being applied. This holds the seed in place and allows water and air to penetrate.

Now lightly water the seed in. To reduce the risk of fungal diseases such as damping off, you can add natural biological preparations: fungi and bacteria that are antagonists to these diseases. There are a few on the market which do help to control them. In a perfect world, it would be great to now place the seed punnets/pots outside in the elements, wind, sun and rain. However, they are very difficult to manage due to ever-changing weather conditions: too wet, too dry or hot. I prefer to place them in a shed, inside a polythene bag with access to some light, for example I may cover them with a sheet of newspaper. Direct sunlight may cook them. This system will hold in the moisture and therefore there is no need to water – you will not have a problem of overwatering.



After sowing seed they can be placed in a polythene bag to maintain moisture, put in your shed with newspaper on top to avoid any direct sunlight.

They can then be left there until they germinate. If you know they will germinate in 3 weeks you can go off and not worry about them. When you think it's about time they germinated, just check them every couple of days. When germination takes place, remove from the polythene bag immediately and place in a lightly-shaded area, and gradually harden them off. When germinated this way, seedlings will look pale but will quickly adjust to their normal colour.

I prefer to prick out (transplant) the seedlings as soon as they germinate before they are hardened off. This early transplanting will isolate each individual seedling, reducing the risk of losing an entire pot full of seedlings to diseases such as damping off which can go through the whole pot in a couple of days. To get the best quality seedlings when transplanting, you need to hold the seedling by the cotyledons (first seed leaves). These are fairly robust, and minor damage rarely results in the seedling rotting. Hold the cotyledon between the forefinger and thumb. This allows you to place the seedling at potting mix level, just touching the top of the potting mix. The stem can be totally buried, holding the seedling firmly in the mix. After watering the cotyledons will be just above the level of the potting mix. Note: holding the delicate stem usually results in major damage, crushing the seedling stem, resulting in the loss of the seedling.





Small seedlings should be held by the cotyledons to avoid damaging the seedling whilst pricking out.

Very small seedlings are difficult to handle; one way of overcoming this is to sow just a few seeds directly into small pots, rather than a large pot; and thin out later if necessary. Hardening off, or acclimatising the seedlings, as soon as possible is imperative to their survival and normal growth. Do not immediately place seedlings in full sun; they need to be in light shade for a few days then gradually introduced into full sun conditions. Note some species that normally grow in shady conditions may need to be kept in broken sunlight. Plants requiring full sun when grown under shady conditions will result

in their seedlings becoming leggy and never producing a good plant, even with tip pruning. Soft seedlings are also more prone to fungal diseases and insect attack.



Above: a prostrate form of *Melaleuca suberosa*.
Right: seedling of this plant displaying prostrate tendencies.



Mini Myrtles – growing from cuttings.

Hazel Dempster

For Hazel's bio, see page 90.

Members of ANPSA have been growing many mini myrtle species successfully over many years both in the east and west. Cuttings have been the main source of plants. Home grown may be the only way many of the species will be available for home gardens. There are many new desirable genera to try.

Recognized cutting procedures are practiced. The cutting medium found to be most successful is 50% perlite and 50% unfertilised native seedling mix. Cutting containers may be trays placed on controlled benches, trays or pots.

Most of the species grow from cuttings taken after new established growth, or just before flowers start to form. Usually new growth, with a few mm of the previous season, gives the cutting structure to be maintained during the striking period.

Cutting length from a few mm to 10 cm is enough. Clonex Purple Gel is the preferred striking hormone. The cutting stems are dipped 3 cm into the gel. This allows the roots to form up the stem of the cutting, to provide a strong growing base for the plant.

Different genera may take longer to produce roots. The softer-foliage species, especially from wetter habitats strike earlier than those in the dryer parts.

Collection licenses are required for material taken from their natural habitats and are available through the Licensing Department in each state. Interstate collections are restricted by current quarantine regulations.

Methods shown in the photos, can be used by the home gardener for the few plants needed for gardening purposes, or a small hot bed situation, set up for larger numbers.



Plastic storage containers make mini portable 'glasshouses.'





A collection of suitable cutting material from many different species.



Cut-off plastic drink bottles make mini-glasshouses for backyard propagators

Myrtle Rust Impacts in Eastern Australia

Neil Marriott

Neil is an environmental and horticultural consultant who has been carrying out research into West Australian plants for over 30 years, and has covered most of the SW, discovering and describing many plants new to science. He is a life member of APS Victoria. His property 'White Gums' holds a large collection of Western Australian plant species, including from the Myrtaceae family most of which were growing superbly in their large garden areas.

Myrtle Rust is a truly awful fungal disease, having major impacts on many members of the family *Myrtaceae* in much of Eastern Australia. Fortunately it is largely confined to coastal and sub-coastal regions as it requires warm humid conditions for survival and reproduction. Along with many other gardeners, we have put our property on the Myrtle Rust watch list for Victoria – this does **NOT** mean that we have Myrtle Rust, it means that we have a large range of *Myrtaceae* genera, including many highly susceptible species planted on our property which we regularly monitor for any signs of a Myrtle Rust outbreak.

So far the most susceptible species appears to be *Agonis flexuosa*, particularly the dark foliaged cultivars, as well as a number of tropical and sub-tropical rainforest shrubs and trees. Sadly, it also includes some showy Western Australian species including *Chamelaucium* and *Verticordia* species. Here at Stawell in western Victoria we are growing all of these and many more Eastern and Western members of the Myrtaceae family, so are in an ideal situation to monitor them for this insidious disease!

One of the benefits of living inland from the Great Dividing Range is that the air is always dryer than along the coast. For example, when we have hot summer conditions the humidity is usually less than 5% — not the conditions Myrtle Rust can survive in! However according to the Department of Agriculture, Victoria, Myrtle Rust has now been detected at more than 80 sites across the state, mainly at production nurseries and wholesale outlets in and around metropolitan Melbourne. However, detections have also been made at public parks and private residences, as well as at Shepparton, Ballarat, Tynong North and East Gippsland in regional Victoria. Experience elsewhere in Australia shows it won't be possible to eradicate the disease, so the focus in Victoria is now on management to minimise its spread and impact.

An excellent illustrated summary "*Myrtle rust – impact on native Myrtaceae and associated plant communities in Australia*" by Geoff Pegg – DAF Queensland www.appsnet.org/publications/Brisbane_Presentations/Pegg.pdf gives a chilling summary of the disease's impact on



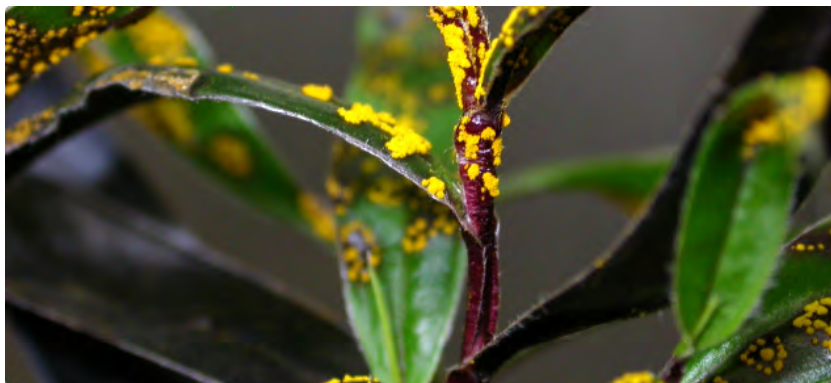


native rainforest Myrtaceae plant species and communities. I recommend readers to the paper so you can see just what the disease looks like, where it has been recorded and the impacts it is already having down the East Coast of Australia. Sadly it is now found all the way from Darwin and Cape York down to Melbourne and Geelong and even in Tasmania! We MUST make sure it never gets to Western Australia –the results would be catastrophic!

I have observed the disease in Peter Olde's garden at Oakdale, SW of Sydney where Peter tells me Myrtle Rust is an irregular seasonal issue, mainly in autumn. Peter says that this year was quite bad in the middle of winter, seriously affecting the *Chamelauciums* and *Verticordias*. *Chamelaucium* 'Woppa Wax' was very severely affected and will probably die. *Verticordia* 'Paddy's Pink' was killed by an attack a few years ago in plantations Peter and son David have for the cut flower trade. New growth on small myrtles in the plantation is severely affected.

As a result Peter and David do not grow many *Myrtaceae* now to keep the gardens looking good. Some *Verticordia* are never happy - possibly due to myrtle rust. The plants under attack can certainly recover – witness *Verticordia* 'Paddy's Pink' which is looking lovely now but did get hit a few years back. *Pileanthus* are fortunately unaffected at present.

In summary, Myrtle Rust is out there lurking in the bush and in gardens, just waiting for the right conditions to spread. For this reason, readers should be extremely wary when buying Myrtaceae plants from nurseries – ensure that the nursery is maintaining strict fungus control procedures. It is also highly risky to take Myrtaceae cutting material from areas that have had Myrtle Rust outbreaks. It is just not worth the risk! Make yourself knowledgeable on what it looks like and keep alert. In the garden, grow small Myrtles only in open, sunny sites without crowding.



Myrtle rust on the After Dark variety of *Agonis flexuosa*.

Myrtle Rust Impacts in Western Australia

Hazel Dempster

I have been following the story of Myrtle Rust since it was first detected in the eastern states in 2010. The highest alert in plant disease management was given with the hope the disease could be eradicated before it spread. There were comments, expressed with alarm, as it spread quite rapidly because of the widespread range of members of the Myrtaceae family in that part of the country. Control methods were quickly circulated, and small areas managed. The spread continued with much of it following the trail of nursery plants being delivered to garden centres and plants outlets up and down the east coast. A ban on all Myrtaceae material nursery, plants, seed and herbarium material coming into WA, was put in place because of the unknown effect on the rich biodiversity there. Alarming to WA the alert level system in the east was downgraded to management only in those states, as it could be seen that full control and eradication may not be possible.

The disease has not been detected in WA where the state has most to lose because much of our unique flora is potentially susceptible. The citizens of WA would not be aware of the impact the rust will have in WA economically, based on the seasonal tourist influx.

Myrtle Rust produces lesions on young, actively-growing leaves and shoots, as well as on fruit and sepals. Leaves may become buckled or twisted as a result of infection. Plants affected by the fungus exhibit bright yellow or orange-yellow spores. Occasionally, they may have dark brown spores. Severe rust of young trees may kill shoot tips, causing loss of soft leaders and bushy habit.

All states except WA have reported findings. Rust is highly transportable. The most common dispersal mechanism is wind, but they may also attract bees, both introduced and native species to spread the spores. The spores can also be spread via contaminated clothing, infected plant material, insect movement, on goods and equipment. Visiting travellers from rust prone areas are encouraged to be aware of what they may carry with them when travelling to WA.

What does the future hold for our flora? Perhaps we may be saved by drying climate as most rust diseases need moisture and a set of temperatures to grow and spread. The total effect is unknown on a flora already being threatened with constant disturbance, by dieback disease, and by entry to many still-pristine landscapes by people using off-road vehicles and looking for new places to see and play.



