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This issue is dated March 2010 to maintain sequence. It was, however, compiled in August 2010 and may mention occurrences that occurred between these dates.

Australian Plants articles

Australian Plants is published quarterly to promote knowledge of Australian native plants.

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Introduction

Merle Thompson

Welcome to the second half century of the *Australian Plants* journal.

The last issue celebrated the journal's milestone of fifty years. With this issue we mark the 200th edition. The editorial committee hopes to supply Society members and subscribers with many more years of issues which will promote knowledge of Australian native plants and provide you with enjoyment and satisfaction.

It is our plan to produce some issues which are "themed", that is, they will be devoted to a specific area of interest such as a plant family or genus, an area within Australia or a botanic garden. Others will be of a more eclectic nature with a range or topics.

The current issue is of the latter type and is far-reaching in its subjects.

In the first article Mark Abell considers the growing of native Australian plants in a medium which is probably new to many readers – aquaria and terrariums. He describes a selection of native plants for this purpose. Some of these plants are also applicable for those with ponds, dams and water features. They should also be studied by those interested in plant communities of the waterways.

Geographically Norfolk Island is not part of Australia but politically and administratively it is an integral part of our nation. It also shares an historical link with the early white settlement. Captain James Cook thought that the Norfolk Island Pine, sometimes described as the world's most symmetrical tree, would have timber appropriate for ships' masts. This was not the case, but the interest led to the Island being a penal settlement. Kevin Mills provides us with insight into the flora of Norfolk Island and its similarity to that of Australia.

Christine McRae tells us of the native grass, *Microlaena stipoides* and its potential as a water saving, attractive lawn.

Doug Rickard and Margaret Bradhurst are 'botanical travellers' and find that the flora of Western Australia is a magnet they cannot resist.

They describe for us the flora they encountered in the Stirling Ranges.

In relation to horticulture, Bruce Higgs writes of the concern for the future of the seed collecting industry and Paul Carmen tells us of the progress with developing a checklist of Australian cultivars.

We conclude with a review of a book on correas by former ANPSA Study Group leader, Maria Hitchcock.



Native Plants for Aquaria

Mark Abell

A large part of Mark's childhood was spent around native plants and SGAP, as it was then known, through his father's involvement. He is also involved with native freshwater fishes (through a group called ANGFA – Australian & New Guinea Fishes Association). Thus aquatic plants represent an overlap in two of his main interests (fish & plants).

The article was prepared with assistance from Dave Wilson, proprietor of Aquagreen, a nursery specialising in Australian native aquatic plants and fish.

Plants have been popular in aquaria for a while; they can add greatly to the aesthetic appeal of aquaria and stop fish tanks from just looking like a “cube of water”. Some of the more extensively planted aquaria are quite beautiful in their own right and they can represent an entire ecosystem in miniature. These carefully designed and crafted planted aquaria are often referred to as aquascapes.

The growing of lushly planted aquascapes has become more accessible in recent years, owing to much of the required hardware becoming cheaper and more widely available. The requirements for growing plants in aquarium conditions are also much better understood. High quality lighting, aquatic plant fertilisation (including CO₂), engineered plant substrates and suitable filtration are all readily available. This all makes it possible to produce very attractive underwater gardens in miniature.

In addition to their visual appeal, the inclusion of plants in aquaria provides a number of other benefits. These include -

- Water purification – growing plants will take up fish wastes and use them as a fertiliser (this includes ammonia and some metals)
- Improved fish health – most fish are less stressed in planted aquaria, the plants provide cover and fish can also benefit from eating some plants.
- Plants will add oxygen and remove CO₂ from the water.
- Plants can help to control algae.
- They help stabilise the pH of the tank water.
- They prevent substrates from becoming toxic.

Starting in the 1930s, and mainly developed in the Netherlands, is what is often referred to as the “Dutch Style” aquarium. These tanks focus on a lush arrangement of plants, with the plants layered from front to back, low to high and making use of a wide range of plants of different colours and textures. They are constructed in a manner similar to the

more classic garden borders. Like good garden borders they also require significant maintenance to keep them looking good.

Another type of aquascape is the “biotype aquarium”. This consists of fish and plants from a single area and is used to create an aquascape that tries to represent the natural environment of the area chosen.



Daly River biotype – a tank setup to replicate a section of the River

Below: Aquascape Howard River

More recently, in the 1990s, Takashi Amano popularised an aquascape style based upon Japanese design principles. This was a much more naturalistic style of planting that was often intended to represent a larger landscape in miniature. These designs also make greater use of rocks and logs for some hard landscape elements. It is worth noting that, whilst these designs look more natural than the “Dutch Style”, they also often require significant maintenance.

Many of the plants that Amano used were previously not very well known. One of the carpeting plants that he used extensively was *Glossostigma elatinoides*. That this is an Australian native (which at the time was unknown in the local aquarium circles), created interest in seeing what other native plants would also be suitable for use in aquaria. Subsequent testing of Australian natives has revealed a rich (and expanding) set of plants that are suitable for aquatic use.



Owing to the efforts of some aquarists, knowledge about suitable species (and their growing requirements) is expanding, and today there is a wider range of native aquatic plants available than ever before. These cover a wide variety of different forms and growth habits. With a wide range of plants tested and available, you can now achieve beautiful aquascapes by using only Australian native plants.

What follows is an overview of some of the many native plants that are suitable for aquarium use. Much like the way gardening books break plants into different categories (i.e. trees, shrubs, ground covers, climbers), it is useful to make some similar groupings for aquatic plants.



Just like with a good garden, it is important to realise that some ongoing maintenance is required to keep your aquatic garden looking at its best.

Foreground Plants

These are the lower growing aquatic plants (somewhat analogous to ground covers and small shrubs). They are typically planted towards the front of a planted tank. In nature they tend to be found in shallower waters at the margins of waterbodies and as a result have higher light requirements than many of the plants that people may be used to.

Elatine gratioloides – “Waterwort”

Found in all states of Australia, this pale green carpeting plant is easy to grow under strong light.

Glossostigma elatinoides “Small Mudmat”

Widespread across much of non-tropical Australia, this plant grows well under strong light. It was made popular by Takashi Amano in his “Nature Aquarium World” books.

Lilaeopsis brisbanica – “Brisbane River Grasswort”

A rare plant that is currently only known from a section of the Brisbane River. As well as growing in fresh water, this plant can also handle more saline conditions. It also requires high light to maintain its carpeting habit.

Other plants that can be used as foreground plants include -

Hydrocotyle tripartita “Pennywort”

Glossostigma diandrum: “Small Mud Mat”

Mimulus repens – “Maori Musk”

Background Plants

These are taller plants (analogous to trees and large shrubs) and, as such, are used towards the rear of the tank to provide height and a backdrop for the rest of the planting. Many of these plants have less demanding light requirements and this group contains many of the easier to grow plants. Many will require regular trimming to keep them looking at their best.

Valisneria nana – “ribbon grass”

One of the long time aquarium staples, this is a widely available and easy to grow plant. This plant can vary considerably over its range and some of the different forms are worth seeking out. Owing to its vigorous nature and the ability to spread via runners, it can come to dominate if it is not regularly thinned out.



Glossostigma elatinoides



Elatine gratioloides



Hydrocotyle tripartita



(L to R) *Hygrophilla angustifolia*, *Ottelia alismoides*, *Valisneria nana*

Bacopa monniera

This round leafed plant is found in shallow waters near the coastal areas along the east coast. Some forms coming from brackish water are salt tolerant. It is also found overseas where it is known of as the herb “Brahmi”.

Limnophilla brownii – “Darwin River Ambulia”

From Northern Australia, this plant has fine feathery leaves that make for a good foliage contrast to other plants. It grows by a runner along the substrate, with the feathery upright stems. If allowed to grow above the water, the emerge leaves lose their feathery form.

Myriophyllum spp. – “Millfoil”

There are quite a few *Myriophyllum* species found around Australia and most of them are suitable for aquarium use. Like *Limnophilla*, they have feathery submerged leaves with a different emerge form. They are generally amongst the easier to grow aquatic plants.

Pogostemon stellatus – “pogo”

Found across the far north of Australia, this is a popular and attractive background plant. Depending on the original collection location are a

number of different forms available. When grown under strong light the leaves will show better colour.

Hydrilla verticillata

This widespread and easy to grow plant is found in all mainland states. It can easily be confused with the introduced weeds *Elodia canadensis* and *Egeria densa* and in some sites two or more of these species can be found together. It can be distinguished from the introduced weeds by the toothed margins present on the leaves. It can thus be used as a direct replacement for the above weeds in aquaria and ponds.

Some other plants that make good background plants include -

Potamogeton spp. – “Pondweed”

Rotala mexicana *Triglochin procerum* – “Water Ribbons”

Hygrophilla angustifolia “Willow hygro”

Feature Plants

These are more distinctive plants that are often used to create a focal point in an aquascape. As such, they tend to be used in the centre third of the tank.

Eriocaulon setaceum

Found in the northern parts of Australia, this attractive fine leaved plant can be somewhat difficult to grow. It requires high light, soft acidic water and prefers lower nutrient levels.

Blyxa aubertii

This tropical plant can appear similar to *Valisneria nana*, but does not form runners and stays in a tight clump. It requires good light and a fertile substrate for best growth. Whilst in the wild it is an annual, with more consistent growing conditions it will last longer than one season.

Aponogeton vanbruggenii – “NT Lace Plant”

From the tropical areas of NT and QLD, this is a distinctive plant with ruffled leaves that show striking venation. It benefits from a fertile substrate and some forms show red colouration under strong light. To survive the dry season the plants produce an edible tuber.

Ottelia alismoides

This plant is found in NT and QLD and makes a striking feature plant for a larger aquarium. It grows best under strong light and with a rich substrate. Whilst an annual in the wild, it lasts considerably longer under good conditions.



Limnophylla brownii [inset foliage]



Pogostemon stellatus
Below – flower



Eriocaulon setaceum



Ottelia alismoides [inset foliage]



Aponogeton vanbruggenii

Unusual Plants

There are a number of plants that have features that make them stand out as being a bit different from most other plants.

Ceratopteris thalictroides – “Water Sprite”

An aquatic fern that is found throughout tropical Australia. In the dry season it can grow emerge (as pictured), or fully submerge in the wet. It can grow either rooted in the substrate, or floating on the surface. It can



be propagated from the plantlets that appear on its fronds. It is a hardy and vigorous plant that is widely grown and readily available.

Utricularia gibba, *U. australis* – “Bladderwort”

These are insectivorous plants that trap small aquatic creatures using bladder-like traps. These highly specialised traps are triggered when hairs at the entrance are disturbed, causing anything near the entrance to be swept in. Any small animals caught inside are then dissolved and used by the plant as a source of nitrogen. These plants are free floating and have fine thread-like leaves and stems.

Marsillea hirsuta – “Hairy Nardoo”

This fern has “four-leaf clover” type leaves which are hairy when grown in its normal emerge form. However, when grown in an aquarium with medium light, its submerge form produces runners with single lobed leaves.

Nymphaea nouchali

This is a waterlily where the submerge form of the leaves (pale green above, purplish below) makes for a striking feature plant. It is found across tropical Australia and likes a rich substrate and water above 25 degrees. If the water is deep enough (> 30cm) it has been known to flower underwater.

Floating plants

Better used in open topped aquaria (and in outside water features), where they can be seen from above, are floating plants. Their generally rapid growth and the capacity to reduce the light from reaching deeper in the tank can make them useful as a way to handle excess nutrient levels and to assist in controlling algae problems.

Azolla pinnata and *A. filiculoides*

These plants are widespread aquatic ferns. Outdoors and in strong light they often take on a red colour. They are undemanding and vigorous plants.

Spirodella spp. – “Duckweed”

This common floating plant has small pale green leaves with a purplish underside. As well as ducks, many fish find this a desirable food. It can, however, spread quickly if the fish in the aquaria are not particularly interested in it.

Marsillea mutica – “Rainbow Nardoo”

This widespread plant has leaves that look somewhat like a floating “four-leaf clover”. It is, however, a fern. The leaves are about 4cm across and have an attractive two toned pattern.



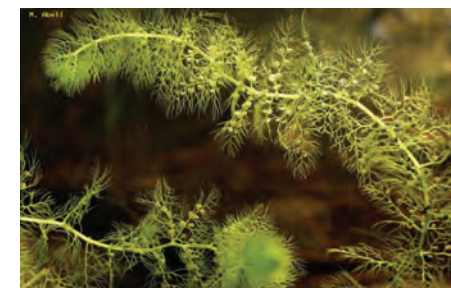
Ceratopteris thalictroides



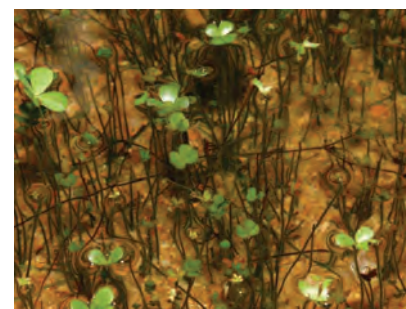
Azolla pinnata & *A. filiculoides* growing together which is unusual Richmond River Casino NSW



Spirodella punctata



Utricularia australis



Marsillea hirsuta (grown submerge)



Ceratophyllum demersum



One of the many native planted aquaria at the Territory Wildlife Park Aquarium



Ceratophyllum demersum – “Hornwort”

This is another widespread plant which is very easy to grow. It can be anchored to the substrate, but it prefers to float just below the surface.

It has long been a popular aquarium plant and is good for helping to control algae. The thick floating tangles it can create are excellent habitat for young fish and tadpoles.

Some common weeds

It is also worth keeping in mind that many weeds have started out as aquarium and pond plants. You should be particularly careful with any plants used outdoors, and ensure that measures are taken to prevent any escapes into nearby waterways. The following are some of the plants that have in the past been used in aquaria and are now weeds.

They should not be used in your aquaria or ponds and need to be differentiated from some often similar looking native plants.

Cabomba caroliniana – “Fanwort”

Egeria densa – “Dense Waterweed, Elodea”

Myriophyllum aquaticum – “Parrots Feather”

Hygrophilla polysperma *Salvinia molesta*

In conclusion...

The plants mentioned above are only a small sample of the possible range of natives that can be used in aquaria and the range of possible plants is still expanding. It can be seen that there is a wide range of Australian native aquatic plants that can be used to create beautiful native aquascapes. When further combined with small native fish and invertebrates, you can end up creating ecosystems in miniature.

Photos by Dave Wilson and Mark Abell

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The Plants of Norfolk Island

Kevin Mills

Dr Kevin Mills has spent more than 25 years studying the rainforest in southern NSW and over the past few years has been researching the plants and vegetation of Norfolk Island, including the history of its botany.

Introduction

Norfolk Island and its outlying islands, discovered by James Cook in 1774 and settled as a convict penal colony in 1788, lie about 1,500 kilometres to the east of Australia. Situated beyond Lord Howe Island, it is a remote self-governing Australian territory. The climate is subtropical; at 29° south the island group is located at the same latitude as Coffs Harbour on the north coast of New South Wales. For a botanist from eastern Australia, the plants are mostly very familiar, as Norfolk Island shares more plants with Australia than with any other region.

Subtropical rainforest originally covered most of the island, the flora being derived from the surrounding, albeit distant, land masses. The rainforest exhibits many of the characteristics of a subtropical rainforest: palms are prominent, vines and creepers, including some large lianas, are common, there are many fleshy-fruited species, some trees have buttressed trunks, and several species have large leaves. Epiphytes are common, while ferns make up a large proportion of the Norfolk flora.

There is also a coastal flora. Many species typical of coasts throughout the south-western Pacific region grow on the foreshores of the islands.

The isolation of the island in the middle of a large ocean, the latitude and the geographic location between Australia, New Zealand and the tropical islands to the north such as New Caledonia, were paramount in determining the characteristics of the rainforest that evolved on Norfolk



Broad-leaved Meryta, *Meryta latifolia* (Araliaceae), which is endemic to the island.

All photos by the author

Island. Of the 181 recognised indigenous taxa, 51 percent is shared with Australia, 33 percent with New Zealand, 21 percent with New Caledonia and 6 percent with Fiji. About 39 percent is shared with Lord

The upland rainforest is pictured on Page 209 and the lowland rainforest is pictured on the back cover. In the latter, the large buttressed trees are Whitewood, *Celtis paniculata*, and the liana is Samson's Sinews, *Callerya australis*.



Howe Island, the closest land mass, about 900 kilometres to the southwest. The higher percentages for Australia and Lord Howe Island are due to the fact that the dominant weather systems approach from the west, so that the likelihood of transport of plant propagules, whether they are wind-blown spores and seeds or floating vegetation, is greater from that direction.

Like many islands, endemism is high; the endemic plants account for about 24 percent of the total indigenous flora.

It is of interest to compare the Norfolk Island flora with that of Lord Howe Island and the Kermadec Islands, the three island groups being subtropical and located at a similar latitude and all are remote from major land masses. Some comparisons are tabulated below. The numbers of indigenous and endemic species correlates well with the age of the island group; i.e. the older the islands, the higher number of species are in each category.

Comparison of location and flora of Norfolk, Lord Howe and Kermadec Islands			
Attribute	Norfolk	Lord Howe	Kermadec
Latitude	29° 02' S	31° 28' S	29°-31°30'S
Longitude	167° 56' E	159° 09' E	178° W-179° W
Area of islands	36 km ²	12 km ²	34 km ²
Approximate age	c. 3M years	c. 6.5M yrs	<1 M years
Highest point	316 m	875 m	518 m
Distance from Australia	1,500 km	580 km	2,500 km
Distance: New Caledonia	800 km	1,200 km	1,700 km
Distance: New Zealand	700 km	1,300 km	960 km
No. of indigenous plants	181 (33%)	241 (52%)	116 (41%)
No. of introduced plants	375 (67%)	218 (48%)	167 (59%)
Total no. plants	556 (100%)	459 (100%)	281 (100%)
No. fern species	45 (25%)	59 (24%)	41 (36%)
No. endemics	43 (23.7%)	105 (43.6%)	21 (18%)
Species shared – Norfolk		66 spp. (39%)	43 spp. (24%)

Plants shared with NSW

The habit and number of Norfolk Island plants and the numbers shared with NSW are tabulated below. The 91 species of indigenous Norfolk Island plants shared with NSW represent 50 percent of the island's flora. The number of shared genera is very high at 87 percent.

Habit	Norfolk Island		Shared with NSW	
	Species	Genera	Species	Genera
Trees	31	30	8	18
Shrubs	17	14	3	12
Vines/Creepers	19	17	10	18
Forbs	31	26	21	23
Grasses	15	14	11	13
Orchids	11	9	3	7
Ferns	45	31	26	30
Sedges/Rushes	12	8	9	8
Total	181	149	91 (50%)	129 (87%)

Among the forest plants shared with NSW are some that are common in the Sydney region, including Brush Bloodwood *Balogia inophylla*, Scrambling Lily *Geitonoplesium cymosum*, Four-leaved Peperomia *Peperomia tetraphylla*, Hopbush *Dodonaea viscosa* and Wandering Jew *Commelina cyanea*. Ferns, as one would expect because they are easily dispersed, are mostly shared with NSW. These include Bird's Nest Fern *Asplenium australasicum*, Binung *Christella dentata*, Common Rasp Fern *Doodia australis*, Oak Fern *Histiopteris incisa* and Climbing Fern *Arthropteris tenella*. The two regions share many genera, although the species in each are distinct. These genera include *Pittosporum*, *Myrsine*, *Dendrobium*, *Pisonia*, *Elaeodendron*, *Myoporum*, *Pouteria*, *Wikstroemia*, and the ferns *Cyathea* and *Blechnum*.



Kurrajong, *Wikstroemia australis*

Many coastal plants are also shared with NSW, including Coastal Jack Bean *Canavalia rosea*, Salt Couch *Sporobolus virginicus*, Knobby Club-rush *Ficinia nodosa*, Goat's-foot Morning Glory *Ipomoea brasiliensis*, Sea Daisy *Melanthera biflora*, Swamp Lily *Crinum pedunculatum*, Pigface *Carpobrotus glaucescens* and New Zealand Spinach *Tetragonia tetragonioides*.

Some interesting species

Interesting plants on the islands include the endemic taxa. These taxa have evolved from plants that arrived in the distant past into different species, subspecies, varieties or forms. The lofty Norfolk Island Pine



Araucaria heterophylla is ubiquitous across the island, growing to over 50 metres on the ridges running from the mountains and towering well above the rainforest canopy. This is a well known tree around the world, often planted along seaside promenades. Other species of *Araucaria* occur in New Guinea, Australia, South America and, with 13 of the recognised 18 species, New Caledonia.

The endemic Mountain Rush *Freycinetia baueriana*, a relative of the *Pandanas* or Screw Pine of subtropical and tropical shores including northern NSW, produces large clusters of red fruit encircled by red bracts. A most spectacular plant, it climbs high into trees using aerial roots that attach to tree trunks. This plant is closely related to *Freycinetia excelsa* of far north-eastern NSW and Queensland.

Another endemic genus, the Phillip Island Glory Pea, *Streblorrhiza speciosa*, is extinct and has not been reported on the island since 1830. Soft Wood *Achyranthes arborescens* is quite a rare rainforest tree, having been greatly reduced in abundance, but has more recently been planted around the national park. This plant is the largest species in the genus.

The tree Bastard Oak *Ungeria floribunda* is a botanically important species because the genus is endemic to Norfolk Island. This tree produces large inflorescences of red flowers and relatively large brownish ribbed fruits.

A relative of the stinging nettle is the Nettle Tree *Boehmeria australis*, a species that also grows on the Kermadecs. Unlike other species in the family, this tree does not have stinging hairs. A large vine known as Devil's Guts *Capparis nobilis* clammers high into the tree canopy, and produces large white flowers and purple, tennis ball sized fruit. The long, rampant stems bear prickles, hence the alternative common name of 'wait-a-while'.

The palm *Rhopalostylis baueri* is a prominent tree in most of the rainforest gullies. This species is shared with the Kermadec Islands, northeast of New Zealand.



The ripening fruits of the palm *Rhopalostylis baueri* (Arecaceae).

Two indigenous tree ferns grow on Norfolk Island. The endemic species *Cyathea brownii*, is reputed to be the tallest fern in the world, growing to over 15 metres. The other species is an endemic subspecies, *Cyathea australis* subsp. *norfolkensis*, which is closely related to the common tree fern in New South Wales.



Ti, *Cordyline obtecta*



Evergreen, *Alyxia gynopogon*



N.I. Euphorbia, *Euphorbia norfolkiana*



Phillip Island *Hibiscus insularis*



Upland rainforest; the large trunk is the Norfolk Island Pine *Araucaria heterophylla* the large leaved plants are Narrow-leaved Meryta, *Meryta angustifolia*. Both are endemic to the island.



Conservation

The plants of Norfolk Island have been severely impacted since Europeans arrived 222 years ago. About seven plant species have become extinct on the island over that time; the exact number will never be known. Two species are extinct, including the endemic genus *Streblorrhiza*, while the others still occur in other regions. Most of the island was cleared in convict times, i.e. pre-1850, and all of the island was subjected to grazing by stock until several decades ago.

Continuing threats include introduced plants and animals, particularly rats and woody weeds. The main weeds are Cherry Guava *Psidium cattleianum*, Olive *Olea europaea* subsp. *cuspidata* and William Taylor (Mistflower) *Ageratina riparia*.

Norfolk Island National Park covers about 650 hectares, including all of the 190 hectares of Phillip Island, representing about 18 percent of the land area of the island group. Norfolk Island Botanic Garden, covering 5.5 hectares, is also managed by Parks Australia, a Commonwealth government agency. Sections of the coast of Norfolk Island and Nepean Island are set aside as public reserves and are managed by the Norfolk Island Administration for conservation.

About 25 percent of the indigenous taxa are listed as threatened under Australian legislation. While some of these species are common, others are very rare in the wild and are critically endangered. A recovery plan has recently been prepared for the listed threatened plants and animals, but funding is required to adequately address the threats to these species.

[illegible]

Microlaena stipoides as a lawn, picture courtesy of Native Seeds Pty Ltd, Cheltenham, Victoria.
See article on next page.

Microlaena stipoides – An Australian Lawn

Christine McRae

*Adapted by Merle Thompson from a talk to the Central West APS Group
Christine lives in the Mudgee area (Central West, NSW) where she and
her husband run sheep and cattle on native pastures. She is interested
in native grasses and their place in our environment. Christine is also
involved in a Conserving Native Grasses in a Rural Cemeteries project
with Mid-Western Regional Council advisory Environment Group.*

As gardeners, many of us will have experienced the effects of water restrictions, either imposed by local authorities or by our own limited resources. Many will have also met with vigorously growing lawn species such as Couch, Kikuyu and Buffalo grasses that invade our garden beds and other areas where they are not wanted. I would like to present to you the life history attributes of an Australian native grass, *Microlaena stipoides*, and how these attributes can be utilised to establish an attractive and relatively low maintenance lawn.

The *Microlaena* genus comprises about ten species which occur in Australasia and the Pacific Islands. *Microlaena stipoides* is one of two species native to Australia, the other being *Microlaena tasmanica*, which, as the specific epithet implies, is endemic to Tasmania. *M. stipoides* occurs in all Australian states except the Northern Territory, and also in New Zealand.

While the geographic distribution of *M. stipoides* is widespread, the environmental factors influencing abundance are rather specific. *M. stipoides* is tolerant of acidic soils down to a pH of about 3.9 as the roots possess the ability to exclude the uptake of soluble aluminium. This can reduce competition from other less tolerant species. Higher altitudes to about 1,000m are preferable as well as an annual precipitation above 750mm. The species tolerates higher nitrogen levels than most other native grasses, and is therefore common on the fringes of sheep camps or dominant on old sheep camps. Frequent soil disturbance discourages establishment and growth at all stages. *M. stipoides* is more frequent in minimally cleared sites and often dominant under mature trees with a canopy cover of between 80% and 90%.



Christine with members of Central West Group
in a paddock of *Microlaena stipoides* and other
native grasses Photo: Merle Thompson



Microlaena stipoides is a slender perennial grass with a short, creeping rhizome and often prostrate, stoloniferous stems. Plants may be tufted and erect, or prostrate, and, with adequate moisture, will remain green all year. The inflorescence is a narrow drooping panicle or raceme with branches and pedicels to one side. Spikelets are solitary and are composed of three florets, the lower two sterile and reduced to strongly awned lemmas, while the upper fertile floret is awnless but acutely pointed.



Above: Author's photo of *M. stipoides* in her paddock.
Above right: Her drawing of a spikelet.

As a species *M. stipoides* is reproductively flexible and reproduces by both sexual and asexual means. Asexual reproduction is through vegetative means only, where it spreads very slowly by short rhizomes which eventually give rise to independent plants. Increased vegetative reproduction occurs in shaded areas and in plants that are frequently defoliated. *Microlaena* is tolerant of frequent mowing and grazing because of its low growing point, like Redgrass, which protects the vegetative buds. However, *Microlaena* is a more attractive species for garden applications and is also more frost tolerant.

The fertile florets of *M. stipoides* are hermaphroditic, producing both male and female parts. Three types of floret are produced, chasmogamous, cleistogamous and clandestine cleistogamous or cleistogenes. In chasmogamous florets the anthers and stigmas are exerted at anthesis, pushed upwards by the swelling of the lodicules. In cleistogamous florets this does not occur, therefore self fertilisation takes place within the closed floret. Chasmogamous and cleistogamous spikelets form in the normal fashion along the drooping inflorescence, whereas cleistogenes may be found in the leaf axils of the upper 3-5 nodes of the culms. Investigations by Charles Huxtable in 1990 found that all three types of spikelet may be present simultaneously on the one plant, but that chasmogamous and cleistogamous spikelets occur on different inflorescences.

Complex breeding systems, such as that of *M. stipoides*, have also been described for some of the other widespread and successful grasses such as *Themeda australis* and *Dicanthium sericeum*. The reproductive effort invested in cleistogamous spikelets is less than that

of chasmogamous spikelets as the various parts of the spikelet are much reduced or absent.

Within a population of *M. stipoides* the spikelets are mostly cleistogamous, resulting in a large number of florets being produced with a reduced cost of reproduction while maintaining an advantage over asexuality. As a result of the large number of cleistogamous spikelets *M. stipoides* tends to be relatively uniform within a population and highly variable between.

Inbreeding depression, or reduced vigour, can occur in populations where plants are largely self pollinated. However, the production of chasmogamous, or open, florets triggered by high temperatures in January and/or February (*R.D.B. Whalley, pers. comm.*) of all individuals in a population results in some degree of cross fertilisation. By introducing new genetic material from outside the present population we are countering the effects of genetic drift, or loss of beneficial alleles. Therefore the concerns about introducing plant material from another area can be largely discounted.

Microlaena stipoides has a relatively short juvenile period, and is often reproductively mature in the same growing season if germination occurs early enough in spring. Plants germinating in autumn will flower the following summer (*Personal observation*). Seed production is lower in the first year, but as plants increase in size so do the number of seeds. Following fire plants may re-sprout from lateral roots. A secondary juvenile period of about four months is imposed on adult plants, with no seedling emergence recorded before 12 months after a fire.



M. stipoides at Duramana NSW
Photo: Merle Thompson

Depending on rainfall patterns, *M. stipoides* may flower anytime from spring until the autumn. For example, in some years this species may have one flowering event in spring and another in the autumn. In other years, where a wet spring is followed by a dry summer, determinate flowering may occur. With adequate soil moisture the species may exhibit indeterminate flowering and produce a succession of inflorescences throughout the spring, summer and autumn. Significant rainfall events, following protracted dry periods, shifts the allocation priority from growth to sexual reproduction, resulting in a large increase in the numbers of seed produced (*J. Kidston, pers. comm.*). This has occurred after the significant and welcome rainfall this summer. To increase seed



production in our gardens it would, then, seem logical to apply additional water to the plants when rainfall is limiting.

The seed of *M. stipoides* begins to ripen in early December. Seed production and seed size can exceed that of any other Australian native perennial grass recorded to date, but the range is extremely variable. Over an 8 week period a spikelet yield of between 1.02 and 5.12 grams has been recorded. Over an extended period of 6 months Judy Earl, from the Northern Tablelands (NSW), recorded a staggering spikelet yield of 18 to 39 grams per plant. Under optimum conditions individual plants can live in excess of 10 years and may therefore produce significant amounts of seed throughout this period. In experiments conducted by Charles Huxtable, results indicated that plants growing in full sunlight produced the largest numbers of seeds. *M. stipoides* plants that grew in deeper shade produced the lowest numbers of seeds. *M. stipoides* spikelets turn a straw or golden colour when mature. Large numbers can be readily harvested by running a hand gently along the inflorescence and into a bucket. To test for ripeness simply gather a handful of seeds and place one between your front teeth and bite down gently. If there is firm resistance then the seed is mature. This should be repeated with several samples.

Grass seeds contain a nutritious endosperm to nourish the developing embryo making them an attractive food source. The seeds of *M. stipoides* are eaten by various finch species and comprise a significant proportion of the diet of the Common Wombat (*Vombatus ursinus*) in summer. There is also evidence of seed predation by ants.

Under natural conditions the seed has very little dormancy, so does not form a persistent soil seed bank. Cathy Waters found that seed remains viable in soil for up to 3 months, until soil moisture becomes available for germination. However, Charles Huxtable and Wal Whalley recorded 120 days in dry soil over summer before germination. *Microlaena* seeds usually germinate in 7 to 25 days depending on soil temperature. Native grass recruitment is a relatively rare event under natural conditions and only occurs when conditions are optimal. Optimum germination temperatures are between 20°C and 30°C, with germination very slow at temperatures below 10°C. Rainfall events of 40mm or more produce substantial germination events, with the highest germinations occurring from autumn sowings. Laboratory germination trials conducted by Peter Clarke at the University of New England produced high germination rates close to 100% with the application of freshly made smoke water, complete darkness and chilling to 5°C. However, after exposure to 80°C for 15 minutes no seeds germinated.

Dispersal units of most grass species possess ancillary structures to assist in dispersal, for example, the many silky hairs of *Austrodanthonia* species assist in wind dispersal. The ancillary structures of the dispersal unit of *M. stipoides* are the two strongly awned sterile lemmas and the stiff backwards facing hairs on the sharpened callus. These do not facilitate dispersal by wind, but rather serve to orient it during the fall from the inflorescence. Dispersal units reaching the soil surface with a vertical orientation are much more likely to germinate than those with a horizontal orientation. In addition, the structure of the inflorescence and the high relative weight of individual dispersal units recommend they are usually dispersed within close proximity to the parent plant, which can result in a dense sward in time. Cleistogenes develop at the same time as cleistogamous spikelets on the same tiller, but are released through a rupture in the leaf sheath only after the tiller has dried out. This occurs after the aerial dispersal units have been shed, extending the period of seed dispersal which could be considered a selective advantage for the plant.

The seedling stage is often the most vulnerable in a plant's life cycle. *M. stipoides* seedlings develop slowly after germination. There is, therefore, danger from competition for resources such as light, nutrients and space, especially from broad leaf weeds and the more vigorously growing annual grasses. Seedling survival is also severely reduced by moisture stress.

Conclusion

Therefore an attractive and tractable lawn may be established with freshly gathered seed sown in the Autumn. The seeds should be lightly covered and provided with adequate moisture before and after germination. Careful weeding, plus the addition of some nitrogenous fertiliser, after about three months, such as old sheep manure, and judicious mowing will further enhance success. The short rhizomes of *M. stipoides* will ensure that the grass stays where you want it to, although who could be dismayed at the timid incursion of *M. stipoides* plants on to one's garden beds or paths?

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A fully annotated copy of this article can be made available on request.



Discovering the Stirling Range

Doug Rickard Australian Plants Society, Sutherland Group

So you've decided to go to the Stirling Range in the south west of Western Australia. Congratulations, I think that you've made a great choice. Despite low soil fertility the Stirling Range is a floral wonderland that is home to 90 different plant families, 384 genera and over 1,500 plant species – 87 of which are found nowhere else in the World. The 65km-long Stirling Range National Park, which is located 337km south east of Perth, covers an area of 1159km² and is home to more than a third of the known flora of the south west of Australia. Margaret Bradhurst and I visited the area for the first time last year and were so impressed that we hope to go back in the not too distant future.

In this article I have put down some pointers for would-be travellers to the Stirling Range as well as telling you about just a handful of the many hundreds of different species of plants that we saw and photographed during our trip.

When should you go?

Obviously the best time to go is in springtime when the wildflowers are at their peak – this is usually in late September and early October. However, the peak period can be a bit earlier or later than this depending on the weather. But no matter when in spring you go, you will always find that some of the plants you wanted to see in the wild have either just finished blooming or are still only in bud – for example we missed seeing the spectacular Queen of Sheba Orchid (*Thelymitra speciosa*) by a couple of weeks.

What's the weather like in the Stirling Range in spring?

Because of their height and proximity to the south coast, the climate on the peaks differs from that of the surrounding district – this is the main reason for the great variety of wildflowers you'll find in the Stirling Range.



Mist and clouds shrouding the 1095m high Bluff Knoll

All photos by Doug Rickard and Margaret Bradhurst

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Even in spring the weather can be unpredictable, particularly higher in the Range. Sudden cold changes often result in rain or hail setting in – and snow can fall on the peaks as late as September. So take warm clothing and wet weather gear. Lower down the daily temperature in spring gets up to about 18-20°C falling to about 8-11°C overnight, but on the peaks it is considerably colder. When we were there, the night-time temperature on the Ridge Track during the first week in October fell to about 4°C.

What is the best way to go to the Stirling Range?

There are several alternatives. You can go on one of the many wildflower tours, nearly all of which start from Perth. These tours are usually accompanied by a botanical tour guide so you get told the names of (most of) the plants you see. These tours are great but they tend to be a bit rushed and you never seem to have enough time at any one place.

If you really want to explore the Stirling Range get in a car, 4WD or camper van and drive yourself. This way you can spend as much time as you like stopping at or returning to places of interest, getting off the beaten track or going for hikes into the bush. For our trip we hired a car in Perth. This also gave us the opportunity to explore many different areas on our way to and from the Stirling Range.

What are the roads like in the south west of WA?

Generally the roads throughout the South West are very good so you do not need a 4WD unless you intend to do some serious off-roading. Whatever vehicle you travel in, remember that away from Perth petrol stations and places to eat are a long way apart – so fill up your vehicle whenever you get the opportunity and always take food and water with you.

Where can you stay?

The place to stay if you want hostel or self-contained cabin-style accommodation as close to the Stirling Range National Park as possible is the Stirling Range Retreat on the Chester Pass Road just outside the northern boundary. The Retreat not only offers a wide range of accommodation but it also has facilities for caravans, camper vans and for those who want to camp. The only place actually within the Park where you can camp or park your van is at Moingup Springs near the Mt. Toolbrunup Turn-off on the Chester Pass Road. There is more accommodation outside the Park at the little more up-market Lily Dutch Windmill about 30 minutes drive north of the Park boundary and in the Porongurup Range to the south of the Park.



How do you go about seeing the wildflowers?

The best advice that I can offer is that when you see something of interest as you drive along the road, stop, get out of your vehicle and start taking photographs. We found that wherever we stopped and went on a short walk into the bush we usually found many plants that we had not come across before. Remember it pays to ask the locals where the best wildflowers in the area can be found.

When travelling to and from the Stirling Range the 'something of interest' may not only be some stunning flowers by the roadside or a sweeping panoramic view – it may be as simple as a change in habitat, coming across a small nature reserve or even a couple of emus by the road. In particular, throughout the south west, look out for two habitats that are strange to us folk from the eastern States – granite outcrops and winter-wet swamps. Both are great places to find interesting and often unusual plants.



Typical vegetation you will find at the roadside along the Stirling Range Drive – this picture was taken near Mt. Magog

Be prepared to take a lot of photographs

As you will most probably be using a digital camera don't forget to take along your battery charger and/or spare batteries. Also, take something on to which you can download each day's shots – do not rely on your camera's memory card as that will fill very quickly. Each night we culled out our duds and downloaded the rest of our day's pictures on to my laptop computer. Even after some serious culling Margaret and I together averaged a total of over 200 pictures a day during our time in the south west. I suggest that you clear your camera's memory each day before you set out – it is most frustrating to suddenly find half way through the day that your camera is telling you that its memory is full.

Do not just take pictures of the flowers, attractive as they may be. Make sure that you also take at least one picture that shows the leaves of the plant and one that shows the whole plant. These will be invaluable when you get home and try to identify the plants.

Nothing is worse when you are trying to decide between two or more possibilities and the book says that species A has linear leaves whilst

species B has ovate leaves – and you do not have a picture showing the leaves of the plant you saw.

When you come across a plant that you remember seeing before in another area there is a tendency to say "Oh, I've already photographed that" and not take a picture of it. Resist this temptation and take another photograph, even though you may discard it later – the new photograph could well be of a different subspecies, a local variant, a natural hybrid or just an oddball. We found a good example of different subspecies with the three very similar looking but different Cowslip Orchids (*Caladenia flava*) that grow in the south west (there is a fourth subspecies but that only grows north of Perth).



Caladenia flava



Caladenia flava ssp. *sylvestris*



Caladenia flava ssp. 'Brookton Highway'

The two forms of Mountain Bell (*Darwinia leiostyla*) are an example of local variants occurring quite close together in the Stirling Range. The familiar form with light pink flowers grows on the higher slopes of the Range, whilst the darker red flowered form is only found at lower altitudes.



Another plant that has two different forms is Chittick (*Lambertia inermis*). However, the two forms of this species are difficult to confuse – one has bright orange-red flowers (*Lambertia inermis* var. *inermis*) whilst the other has bright yellow flowers (*Lambertia inermis* var. *drummondii*).

The usual light pink form of *Darwinia leiostyla*

The darker red form of *Darwinia leiostyla* is portrayed on the front cover.



Chittick
Lambertia inermis var. *inermis*



Yellow Chittick
Lambertia inermis var. *drummondii*



One plant that you will not have trouble with is the Kingia (*Kingia australis*) – there is only one species and no variants of this unique plant. The Kingia is endemic to the south west of WA and although it looks like a Grass Tree it is not – it is actually a very large herb.

Just two of the many Kingias (*Kingia australis*) growing in the heathland on the slopes of Bluff Knoll

Identifying the plants you photographed

I am not a botanist (I spent my whole working life trying to be an engineer) so when it comes to identifying plants I need all the help I can get. We found that the Florabase website of the WA Herbarium (www.florabase.calm.wa.gov.au) was by far the most useful source of information. Another was the book '*Wildflowers of Southern Western Australia*' by Margaret G Corrish & Bruce A Fuhrer (The Five Mile Press, 2002).

On our trip we were particularly interested in finding orchids and to this end the book '*Guide to the Native Orchids of South Western Australia*' by Bob Liddlelow (R & R Publications, 2006) was invaluable. This book has a series of 'mud maps' that show you where and when you can expect to find various species of orchids throughout the south west. This book also came in very useful when we were trying to identify the over 60 different species of orchids that we had seen.

If you are from the eastern States your plant identification skills will probably be challenged most trying to sort out all the different Triggerplants, Droseras and particularly the Pea flowers that you will come across in the Stirling Range.

But the most challenging of all are those photographs you took of flowers or plants that when you look at them after you get home you have not got a clue as to even what family they belong, let alone the species. The picture Margaret took of an orange dangly thing is a good example. It turned out to be the shrivelled remnant of a Yellow Flag (*Patersonia umbrosa* ssp. *umbrosa*)



The shrivelled remnant of a Yellow Flag (*Patersonia umbrosa* ssp. *umbrosa*) and inset the flower in full bloom

Do not limit yourself just to photographing the flora

As well as the flora, the Stirling Range is home to a wide variety of native fauna – so keep your eyes open and your camera ready. If you have to get your camera and turn it on before you frame your shot and focus, the animal or bird invariably moves off about one second before you are ready to press the shutter.



While we were photographing flowers near Mt. Magog we became aware of two sets of eyes quietly watching us (yes, two sets – the joey in the pouch was also having a peek)



Other places to visit during your trip

The other places in the south west that we recommend you should think about adding to your itinerary when travelling to and from the Stirling Range are:

Boyagin Rock – A granite outcrop near Brookton, 100km south east of Perth. Not to be missed!

Mt Frankland – A huge granite outcrop in the Mt. Frankland National Park 20km north of Walpole. Well worth the climb to the summit.

Dryandra Woodland – An island of native flora and fauna in the Wheatbelt near Narrogin.

Cape Naturaliste – The Dunsborough/Yallingup area on the coast about 200km south of Perth. A magic area for native flora (and the wineries are great too!)

The Augusta Area – In the far south west. May be a bit out of the way, but it's worth a visit if you have time.

The Valley of the Giants – On the south coast near Walpole. Seeing the unique Tingle trees is a must.

Bremer Bay and Esperance Area – Again a bit off the beaten track but you'll get to see a different and more arid habitat area. Great if you have time.

Wireless Hill and Gooseberry Hill Reserves in Perth – Do not miss visiting both of these while you are in Perth.

... and, of course, Kings Park in Perth – Try to get there on the WA Queen's Birthday Weekend at the end of September when the Kings Park Festival is on.

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Orchids of the Stirling Range

Margaret Bradhurst

Margaret has had a lifelong interest in native orchids and is a very keen photographer of native plants. She is also involved in Bushcare in Sutherland Shire, within the Sydney metropolitan area.

For many of us who live in the Eastern states, the wildflowers of Western Australia act like a magnet – something you should see at least once in our lifetime. If you are keen on orchids a visit to the Stirling Range is a must, as 123 different varieties of terrestrial orchids have been recorded in the area.

We visited the Stirling Range during the second week in October, and this proved to be a good time as it coincided with the flowering period of many of the orchids and other native plants. Late winter through spring is considered to be the peak time for orchids in the Stirling Range.

We found that a good introduction to many of the orchids and other wildflowers was to join the 'Hidden Treasures Orchid and Wildflower Tour', which is run for visitors staying at the Stirling Range Retreat. During September and October tours lasting three hours are conducted daily. A small mini-bus carrying 12 passengers takes visitors to sites nearby where orchids are known to be flowering. Tours during the final week of August are also provided for those wanting to see the well-known Queen of Sheba Orchid in flower. Evening slide shows are held three nights a week featuring plants and orchids that grow locally. This is a great help in identifying some of the plants seen during the day.

There are many good walks and drives to take in and around the Stirling Range National Park. Chester Pass Road is a good hunting ground for orchids and other native plants, as are Mt Trio Road and Stirling Range Drive. The Kanga Walk which starts off from within the Stirling Range Retreat and crosses Paper Collar Creek is quite a long walk but worth the effort. The Bluff Knoll Road offers plenty of opportunities to stop and look around and there are numerous firebreaks to explore on most of the main roads.

Spring starts in the Stirling Range with the Queen of Sheba orchid which flowers from the end of August to the middle of September. As well as the Queen of Sheba, several other species of *Thelymitra* (Sun Orchids) can be found in the area.



Genus *Thelymitra*

The most spectacular and colourful of the *Thelymitras* are the two species of the Queen of Sheba Orchid. *Thelymitra variegata* (Queen of Sheba) has one to four flowers each about 3-5cm across on a stem 16-20cm high. Its flowers are deep pink with purple blotches, although colours and markings can vary.

Generally, *Thelymitra speciosa* (Eastern Queen of Sheba) has only one or two flowers and is coloured in deeper tones of gold and purple.

Both species have an unusual curled or twisted leaf and, in common with most *Thelymitras*, the Queen of Sheba orchids will only open their flowers on warm sunny days.

Thelymitra macrophylla (Large-leaved Sun Orchid) is a robust species that has a large ribbed leaf about 35cm long. It has between two and fifteen blue flowers on a stem to 100cm tall. Flowers are fragrant and have a pair of white toothbrush-like hair tufts on the column in the centre of the flower.

Another blue Sun Orchid, *Thelymitra crinita* (Blue Lady Orchid), is said to mimic the native lily *Orthrosanthus laxus* in attracting its pollinator. The column arms have purple hair tufts and the top of the column is covered with tiny black and yellow calli.

Thelymitra antennifera (Vanilla Orchid or Lemon-scented Sun Orchid pictured right) is a yellow Sun Orchid that can form quite large colonies. It flowers more freely than some other species, often opening in cooler days. The column has two small brown or red ear-like structures, which make this species easy to identify.

Other Sun Orchids in the area include *Thelymitra benthianiana* (Leopard Sun Orchid) with its yellowish flowers with brown blotches, and the smaller yellow-flowered *Thelymitra flexuosa* (Twisted Sun Orchid). Both flower in October.



Thelymitra antennifera Vanilla orchid



Thelymitra variegata Queen of Sheba



Thelymitra speciosa Eastern Queen of Sheba



Thelymitra speciosa (Leaf)



Thelymitra macrophylla
Large-leaved Sun Orchid



Thelymitra crinita Blue-lady Orchid



Genus *Lyperanthus*

Lyperanthus serratus was in full flower on the edge of Chester Pass Road. The flower appears to be covered with a powdery bloom. The labellum has a mass of long cream calli at its tip and this protrudes out from under the hooded dorsal sepal.

There was no sign of any flowers of the closely related *Pyrorchis nigricans* (Red Beak Orchid). Lots of leaves were seen, especially around the Stirling Range Retrea but fire is usually needed to stimulate these orchids into flowering.



Lyperanthus serratus

Genus *Caladenia*

The genus *Caladenia* is well represented in the Stirling Range. The season starts in August with the bright yellow and easily recognisable flowers of *Caladenia flava* (Cowslip Orchid) and the bright pink flowers of *Caladenia reptans* (Little Pink Fairy Orchid) and continues to October when the later flowering Spider Orchids are in flower.

One of the most common is *Caladenia latifolia* (Pink Fairy Orchid) that flowers from late September to early October. We also found an uncommon all-white albino form of this orchid



Caladenia latifolia Pink Fairy Orchid

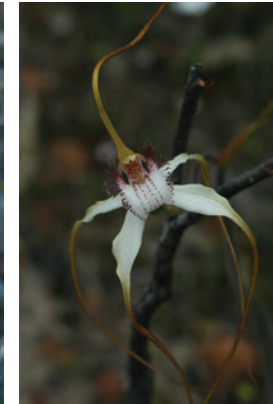


Caladenia latifolia (Albino form)

Spider Orchids are always a thrill to find, but can be tricky to identify. It is not uncommon for them to hybridise with others of their genus that grow in their vicinity. Below are a few of the larger Spider Orchids we saw in flower.



Caladenia pectinata
King Spider Orchid



Caladenia longicauda
Stark White Spider

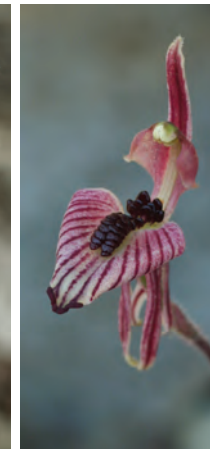


Caladenia polychroma
Joseph's Spider Orchid

The *Caladenias* of the Stirling Range come in all sorts of interesting shapes and sizes -



Caladenia barbarossa
Dragon Orchid



Caladenia cairnsia
Zebra Orchid



Caladenia discoidea

Other *Caladenias* which can be found in flower in October include two Green-comb Spider Orchids, *Caladenia lobata* (Butterfly Orchid) and *Caladenia falcata* (Fringed Mantis Orchid).



Other Spider Orchids flowering in spring include *Caladenia filifera* (Blood Spider Orchid), *Caladenia heberleana* (Heberles Spider Orchid), and *Caladenia macrostylis* (Leaping Spider Orchid)



Caladenia plicata Crab-lipped Spider Orchid



Caladenia ferruginea Rusty Spider Orchid

Genus Diuris

At least three species of *Diuris* have been recorded from the Stirling Range. *Diuris laxiflora* (Bee Orchid) is one of the smaller flowered of the *Diuris* Orchids. The attractive *Diuris longifolia* (Purple Pansy Orchid) has mauve and mustard colouring on the central parts of the flower. Both of the pictured plants were seen on the Chester Pass Road. *Diuris corymbosa* (Common Donkey Orchid) flowers late August to September.



Diuris laxiflora Bee Orchid



Diuris longifolia Purple Pansy Orchid

Genus Elythanthera

We saw *Elythanthera brunonis* (Enamel Orchid) in a number of locations, the maroon and white-spotted bud opening to reveal pale to dark purple glossy 'enamelled' petals and sepals.



Elythanthera brunonis
Purple Enamel Orchid



Genus Drakaea

The *Drakaea* genus (Hammer Orchids) is endemic to Western Australia. We found two species flowering in the Stirling Range area. These fascinating little plants are very difficult to see in leaf litter, but stand out well when found growing on the sides of tracks in the whitish sandy soils. They have a heart-shaped ground-hugging leaf. The labellum resembles an insect and is decorated with glands and hairs. It is hinged and flips towards the pollen-carrying column when an insect lands on the flower.

Drakaea glyptodon (King-in-his-Carriage) has a swollen dark-reddish black labellum which is covered with bristly hairs, whereas *Drakaea gracilis* (Slender Hammer Orchid) has a slender reddish-black hairy labellum with a turned-up hairless tail.



Drakaea glyptodon King-in-his-Carriage



Drakaea gracilis Slender Hammer Orchid

Genus Paracaleana

Paracaleana nigrata (Small Duck Orchid) is another small dark-coloured orchid which is not seen often. We found it growing in sandy soil near *Drakaea gracilis*.

Genus Cryptostylis

As the flowering period of *Cryptostylis ovata* (Slipper Orchid pictured right) is normally November and December, they were still in early bud when we saw them in October. It is the only terrestrial orchid in Western Australia with an evergreen leaf.



Genus Pterostylis

This species of *Pterostylis barbata* with its widely spreading lateral sepals and sparsely hairy labellum is one of several species of Greenhood orchids in the Bird Orchid complex.

Pterostylis recurva (Jug Orchid) has a very distinctive and unique green and white striped flower. It is only found in Western Australia.



Pterostylis recurva Bird Orchid



Pterostylis barbata Jug Orchid

Other *Pterostylis* orchids in the area include *Pterostylis concava* (Pouched Greenhood), *Pterostylis sanguinea* (Red-banded Greenhood), *Pterostylis vittata* (Green-banded Greenhood) and *Pterostylis nana* (Snail Orchid). The flowering period for these orchids is usually August and early September.

All photographs by Margaret Bradhurst except – *Thelymitra variegata* – Thomas Blinco; *Thelymitra speciosa* – John Ewing; *Elythranthera brunonis* flower – Doug Rickard

Australian Native Seed Industry, an Industry in Crisis?

Bruce Higgs

Bruce Higgs lives on the outskirts of Sydney where for the last ten years he has operated a wholesale nursery business with his wife, Heather. Bruce has authored numerous papers and is editor of the International Plant Propagators Society newsletter "the propagator" and a regular presenter to garden clubs and Australian Plants Society groups.

Over recent years Bruce has spoken to many people who are concerned about the Australian native seed industry. Many seed collectors in Australia are now over 70, and have a wealth of knowledge about the location of plant species and the time to collect viable seed, as well as how to go about collecting, cleaning and storing seed. This knowledge could be lost within a few years, and represents a threat to the continuity of supply of seed. This loss of know-how potentially affects revegetation projects, cut flower growers and ornamental horticulture.

Over the last few years many of the specialist seed companies in Australia, including the larger suppliers, were contacted about this issue. All agreed that there is a looming crisis, with fewer young people getting involved in the seed collecting business.

Comments from some included "it was not lucrative enough now", or "the conditions of outside work in the wild were too extreme". There would seem to be a problem with outdoors work for some people who have joined the industry. Owners of some businesses quoted responses from younger generation collectors such a "working in the sun was too hot for them" or "they didn't like leeches".



At the August 2008 conference of the Australian Seed Federation in Hobart (see bsm@asf.asn.au) it was recommended that seed costs needed to rise by 35% to cover the cost of increases to attract people to the industry. Since then we have had the Global Financial Crisis and prices do not seem to have changed much.

How do I get that seed? Glenbrook Reserve NSW – Photo B Higgs



The major markets now for native seed are minesite regeneration and public works (mostly roadside revegetation projects). These usually demand specially collected provenance seed. Some nurseries now make revegetation their core business and collect their own seed with specialist teams. The problem, though, in many cases is that there just is not enough local seed available when it is needed.

The drought years have had an effect on the quantity and viability of seed available as well as state restrictions to harvesting seed. Good quantities of viable seed are often obtained two years after a good season. Experienced seed collectors not only know how to collect seed representative of the species but when to collect it for maximum viability. Have you tried collecting seed to eventually find that the viability was low or it turned out to be not what you expected?

State Forestry regeneration follows a different model, where seedlings are produced from seed collected in areas being logged by those concerned with planting and trimming trees. The Tasmanian 'Forest Practices Code' seems to be assuring a worthwhile industry for seed collectors in that state.

The Queensland Department of Primary Industries has established a government corporation to supply seed from tree orchards. Owing to regulations they cannot collect from government forests. Instead of offering seeds from hundreds of species as in the past, they have rationalised to five, with separations of about 2 kilometres to prevent crossbreeding. You need large land holdings for this type of operation.

Mostly restrictions to collecting seed have arisen through various state regulations aimed at "protecting" flora and fauna but treating them the same. You wouldn't want people to be going into national parks trapping goannas and trying to breed from them. Or worse still, chopping off a tail and trying to clone another goanna in the laboratory – that is ridiculous.

Surely the logic should be different for plants. Harvesting a small amount of seed (if controlled by permits) or taking a few cuttings for clonal propagation by accredited people would conserve the species and gene pool rather than risk it being lost. How many beautiful forms of plants have been lost through fire due to the inability to legally collect seed or take cuttings for conservation sake?

Permits to harvest seed from forests and government parks are now very difficult to obtain. Housing developments that encroach onto coastal bushland have further restricted the availability of suitable collecting areas. Low cost imported seed and low viability old seed have also damaged the industry.

Restrictive quarantine laws in W. A. and Tasmania aimed at stopping importation of weed species also pose a problem in moving seed around the country.

So, like all things, the more you look the more complex the picture becomes. Fortunately for those wanting a partner seeking a way forward, Florabank working with Greening Australia was established a few years ago. The Floradata database will hopefully be revised with Millennium seedbank and CSIRO information on seed location, collection and storage. Training courses are being conducted for seed collectors. They have recognised the problems the native seed industry faces from their own research. Florabank is currently working with RIAWA (Revegetation Industry Association of WA), to establish seed standards criteria for the industry in Western Australia.

How can our members be involved?

Does the Australian Native Plants Society have a role in this? Many members have a great knowledge of Australian plant species growing near them. Some also have a wealth of experience collecting seed either as amateurs or professionally. The challenge, then, is to write-up that knowledge so that others may benefit in the future or at least so those unique nearby wild plant collections can be conserved in some way. What a great topic for local groups to discuss.

Other possibilities include:

- Seed suppliers are seeking new suppliers. Perhaps there are members looking for a "sea change" or there are groups willing to get involved.
- Input from people involved in collecting native seed in W.A. is now being sought and people are being encouraged to contribute to this process via the RIAWA website <http://riawa.com.au/wordpress/>.
- By encouraging and supporting a research proposal for Florabank to interview older collectors and capture their knowledge for the benefit of all.
- Establishing a code of practice and accreditation system for seed suppliers / collectors to improve professionalism and rewards. This could initially involve Florabank with the Nursery Industry Association and perhaps Cut Flowers Associations in each state. .
- Gaining permits for accredited collectors under guidelines to government controlled parks and forests to ensure genetic diversity. Members or regions of the Australian Plants Society could support this.



- Dr Penny Atkinson of Florabank also suggested that Australian native seed could be sold with viability information at different levels of assurance: standard, and provenance.
- Nurseries set up their own plant orchards to collect seed, while minimising the potential for hybridisation. This may be only available to those with access to large landholdings.

Reference Material

One of the collectors, in his mid eighties, has written and published a book to capture some of this knowledge: "The Australian Seedsman, Harold Grant". This is an excellent book for those which to collect Native seed especially on the East Coast of Australia. Harold can be contacted for copies of this book at \$15 plus postage (90 Wingewarra St. Dubbo NSW 2830). Other good references beside those in past issues of *Australian Plants* on native seed collecting include:

- Florabank website <http://www.florabank.org.au/>
- Murray Ralph "Seed Collection of Australian Native Plants For Revegetation, Tree Planting and Direct Seeding" Bushland Horticulture 1999
- Murray Ralph "Growing Australian Native Plants from Seed for Revegetation, Tree Planting and Direct Seeding" Bushland Horticulture 1999
- Luke Sweedman, David Merritt "Australian Seeds A Guide to Their Collection, Identification and Biology" CSIRO Publishing 2006
- Warren Mortlock "Native seed in Australia : a survey of collection, storage and distribution of native seed for revegetation and conservation purposes" Florabank 1999
- Doran J (1991) "How to collect native tree seed easily" Greening Australia, 14 page pamphlet, ACT.
- David Perry "How to collect seed from native trees and shrubs" Natural Resources and Environment Vic Landcare notes from the internet www.nynrm.sa.gov.au/Portals/5/pdf/LandAndSoil/8.pdf



Capsules ready to release seed at Kings Park nursery WA

Photos B Higgs



Banksia seed – after blow torch treatment of fruit and release after swelling in water

The Checklist of Australian Native Plant Cultivars

Paul Carmen

Paul is the ACRA Registrar, Australian National Botanic Gardens, Canberra. He is a member of the Australian Native Plants Society, Canberra Region

Introduction

The Australian Cultivar Registration Authority (ACRA) was established by the International Commission for the Nomenclature of Cultivated Plants (ICNCP) in 1962, to register and record the names and descriptions of Australian native plant cultivars. Over the years ACRA has registered over 400 cultivars however, these represent a very small proportion of the cultivars for which there are published names and descriptions.

The Checklist of Australian Plant Cultivars Project will provide a single website which can be used to research all Australian native plant cultivar names and their descriptions.

Background History of ACRA

When the Society for Growing Australian Plants (SGAP, now called the Australian Native Plants Society Australia, ANPSA) was formed in the late 1950s, the newly formed Executive believed the Society should have a role in the registration of the cultivars of Australian native plants.

Correspondence was initiated by the SGAP publication branch with the Royal Horticultural Society in England in 1959. In February 1962, the South East Region of SGAP accepted an offer from the 'International Commission for the Nomenclature of Cultivated Plants (ICNCP) to undertake the registrations of cultivars of genera endemic to Australia, and to act as the national registration authority, in conjunction with the National Herbarium (in Melbourne)'.¹

Initially the new ACRA committee had four members, two from the National Herbarium (with Jim Willis as Chairman) and two representing SGAP. Over the years, the ACRA committee has been significantly expanded, and it now includes representatives of most major Australian Botanic Gardens, ANPSA, and the nursery industry.

Since 1973, staff of the Australian National Botanic Gardens (ANBG) have filled the roles of Registrar and Secretary of ACRA (on a part time basis), and the ANBG has also provided office space, storage of herbarium specimens, database and administrative functions, and, in more recent years, a website at <http://www.anbg.gov.au/acra>.



So what is a cultivar?

A cultivar is a plant that has been selected for a particular character (or combination of characters) that is clearly distinct, uniform, stable in these characters, and when propagated by appropriate means retains these characters.

The Role of ACRA

Over the years ACRA has performed three major functions in regard to the cultivars of Australian plants:

1. a registration function;
2. the recording of published names; and
3. an advisory role for Plant Breeders Rights applications.

1. Cultivar Registrations

The registration process creates a comprehensive description of each cultivar. This description can then be used to identify the cultivar and compare it with others.

The description of the cultivar records:

- the parentage (if known);
- history of the cultivar;
- the derivation of meaning of the cultivar name or epithet;
- the names of the raiser or breeder, nominant and introducer (when known);
- indicates one or more recognisable attributes or characters;
- indicates how the cultivar differs from similar cultivars;
- records the colour codes for leaves and flowers (from the Royal Horticultural Society Colour Charts) ; and
- includes a photo or photos.

The ACRA description also includes cultivation and propagation information.

The guidelines for registering cultivars are recorded in the *International Code of Nomenclature for Cultivated Plants*², often shortened to the *Cultivated Plant Code*, and have been adopted by ACRA for all cultivars of Australian plants.

To date, ACRA has registered over 400 cultivars with full descriptions and these can be found at www.anbg.gov.au/acra/acra-list-2009.html. Many of these cultivars represent a documentary history of the Australian Plants Society and its role in developing Australian plants. For example, many of the 'Poorinda' hybrids bred by Leo Hodge in the 1960s and 70s have been registered or recorded with ACRA.

Although by no means comprehensive, the descriptions on the ACRA website provide a reference point for the horticultural industry and the public alike.

2. Recording of Names

In 1962, the newly formed ACRA committee sent letters to nurseries and members of the nursery industry and horticultural societies throughout Australia asking for lists of names of known cultivars. Gradually over time, lists of names of cultivars were compiled, and eventually a card system was developed to record all the information gathered.

3. Plant Breeders Rights

As an authority on the cultivars of Australian plants, the ACRA committee plays a significant role in the assessment of Plant Breeders Rights (PBR) applications and provides advice on:

- identification;
- novelty; and
- distinctiveness.

The ACRA committee also comments on the comparators used to distinguish new cultivars and suggests additional potential comparators. It also processes and stores herbarium specimens of PBR cultivars in the Australian National Herbarium.

The Checklist of Australian Plant Cultivars Project

The primary purpose of the Checklist of Australian Plant Cultivars project is to bring all the published names and descriptions of Australia's native plant cultivars together in one website location within the searchable database, the Australian Plant Name Index (APNI) <http://www.anbg.gov.au/cgi-bin/apni>.

APNI is a tool for the botanical community which deals with plant names and their usage in scientific literature, whether as a current name or synonym. The information available from APNI includes scientific and cultivar names, author details, original publication details (protologue), and links to other information such as plant distributions, descriptions and images (where available). APNI **does not** recommend any particular taxonomy or nomenclature.

The Checklist Project will involve a thorough search of all known publications featuring articles about Australian plants and the information gathered will include:

- all cultivar names;
- publication references;



- a link to a PDF file of the protologue (first published description); and
- a photo of the cultivar if possible.

Progress report

The project has been funded by donations from ANPS groups and matching sponsorship by Horticulture Australia Ltd (HAL). Funding has been sufficient to employ a person (on a part-time basis) for one year, from November 2009, to carry out the research and data entry work. The project is now at the half way point, and there are over 4,300 cultivar names recorded in APNI and all the PBR journals have been processed.

Conclusion

As a result of this project, all Australians will have a 'one-stop-shop' on the web for comprehensive information on all the cultivars of Australian plants. The website 'publication' of these descriptions and names will promote uniformity, accuracy and stability in the horticultural industry and significantly increase the knowledge and understanding of Australia's cultivated varieties.

The substantial financial support provided by ANPS groups throughout Australia and Horticulture Australia has been instrumental in getting this project off the ground.

References

1. Walter, John; 2007, SGAP, The Story of Arthur Swaby and the Society for Growing Australian Plants, p197. Australian Plants Society (SGAP Victoria), Hawthorn, Vic.
2. Brickell, C.D. et al. 2004, International Code of Nomenclature for Cultivated Plants, 7th edn., International Society for Horticultural Science, Leuven, Belgium (Acta Horticulturae 647)



Australian Native Plants Society

Visit us on the web at <http://anpsa.org.au>

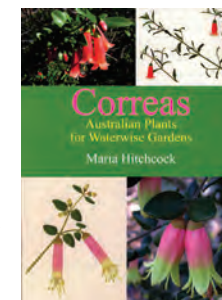
Cultivation and propagation information, extensive photo gallery, ANPSA events, online magazine and much more.

Correas – Australian Plants for Waterwise Gardens

Book Review by Bob O'Neill

Author – Maria Hitchcock Published by Rosenberg Publishing. 176 pages. Paperback. Colour. RRP \$35

Author: Maria was, for many years until 2009, the leader of the ANPSA Correa Study Group. She was enthusiastic – researched extensively, wrote to share her knowledge, led 'correa crawls' to find and document species in situ, developed a plant collection and registered new cultivars.



Reviewer: Over the past 20 years Bob and Dot O'Neill have assembled an extensive correa collection within Katandra Gardens and have made the entire collection available to a number of the public botanical gardens within Victoria.

Since 1989 when I was first introduced to correas, I have had to learn by trial and error, assisted by unselfish support from numerous APS people, including Maria Hitchcock. I learnt that understanding correas in depth was akin to filling in a giant jigsaw puzzle, with numerous large gaps still remaining to be sorted out. This book is a wonderful resource to help complete that fascinating correa jigsaw puzzle.

The clear, colourful style of presentation suits my aging eyes and the content is in everyday language, without being folksy. At the same time it embraces a human element by outlining the contributions of some of the more dedicated correa personalities of the past 50 years.

The key to the correa genus is presented, along with an extensive listing of the species and cultivars. Propagation by cuttings, seeds and grafting are outlined in a detailed, useful, workable manner, as are the nitty gritty aspects of growing correas in the garden. I welcome the attention to attracting birds to the garden with correas.

In summing up, this is a book that will at first be read from cover to cover, then periodically will be taken from the shelf to seek specific information, be it by a relatively inexperienced enthusiast, a serious student or by an old hand like myself.

Congratulations, Maria



Correa pulchella 'Dot's Dream' Selected, named and photographed by Bob O'Neill

