



Acacia brunioides

Australian Native Plants Society (Australia) Inc.

ACACIA STUDY GROUP NEWSLETTER

Group Leader and Newsletter Editor
Bill Aitchison
13 Conos Court, Donvale, Vic 3111
Phone (03) 98723583

Seed Bank Curator
Victoria Tanner

Email: acaciastudygroup@gmail.com

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From The Leader

Dear Members

The last few months have been very challenging, with catastrophic bushfires followed by the Coronavirus pandemic. I am aware that some of our members suffered personal losses in the bushfires, and our thoughts are with them.

Although she ultimately avoided the bushfires, I should mention our Seed Bank Curator **Victoria Tanner**, whose property came under threat from fires approaching Canberra, and she prepared to evacuate. In the midst of these preparations, **Ian Tranter** came and took our Study Group Seed Bank to protect it in a safe location until the fire threat passed. We are very grateful and thank Ian for his support, and to Victoria for her actions at this difficult time.

Acacia sporadica is classified as being vulnerable in Victoria, and is found at only three disjunct locations. One area where it is found is at Carboor, in north eastern Victoria, not far from where Study Group member **Alan Gibb** lives. Alan tells me that the Carboor population is probably the best of the three populations. However, this population was severely impacted by the bushfires, and Alan's assessment is that about 80% of the plants were lost in the fires. He does not expect that there will be much regrowth from seedlings, but there may be some suckering. Alan's intention is to monitor this population as to the extent of its recovery from the fires. Other members may wish to report their own experiences in relation to recovery of *Acacia* populations impacted by the fires.

Sadly, we learnt very recently of the death of **Marion Simmons**. Marion had been a member of our Study Group since 1963, and was a previous Leader of the Study Group.

Note: If you wish to view or download previous Study Group Newsletters, they are available on the Study Group website.

The address is:

<http://anpsa.org.au/acaciaSG>

I have included some more memories of Marion below.

Until his death, **Warren Sheather** had regularly contributed articles to our newsletter on individual Acacia species – for example, he contributed a series of articles on Acacias of the Northern Tablelands of NSW, and another series on Interesting Species in our Seed Bank. Would someone like to volunteer to contribute some similar type articles that we can include in the Newsletter – for example, it could be a series of articles on wattles in your local area, or articles on wattles that you are growing in your garden, or anything else of interest to you.

Because of restrictions resulting from Coronavirus, I have not been able to arrange the usual printing of this newsletter for those members who receive a hardcopy of the newsletter. For those members for whom I have an email address, I have forwarded the digital version to them by email. If any of those members would still like a hardcopy later on, let me know and I will arrange this. For those members for whom I do not have an email address, I hope to be able to print a few copies on my home printer here and post these in the usual way.

An updated version of our Study Group Seed Bank is included on pages 16 and 17 of this newsletter. As always, our thanks go to Victoria Tanner who continues to look after the operation of the Seed Bank

Bill Aitchison

Marion Simmons

20/2/1927 – 14/4/2020

Marion Simmons joined the Acacia Study Group in May 1963, and remained a member until her death, a total membership period of 57 years. She was Leader of the Study Group for a period of 13 years, from 1978 to 1991, and during this period produced 59 Newsletters (Numbers 25 to 83).

Marion was the author of various books and other publications on Acacias, and a list of these appears below.

Marion and her husband John were awarded the Medal of the Order of Australia in the 2004 Australia Day Honours List (John passed away in 2012). At the 2004 ASGAP Conference in Tasmania they were awarded the Australian Plants Award in the amateur category for their outstanding contribution over many years to the study and understanding of our native flora. They were also honoured with Life Membership of the Australian Plants Society Tasmania. Marion and John's lifetime of involvement with Acacias was recognised in 2002 when an Acacia was named after them (*Acacia simmonsiana*).

Over many years, Marion and John travelled all over Australia gathering specimens, with Marion sketching and noting location, habit and other details, and John applying his special expertise as a photographer. Marion's qualifications as an art teacher proved very handy during these trips.

Marion and John lived for many years at Legana, near Launceston. They had a large property of about 0.5 hectares, and they promoted Australian plants by opening their garden in the Australian Open Garden Scheme. Following John's death, Marion continued to live there until she moved to an aged care facility in mid 2019. Her passion for growing Acacias never ceased – in fact even towards the end of 2018, she was still propagating Acacias. At that time, she told me that species she was propagating included *A. alata*, *A. applanata*, *A. bidentata*, *A. declinata*, *A. exilis*, *A. flexifolia*, *A. gordonii*, *A. imbricata*, *A. incurva*, *A. lanigera*, *A. preissiana*, *A. pulviniformis*, *A. restiacea* and *A. stenoptera*.

I only met Marion (and John) on one occasion, when they visited Melbourne in 2006 to attend the FJC Rogers Seminar on Acacias. Since that time, I had regular communication with Marion, something that I valued very highly. Marion was always so generous and willing to share her knowledge, and was so nice in the way she did this.



John and Marion Simmons, at FJC Rogers Acacia Seminar Melbourne 2006
Photo: Bruce Maslin

Bruce Maslin has been Australia's leading Acacia botanist for many years, and is currently Research Associate of the Western Australian Herbarium and Research Associate of the Singapore Botanic Gardens Herbarium. Bruce has written as follows in relation to his past association with Marion and John:

"I had fairly regular communication with Marion and John during the '80s, assisting with identification of their many *Acacia* specimens that they had collected on their annual trips around the country. As best I can recall we three first met up in Perth in 1998. John not only assisted with the collection and processing of specimens, he also

photographed the plants in the wild. After returning home, Marion prepared detailed descriptions and illustrations of a selection of the species, and these subsequently appeared in her two volumes of *Acacias of Australia*. I do not know how many field trips the Simmons undertook (but I do know that they enjoyed each one very much), or how many specimens or species they collected and photographed. However, at the Western Australian Herbarium there are 789 Simmons specimens (most collected in WA) that were gathered between 1974 and 2004. As Marion sought assistance with identifications from other Acacia workers around the country, it is likely that there will be duplicates of Simmons collections in other herbaria. Marion and John's personal set of specimens are deposited in the Melbourne Herbarium, along with John's photographs (see below).

In 1999 I visited Marion and John at their lovely home in Legana, Tasmania; I revisited them again a couple of years later. Their spacious house overlooked the Tamar River and of course, there was an Acacia garden out the back. Those were most enjoyable visits as the Simmons were such congenial hosts. The reason for my first visit was because Marion very generously agreed to make available to me scans of her line drawings of species that appeared not only in the two published volumes of *Acacias of Australia*, but also the unpublished volume three. Similarly, John offered to provide me with duplicates of any of his slides that I needed. You can now see these graphics, appropriately acknowledged, under the Species Gallery of WWW. I will be forever thankful to Marion and John for their assistance and generosity in making this material available.

It was during my first visit to Legana that Marion and John discussed with me the possibilities of preserving for posterity their large specimen and photograph collections of Australian acacias. We discussed various options before finally deciding that a most appropriate place would be the National Herbarium of Victoria (herbarium MEL). Marion subsequently discussed the matter with the then Curator of MEL, Dr Jim Ross, who agreed to accept the collection. I understand that prior to transferring the material to Melbourne, Jim visited John and Marion in order to assess the collection for himself. More recently MEL has agreed to also house in their library Marion's completed, but unpublished, volume 3 of *Acacias of Australia* (including her line drawings of the included species).

The last time I saw Marion and John was at the 2006 Acacia Symposium in Melbourne. However, I did have occasion over subsequent years to speak with Marion by phone, often to get permission on behalf of someone wanting to use John's photographs that appeared on WorldWideWattle.

Both Marion and John will be greatly missed by very many people. However, they have left behind a very fine legacy that will remain useful well into the future."

One of Marion's good friends in Tasmania was **Prue Wright** (who is also a member of our Study Group). I received a note from Prue in relation to Marion's passing, in which she wrote as follows:

"... It was so sad, and yet we are happy that she is no longer shut up in a nursing home. For the last few months she stopped joining us for our plant propagation days, but we held a little party in the home for her 93rd birthday in February. She was a wonderful lady and a friend to us all. And she was just mad about growing Acacias!"

Marion (& John) SIMMONS publications

Simmons, M.H., 1981. *Acacias of Australia*. Volume 1. (Viking O'Neil: South Yarra, Victoria.)

Simmons, M.H., 1987. *Growing Acacias*. Kangaroo Press, Kenthurst. Bill

Simmons, M.H., 1987. *Acacias of Australia*. Volume 1, Revised Edition. Nelson, Melbourne

Simmons, M.H., 1988. *Acacias of Australia*. Volume 2. Viking O'Neil, Penguin Books Australia Ltd, Melbourne.

Simmons, M., J., S., 2003. *Acacia now - but what of the future?* Newsletter of the Australian Plants Society Tasmania 15, 11.

Simmons, M.H., 2009. *Wattles of Tasmania*. Marion H Simmons
Simmons, M., 2010. *Tasmanian Acacias*. Australian Plants 25, 275-281.

Web articles:

Simmons, M. *Cultivation of Acacias*. WorldWideWattle website (<http://worldwidewattle.com/infogallery/cultivation/>). Accessed 5 May 2020.

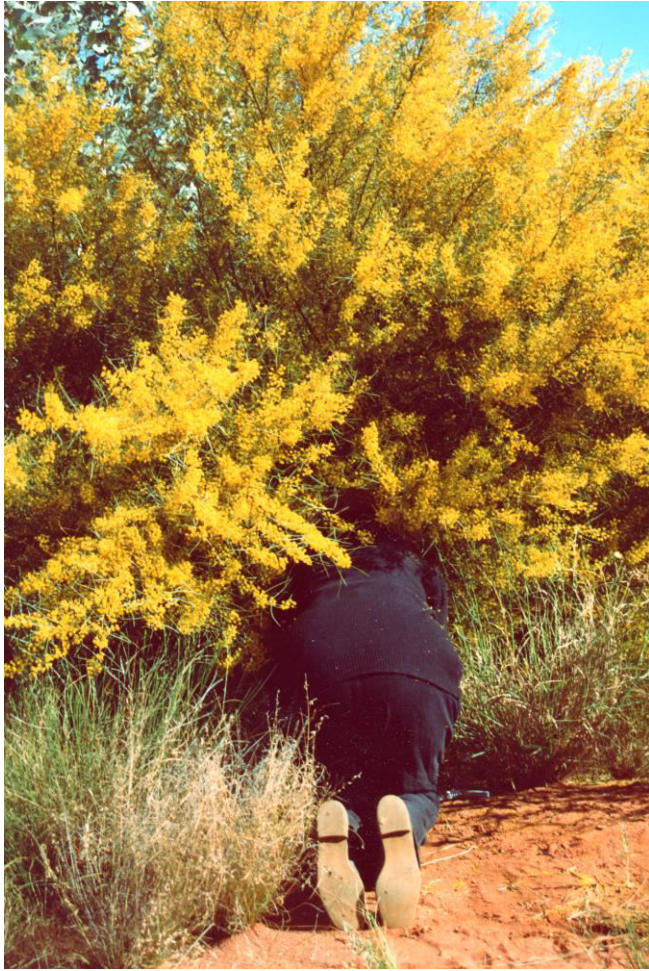
Simmons, M. *Acacia – An Introduction*. Australian Plants Online (<http://anpsa.org.au/APOL16/dec99-3.html>). Accessed 5 May 2020.

Some Photographic Memories of Marion and John

The following are some images taken by John and which he forwarded to the Acacia Study Group, together with his explanations as to the photos.



Marion collecting *Acacia simmonsiana* on Kangaroo Island



Marion collecting pods. We always did our best to find pods. When they weren't on the bush they were often underneath on the ground but the wind often blew other pods under the bushes so one had to be careful that you were getting the right ones. More time was spent at this chore than anything else.



Us collecting on Cape York. Mainly to show how we quickly dried specimens by letting the sun shine on them and the wind blow through them. Each specimen is placed between two layers of newspapers and if moist, blotting paper on both sides. They are then put in the press between two layers of corrugated cardboard which lets the breeze go through. The press was held in place with a bungee cord.

Welcome

A special welcome to the following new member to the Study Group.

Matt Garrett, NSW

From Members and Readers

Helen van Riet (Wangaratta, Vic) wrote (23 January 2020) as follows):

“FYI, I came across this article today. **Tony Rinaudo** is a ‘local’ from Myrtleford. It’s encouraging to us ‘small fry’ who feel so insignificant faced with the enormity of the task to turn around the constant focus on deforestation to somehow ‘protect’ communities from wildfires. The species Tony has used is *Acacia colei* var *colei*.”



Marion collecting pods having the flowering specimens already in the press. Me photographing near Lake King, WA.

<http://www.abc.net.au/news/2020-01-23/what-i-learned-about-australian-bushfires-living-on-edge-sahara/11885000>

(Editor note: One interesting fact I note in the article is that today, Niger has more than 6 million hectares of farmland with an average tree density of 30 trees per hectare (about 240 million trees) – up from 4 trees per hectare in 1980.)

Helen also forwarded a photo that she received from a friend, **Jo Watkins**, showing the success that Jo has had with *Acacia cretacea*.



Acacia cretacea, and Jo Watkins

Jo lives in Glenrowan (near Wangaratta), and she advises that there is not a lot of topsoil and then clay and rock. The prevailing winds are from the west so as her plant has grown it has been blown sideways by the wind, so its growth is on a slant, but it still looks strong. It gets some afternoon shade, but not a lot. It is now probably about 3 years old and flowered last year, but Jo couldn't locate any seed. She did water a couple of times but not a lot, and it continues to grow.

Helen tells me that she also has an *A. cretacea* in her garden. It did survive the ravages of summer, and is now putting on a small amount of new growth, but is still quite spindly.

Victoria Tanner has drawn attention to an article by **Geoff Butler** that appeared in the ANPSA Canberra April 2020 Newsletter (<https://nativeplantscbr.com.au/wp-content/uploads/Fire-Retardant-Native-Plants.pdf>).

The article notes that there are many native species that are fire retardant, and includes a list of species considered suitable for the Southern Highlands. The list includes 21 *Acacia* species

Victoria has also written about the impact on her garden of the close proximity of the recent bushfires:

“I am not sure if you have the same thing happening where you are, but as I had quite a few plants die or near die and trees and taller shrubs near the house were severely removed of greenery or taller branches; but most plants are now returning via epicormic growth - many that I would not have expected to in this way. We also had many days of heavy smoke and more recently some rain, so I wonder if the former stimulated this type of growth (as in after a fire) and the rain assisted. This year I have also noticed a number of acacia seedlings which has never happened before here - perhaps due to rain at the right time? I think that it would be an area of interesting study and wonder if others have noticed the same?”

Please let me have any comments on the question raised by Victoria.

Duncan and Mary Campbell

Ian Campbell (Sydney) is the grandson of Archibald James Campbell, who is recognised for his formation of a Wattle Club in Victoria in 1899 and for the first suggestion of a Wattle Day during a speech in 1908. Whilst AJ Campbell is well known for his achievements, perhaps less well known are Ian's parents, Duncan and Mary Campbell.

Ian has recently sent me some information relating to Duncan and Mary. They were landscape designers in NSW in the 1960s/1970s. From 1968-71, Mary took up a position with the NSW National Trust as its first Landscape Conservation Officer. It was during this period that there was a fight in NSW to save from development an area of bushland on the lower Parramatta River called Kelly's Bush. Mary's role in relation to this saga has now entered the history books – for example, two references are listed below.

At about the same time, Duncan and Mary also took on, in a voluntary capacity, the AJ Small Lookout bush regeneration project. This restoration project was at Bilgola Plateau on land donated to the National Trust. It is on a spectacular headland that overlooks the Northern Beaches coastline in Sydney. Duncan continued with this work after Mary's death in 1971.

In the 1950s, Duncan and Mary created a garden for their house in northern Sydney and when landscaping, as an occupation, did develop a small nursery for use in their work. Ian thinks that his parents had the banksia as their

Sydney nature symbol, rather than the *Acacia* genus. But there is an *Acacia melanoxydon* in the backyard that he believes they planted over 60-70 years ago (Ian and his wife took up the childhood house after his father's death in 1978).

Ian advises that he put his parents' landscape designs and notes in the State Library of NSW some years ago, as well as material from his mother's time at the NSW National Trust.

Ian comments that he did grow up with 'nature' but never had the extraordinary interest and detailed knowledge of Australian plants and trees that his grandfather or for that matter, his parents possessed. His interests went elsewhere. But his approach to acacias, in particular, grew out of close reading of his grandfather's writings and his photos, and benefit now from the kinds of activities that our *Acacia* Study Group is involved with.

References:

Lines, William J. (2006) Patriots: Defending Australia's Natural Heritage (University of Qld Press)
Roddewig, Richard J. (1978) Green Bans: The Birth of Australian Environmental Politics (Hale & Ironmonger)

Two New *Acacia* Species

Acacia cineramis

Acacia cineramis is a recently described new species of *Acacia*.

It is currently found only in the Wimmera district of central-western Victoria, occurring in seven sites across an area of approximately 1145 sq km bounded by the Little Desert to the south, Kaniva to the east, Gerang Gerung to the west and Glenlee to the north. The largest known population of about 2500 individuals occurs just inside the Eastern Block of the Little Desert National Park, another population of about 300 plants occurs within Glenlee Flora and Flora Reserve, whilst population numbers in the other 5 sites are very low (fewer than 15 individuals across all sites). It is likely that in the past it was more widely distributed throughout the Wimmera, but due to heavy clearing for cereal cropping, it is likely that most of the species' habitat has been lost. Its conservation status has been assessed as endangered.

The species name is derived from the Latin words *cinereus* (ash-coloured) and *ramus* (branch) in allusion to the appearance of the branchlets of the species – one of the more obvious characters that distinguish the plant from *Acacia rigens*.

It is noted that it was *Acacia* Study Group members Graham and Maree Goods who rediscovered *A. cineramis* after over

30 years, which then allowed the authors to search other likely habitat.

Reference:

Orel, H.K., Murphy, D.J. & Walsh, N.G. (2020), *Acacia cineramis* (Leguminosae: Mimosoideae), a new species endemic to south-eastern Australia, and an investigation of phyllode nervature in allied species *Muelleria* 38, 87-99

Acacia lespedleyi

The genus *Acacia* is the most speciose genus in the Queensland vascular flora, with over 300 species known. Ten new species were recently described (as reported in our previous newsletter No. 146), and *Acacia lespedleyi* is yet another new species.

It is a shrub to 3m tall with distinctive minni-ritchi bark. It has grey-green phyllodes 32-138 mm long and 2.5-5 mm wide. It has golden yellow spike flowers.

The species has some similarities to *Acacia curranii* and, to a much lesser extent, *Acacia rhodoxylon*.

It is known from just one location west of Eidsvold in south east Queensland with two subpopulations about 2km apart occupying less than 2 sq km. In 2006 it was estimated that there were less than 500 individual plants. The species is considered to be critically endangered.

The species is named in honour of **Les Pedley** (1930-2018) who was a wattle specialist at the Queensland Herbarium for many years.

Reference:

Forster, P.I. (2020). *Acacia lespedleyi* P.I.Forst. (Mimosaceae), a new and geographically restricted species from south-east Queensland. *Austrobaileya* 10(4): 558–563

Host Species of Mistletoe

In Australia, there are 90 species of Mistletoe. These Mistletoes parasitise various host species. Some recent research has revealed that previously, there were 338 known host species. However, the research reveals that there are now 317 new host species not previously known as mistletoe hosts. This increase in known mistletoe hosts has occurred in less than two decades, and suggests that our current knowledge of hosts is still incomplete, and that further new hosts will be discovered in future.

Acacias are important host species of Mistletoes, with 63% of all Mistletoes parasitising species of either *Eucalyptus* or *Acacia*, or both these genera.

There are four species of *Acacia* that are host species parasitised by 10 or more Australian mistletoe species. These are *Acacia aneura* s.l. (17 mistletoe species), *A.*

victoriae (13 species), *A. excelsa* (11 species) and *A. tetragonophylla* (10 species). In total, 199 species of Acacia are recorded as hosting mistletoes.

Reference:

Clark, N.F., McComb, J.A., Taylor-Robinson, A.W. (2020) Host species of mistletoes (Loranthaceae and Viscaceae) in Australia *Australian Journal of Botany* doi:10.1071/BT19137

Acacia carneorum

Our Newsletter No. 128 (March 2015) included an article on *Acacia carneorum*. It was noted in this article that the species is found as a set of small, spatially isolated populations. Whilst regular flowering occurs, only two populations set seed. The populations are typically highly clonal and reproduce mainly through suckering, and lack genetic diversity.

One of the populations referred to in that article was as Boolcoomatta Reserve, a Bush Heritage property about 100km west of Broken Hill, across the border in South Australia. Trevor Blake recalled seeing it there, growing as a thick stand on sand dunes, the plants being about 2.5m high and 2-3m wide. Trevor recalled how prickly the plants were.

Victoria Tanner has now drawn attention to a recent report from Bush Heritage on a monitoring program being undertaken at Boolcoomatta Station Reserve.

This program has involved the mapping and assessment of up to 30 distinct stands at the Reserve. Die-off is prevalent at a large proportion of the sites, most likely attributed to drought and impact from rabbits. Flowering was evident at 35% of the sites, but there was no evidence of seed set.

Reference:

<https://www.bushheritage.org.au/blog/purplewood-acacia-monitoring-on-boolcoomatta> (accessed 14 May 2020)

Acacia sertiformis (maybe)

Ivan Margitta (East Bentleigh, Vic) recently sent me a photo taken at Maranoa Gardens (in Melbourne's east). The photo was taken on 15 December 2019, and Ivan noted that the plant was incorrectly labelled as being *Acacia viscidula* (the plant had been grown from seed sourced from a commercial seed company, and the incorrect labelling may have resulted from incorrectly labelled seed that had been purchased).

Following a query raised by Ivan, **Andrea Dennis** from the Gardens tried to key out the species, and shortlisted it to *A. cremiflora*, *A. sertiformis* or *A. undulifolia* (with a strong leaning towards *A. sertiformis*).



Photo at Maranoa Gardens, 15 December 2019

This prompted Ivan to look further into the species name, but in fact he found hardly anything on the Internet. He did find in his own photo collection a photo which he had labelled *A. sertiformis* while passing through the Pilliga Scrub back in August 2013.



Photo taken Aug 2013, Pilliga Scrub

Whilst the plant in the Pilliga looks somewhat similar to the one at Maranoa Gardens, Ivan queried the flowering time (the Pilliga plant was flowering in early spring, the one at Maranoa Gardens in summer), and the plant in the Pilliga did not appear anywhere near as hairy.

But a subsequent visit to Maranoa Gardens in January did reveal one similarity between that plant and the plant in the Pilliga – flowers open serially with buds still closed at one end and wilted flowers on the other side of the fully open ones.



The plant at Maranoa Gardens, 7 Jan 2020

If anyone can shed any further light on the identification of the plant growing at Maranoa Gardens, that would be much appreciated.

Some Wattles in the Walcott Garden

Ros Walcott has provided some photos of Acacias in their garden at Red Hill, Canberra (with comments as provided by Ros).



Acacia boormannii planted 2003 along our back fence and covered each year in *Clematis microphylla* to make a pleasing picture. We pull off the vine each year so as not to overwhelm the acacia, but it grows back enthusiastically.



Acacia cremiflora planted 2016, a small wattle 1.5m high and 2m wide when fully grown, which flowers several times each year and produces masses of seed pods which are popular with birds.



Detail of *A. cremiflora* flowers

Acacias in China

There have been two recent papers published relating to Acacias in China, and some brief notes on each of these papers follow.

A taxonomic revision of *Acacia* in China

A recent paper published in the journal *Plant Diversity* provides a comprehensive taxonomic revision of *Acacia sens. lat.* in China. In particular, 21 indigenous species, previously recorded as *Acacia*, are now recognised under *Senegalia*. Detailed botanical profiles are provided for these species.

The paper also includes information regarding 15 species from four genera (*Acacia*, *Acaciella*, *Senegalia* and *Vachellia*) that are regarded as major introductions to China. Of these 15 species, 11 are introductions from Australia viz *Acacia auriculiformis*, *A. cincinnata*, *A. crassicarpa*, *A. dealbata*, *A. decurrens*, *A. holosericea*, *A. implexa*, *A.*

mangium, *A. mearnsii*, *A. melanoxylon* and *A. podalyriifolia*).

For the introduced species, the paper contains information under the headings distinctive features, description, distribution, taxonomy, utilisation, etymology and vernacular names.

Reference:

Maslin, B.R., Ho, B.C., Sun, H., Bai, L. 2019. Revision of *Senegalia* in China, and notes on introduced species of *Acacia*, *Acaciella*, *Senegalia* and *Vachellia* (Leguminosae: Mimosoideae) Plant Diversity 41, 353-480.

A tale of exotic Eucalyptus and Acacia species in China

Another paper recently published in International Forestry Review tells a tale of exotic *Eucalyptus* and *Acacia* species in China.

In China, a substantial plantation industry, including 5.4M ha of eucalypts and up to 50,000 ha of acacias, has been built up over the past 40 years. From the 1980s through to the early 2000s a suite of Chinese-Australian collaborative R & D projects made major contributions to domestication, genetic improvement, silviculture and other aspects of plantation eucalypts and acacias in southern China.

In relation to Australian acacias, in the mid 1900s a number were introduced to China, including *A. mearnsii* in the early 1930s, *A. dealbata* and *A. decurrens* in the 1950s and *A. auriculiformis* in the early 1960s. Some years later a number of other potentially useful plantation acacias were introduced, including *A. crassicarpa* and *A. mangium* in 1979. In fact, by 1994 over 100 taxa of Australian *Acacia* are known to have been introduced to China. Of the large cohort of exotic *Acacia* species, about 15 have proved useful, or at least potentially useful, as ornamentals, in amenity plantings, in landscape amelioration projects and/or as commercial plantation species, including: *A. auriculiformis*, *A. cincinnata*, *A. crassicarpa*, *A. dealbata*, *A. decurrens*, *A. holosericea*, *A. implexa*, *A. mangium*, *A. mearnsii*, *A. melanoxylon* and *A. podalyriifolia*.

In the 1980s there was a very optimistic outlook for *A. mearnsii*, a species desired for its tannin rich bark as well as producing wood with desirable wood pulping qualities. Collaborative Chinese-Australian projects were initiated to focus almost entirely on this one species.

But there is now a waning interest in Acacias in China, with little current interest in deploying such species in commercial plantations and actual plantation areas have declined in recent years, with the one exception being *A. melanoxylon*.

The decline in commercial interest in most plantation acacias has been due to a complexity of factors including abiotic factors, economic factors (poor market acceptance of acacia logs for higher value uses), lower productivities compared to clonal hybrid eucalypts and more.

The following are a couple of interesting facts that I found in the paper:

- Some research has shown that mixed plantations of eucalypts and acacias can provide positive results. For example, one trial in 2009 found that a plantation mixture comprising *Eucalyptus urophylla* x *tereticornis* with *Acacia crassicarpa* in a 1:1 ratio provided an increase in growth of over 100% compared to that of pure plantations of either the eucalyptus or acacia taxa used in the mixture. But the results of this and similar research has never led to the large-scale adoption of mixed plantations – a situation attributable to the complexity of managing plantations comprising two different fertiliser and silvicultural requirements while producing different products.
- Despite the relatively small plantation area of *A. melanoxylon* in China, strong interest and active research on this species persists to this day. In fact, in 2014 it was reported that research projects for more than 15 Master and PhD degrees had recently been conducted on this species.

The paper considers the challenges facing future cultivation of both eucalypts and acacias in China, with climate change and pests and diseases perhaps being foremost among such factors.

Reference:

Arnold, R.J., Xie, Y.J., Luo, J.Z., Wang, H.R., Midgley, S.J. 2020. A tale of two genera: exotic *Eucalyptus* and *Acacia* species in China. 1. Domestication and research International Forestry Review Vol. 22(1)

Books

No doubt most of us are spending more time at home than is normal, perhaps an opportunity to catch up on some reading.

Victoria Tanner advises that the following are a couple of books that she has read recently:

George Robinson Protector of Aborigines, by Vivienne Rae-Ellis (published by Melbourne University Press 1992)

The Botanist and the Judge: Alan Cunningham in Tasmania 1818-1819, by AE & TA Orchard (published by AE Orchard 2014)

The following is a book that I have read:

The Lord Treasurer of Botany Sir James Edward Smith and the Linnaean Collections, by Tom Kennett (published by The Linnaean Society 2016)

What books have you been reading while in lockdown?

A couple of new books that include some references to Acacias are:

Wildflowers and Wetland Plants of the Margaret River and its Hinterland
by Jane Scott
Published by Cape to Cape Publishing 2019 RRP \$24.95

This is a guide to the flora of the Margaret River and surrounds and features photographs and descriptions of 290 species.

There are 8 *Acacia* species included in the book, being *A. alata*, *A. divergens*, *A. extensa*, *A. gilbertii*, *A. littorea*, *A. myrtifolia*, *A. obovata* and *A. urophylla*. Reference is also made to the invasive *A. mearnsii* from the eastern states.

Australian Rainforest Seeds: A Guide to Collecting, Processing and Propagation
by Mark Dunphy, Steve McAlpin, Paul Nelson, Michelle Chapman and Hugh Nicholson
Published by CSIRO Publishing 2020 RRP \$49.99

This book is a guide to propagating 300 rainforest species from seed, with individual details show for each species. Not surprisingly, there are not many *Acacia* species included – there are in fact three species, viz *A. bakeri*, *A. disparrima* and *A. melanoxylon*.

Some News Articles

Thanks also to **Victoria Tanner** for drawing attention to a couple of recent news articles.

The first article relates to a project in Africa, called “Let’s Plant Acacias Together”. This project commenced on 21 March 2020, in celebration of International Forest Day 2020. The article refers to the ability of the acacia trees to capture nitrogen, to nourish soil, revive fertility, provide a windbreak function and prevent erosion. It is noted that several drought tolerant species were to be planted, including the African species *Senegalia senegal* (previously *Acacia senegal*), which is used in the production of gum acacia.

Reference:

<https://www.foodnavigator.com/Article/2020/03/20/E414-supplier-backs-reforestation-in-Africa-Our-customers-will-know-how-many-trees-were-planted-thanks-to-their-business#>

The second article referred to by Victoria takes us to Ireland. A report in the Irish Examiner on 16 March 2020 referred to the approach of National Tree Week, commencing on 21 March. This article does not relate to acacias (apart from a reference to acacias as being a firm favourite of giraffes on the African Savanna. The article does, however, pay a tribute to the “beauteous arboreal survivors that surround us”.

Reference:

<https://www.irishexaminer.com/breakingnews/lifestyle/outdoorsandgarden/paying-tribute-to-our-trees-988279.html>

Study Group Membership

Acacia Study Group membership for 2019/20 is as follows:

\$7 (newsletter sent by email)
\$10 (hardcopy of newsletter posted in Australia)
\$20 (hardcopy of newsletter posted overseas)

Subscriptions may be sent to:
Bill Aitchison, 13 Conos Court, Donvale, Victoria 3111

Subscriptions may also be paid directly to our Account at the Bendigo Bank. Account details are:
Account Name: ASGAP Acacia Study Group
BSB: 633-000
Account Number: 130786973

If you pay directly to the Bank Account, please advise us by email (acaciastudygroup@gmail.com).

Adventures with a common wattle

12 Feb 2020

Sean Walsh, School of Ecosystem and Forest Sciences, University of Melbourne

A few years ago I decided to pursue a dream of becoming an ecological modelling specialist. To this end I enrolled in a PhD, then started looking around for a topic. I eventually settled on trying to understand soil and canopy seed banks in fire-adapted native forests. We have many tree species in Australia that need fire to regenerate, but there are many unanswered questions about exactly how they do this, especially given that fire behaviour can be so variable, and sometimes downright terrifying, as the recent fires in southeast Australia have just demonstrated.

To ensure this was more than just a ‘theoretical’ study, I needed to choose a couple of tree species to look at more closely. A lot of ecological research involves rare or threatened species, but I was trying to build a model, so I needed lots of data. I decided to focus on two common species, *Eucalyptus regnans* (Mountain ash) and *Acacia dealbata* (silver wattle) – very plentiful in the forests of the Central Highlands, not far from Melbourne. This story is about my adventures with *A. dealbata* and describes some of my insights so far.

Firstly, I had to find patches of forest where silver wattle was the dominant overstorey tree. Remote sensing came to my rescue here – this particular *Acacia* shows up very nicely as a grey-blue colour in a sea of medium or dark green *Eucalyptus*. I wanted forest patches that were young, middle aged and old – to see if my computer model could reproduce how the seed bank changes over time. Finding young patches was easy – there are many areas in Central Highlands where (for one reason or another) *Eucalyptus* regeneration has failed, and *Acacia* is king. But finding the old patches was incredibly hard!

It turns out that in the Central Highlands the time between major fires in our forests can be quite long – well over a hundred years in some places – but Silver wattle rarely survives beyond 80 years. As far as I know the record for a Silver wattle tree is 92 years (Fedrigo *et al.* 2019). So as an *Acacia* forest patch gets older, the trees simply die one by one, and other tree and shrub species take over. Such places then become devoid of large trees, waiting patiently for another fire. Then *E. regnans* and *A. dealbata* will fight it out for control of the freshly burnt landscape.



Patch of young Silver wattle (centre of image), Nolans Rd Toolangi, NearMap satellite image taken April 2011.

On my first day out in the Central Highlands to measure trees and take soil samples, I was struck by how immensely tall these wattles can become. Unlike the multi-stemmed, almost ‘mallee’ forms that we see along rivers and creeks in Melbourne, these trees typically had very straight trunks and tiny canopies, suggesting that they were desperate for light, in an environment dominated mainly by fast-growing *E. regnans*. The tallest silver wattle tree I found was 39.5m, larger than any other record I have found.

I also noticed how stunningly beautiful these wattle forests can be. (That is, once I had recovered from trooping through leech-infested gullies and staggering through dense wiregrass and shrubbery in order to get to them). *Acacia* trunks were typically covered in lichen, and there was often enough light getting through to support dense fern growth, including mother shield fern (*Polystichum proliferum*), batwing fern (*Histiopteris incisa*), bracken (*Pteridium esculentum*), soft tree fern (*Dicksonia antarctica*) and rough tree fern (*Cyathea australis*).



Middle-aged (36-year old) Acacia dealbata forest patch along Mt Bride Rd, east of Yarra Junction

I did manage to find a few very old *Acacia* patches, most likely dating back to the 1939 Black Friday fire, making them 80 years old. These old Silver wattle trees often had multi-lobed trunks leading down to supporting buttresses at the base. The outer bark was typically cracked and split, showing the ravages of time and occasional extreme weather. Where the base of the trunk was well sheltered and moist, an abundance of moss and other epiphytic growth could be seen. These were truly amazing places to visit.



A towering 80-year old silver wattle at Britannia Creek, east of Yarra Junction, 15 March 2019



Lush epiphytic growth covering the base of an old silver wattle tree, Britannia Creek, 9 Jan 2020

A key part of my research involved digging into the soil, in order to find out how many *Acacia* seeds were present. A simple bulb planter was used to extract samples of soil to 10cm depth, but to get meaningful results I needed 32 such samples per plot. My field technician (Ben) did a great job of helping to carry soil back to our vehicle after each sampling operation. Over 7 days of field work, a total of 148 kg of soil was taken back to the lab.

So, I hear you wondering, what do you do in a lab with that much forest soil? Well, the conventional method is to place the soil in an industrial oven to give any *Acacia* seeds some heat treatment, then lay out the soil in trays in a climate-controlled glasshouse, with automatic or manual watering, then wait for the seeds to germinate. By counting the germinants, and knowing how much forest floor area was sampled, you can calculate the soil seed bank density in seeds per square metre (seeds/m²). The problem is, to make this work you have to make an assumption about the best type of heat treatment to use – and there is evidence that the optimum heat treatment can vary even within a single species (Liyanage *et al.* 2016).

There is an alternative, but it's not for the faint hearted - it involves systematically searching the soil for seed (Goets *et al.* 2018). I figured this would work because *Acacia* seeds have a distinctive shape and are large enough to spot visually. So I developed a method which allowed me to efficiently search through a few kilograms of soil each day, and got started. It took three months, during which I think I aged about three years! But having done this, I now have some valuable information on *Acacia* seed bank densities, which varied from less than 50 seeds/m² (typically in very young forests or on dry sites), up to several thousand seeds/m² at a 36-year old “wet” site (on a south-facing slope).

This was not the end of the story, however; there were still two more problems to solve. Firstly, I needed to be sure these seeds were *Acacia dealbata*, and not some other *Acacia*. Secondly, I needed to eliminate any empty, predated, or decayed seeds. The latter problem wasn't too hard - as I was collecting seeds, I did a quick visual inspection, and was able to eliminate any seeds that showed clear signs of predation or fungal decay. Later I was able to run my collected seeds through the “zig-zag aspirator” at the National Herbarium of Victoria, a clever device which uses an air blower to eliminate empty seeds. The problem of confounding *Acacia* species was more difficult.

I solved part of this problem by first looking for records of other common *Acacia* species in the Central Highlands, and obtaining samples of seeds from these species, to see what they look like. Bill Aitchison very kindly provided samples of *A. obliquinervia*, *A. frutescens*, *A. leprosa*, and *A. verticillata* seeds (some from his own garden), and I already had plenty of *A. dealbata*, *A. implexa*, *A. mearnsii* and *A. melanoxylon* seeds from my own seed collecting efforts. With these collections handy, I then classified each of my forest soil seeds as “probably *A. dealbata*” or “probably not *A. dealbata*”, on the basis of seed shape.

During this process I discovered that seeds of *A. melanoxylon* and *A. obliquinervia* are markedly different from those of *A. dealbata*, so when I found these in my forest soil seed collections, it was straightforward to exclude them. Seeds of *A. obliquinervia* have a very distinct “thick” edge – in fact, the edges are actually so thick that you can stand the seed up on its edge (see photos taken through the Herbarium microscope). Seeds of *A. melanoxylon* are generally rounder than *A. dealbata*, and often have a slightly ridged appearance on the top and bottom surfaces.



Acacia obliquinervia seed, viewed edge-on, being held by tweezers.



The same *Acacia obliquinervia* seed, now free standing on its edge.

Here are some photos showing the different shapes of *A. dealbata*, *A. melanoxylon* and *A. obliquinervia*, viewed from above. Fresh *Acacia* seeds are always shiny and black, but here I have shown what can happen to *A. dealbata* seeds after storage in the soil for some time – a fine brown fungus often covers the surface. I had seen this fungus before... in an earlier study where I had applied heat treatments to seeds then germinated them in the lab. After a couple of months in a wet petri dish, any seed that didn't germinate was covered in a brown fungus... and I wonder if this might actually be a part of the seed's own defence against other less desirable microbes. It's a tough world in the soil, if you have to sit there for decades waiting for the right conditions... so even though *Acacias* rely mainly on their hard seed coat, I would not be surprised if they also had beneficial microbes (Dalling *et al.* 2011).



Acacia dealbata
seed, retrieved from



Acacia melanoxylon
seed, fresh



Acacia obliquinervia
seed, fresh

I also found what I believe to be burnt seeds within soil samples. These have a distinctly *Acacia* seed shape, but the surface is rough and typically broken or split, sometimes showing a dark material inside, which appears to be charcoal. These seeds were all found at sites with plenty of standing *Acacia* trees, so I expect that seed mortality through fire is probably a normal part of *Acacia* seed ecology. Ants will do their best to bury seeds, but not all seeds are buried deep enough to avoid being scorched.

After crunching some data, I noticed an interesting pattern – at sites where there had been a forestry coupe burn (“slash burn”), the smaller and younger the trees, the closer the seed bank was to zero. This suggests that coupe burns are probably reaching such high temperatures that they cause all seeds in the topsoil to either germinate or die, effectively pressing a ‘reset’ button on the *Acacia* seed bank. Fortunately, enough seeds survived and germinated at each of these sites to generate plenty of live *Acacia* plants. Indeed at one such site, *Acacia* saplings were so numerous that I estimated nearly 50000 stems per hectare (50 per square metre). That’s a lot of wattle, but it will all self-thin down as plants compete with each other, and by the time these saplings have reached 80 years old, they will probably be growing at a density of only 100-400 stems per hectare.



Burnt *Acacia* seed, probably *A. dealbata*

The next step in my research is to subject samples of my collected seeds to a range of heat treatments, then set up a germination trial. I know from my own previous lab work with *Acacia dealbata* that freshly collected seeds can give a 99% germination rate if given the right conditions. So it will be particularly interesting to see what germination rate emerges from seeds taken from soil under old *Acacia* forests. I am also taking some core samples and counting tree rings, to find out exactly how old these trees are. Appearances can be deceiving – large, old looking trees might have just had a good location to grow in, so they may not be as old as they look!

It's been a long process, and I still have a way to go, but what I have discovered is that even our most common forest trees are worthy of study – there are so many ecological mysteries to unravel, especially in terms of how fire interacts with trees and their seed, and how our forest wattles manage to survive over such long time scales.

Acknowledgements

I would like to acknowledge Mr Ben Smith who supported my field campaign with a range of technical measurements and plant ID efforts, my supervisors (A/Prof Craig Nitschke, Dr. Raphael Trouve and A/Prof Peter Vesk) for their encouragement and insights, Bill Aitchison (Australian Native Plants Society) and Pat Long (Friends of Plenty River) for supplying samples of seed from a range of *Acacia* species, Dr Megan Hirst from the National Herbarium of Victoria for access to the Herbarium Seed Lab, and my funding sources (an Australian Government Research Training Program (RTP) scholarship and a Student Research Award from the Ecological Society of Australia).

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Seed Bank

An updated list of species in our Seed Bank appears below.

Although we do purchase some seed from commercial sources, we also rely upon donations of seed. If you are able to help with any seed donations they would be very welcome (we would ask you to post any donations to Bill Aitchison, who will forward them on to our Seed Bank Curator, Victoria Tanner). It also helps enormously if you are able to clean, sort and label the seed correctly. Also, we would like to have provenance information for all seed in the seed bank – so if you donate any seed, could you also provide any information you have in relation to provenance.

Our thanks to **Graeme Serle** for a recent donation of seed.

We have had a request for seed of *Acacia spooneri* and *A. coatesii*. Is there a member who can help with seed of either of these species? Also, can anyone help with seed of *A. nanodealbata*?

The procedure for requesting seed from the Seed Bank is as follows. Study Group members are entitled to lodge up to 3 orders per member per year, with 10 packets maximum in each order (negotiable). There is a charge of \$4 in relation to each order, to cover the cost of a padded post bag and postage. The \$4 may be paid in stamps or by direct credit to our Group's bank account. Requests for seed may be lodged in either of the following ways:

1. By email to our Study Group email address, acaciastudygroup@gmail.com (emails to this address go directly to both Victoria and Bill Aitchison). If you make a request by email, you will also need to make the necessary payment by one of the above methods. If you are paying by stamps, these should be mailed to Bill Aitchison, 13 Conos Court, Donvale, Vic 3111
2. By mail (enclosing stamps if required). These requests should be posted to Bill Aitchison (address as in the previous paragraph). Bill will then advise Victoria of the request.

We would like to maintain some data on your results in propagating seed from the Seed Bank. We would therefore ask if you could provide a report on your results, recording information on species, number of seeds sown, number germinated and days after sowing.

ACACIA STUDY GROUP SEED BANK LIST

(current at May 2020)

acanthoclada	blakei	cultriformis	ericifolia	hemiteles	latisepala
acinacea	blakelyi	cupularis	erinacea	(Goldfields form)	lauta
acradenia	blayana	curranii	eriopoda	hemiteles	legnota
acuaria	boormanii	curvata	estrophiolata	(Wheatbelt form)	leichhardtii
acuminata	brachybotrya	curvinervia	euthycarpa	hemsleyi	leiocalyx
adenophora	brachystachya	cuthbertsonii	everstii	heterochroa	leiderma
adoxa var adoxa	brassii	cyclops	excelsa	heteroclita	leiophylla
adsurgens	brevifolia	cyperophylla	exilis	heteroneura	leprosa
adunca	browniana	dallachiana	exocarpoides	hexaneura	leptalea
aestivalis	var browniiana	daphnifolia	extensa	hilliana	leptocarpa
alata ssp alata	var intermedia	dawsonii	falcata	hispidula	leptoclada
alata ssp tetrantha	var endlicheri	dealbata	falciformis	Holland's Rock	leptoloba
alcockii	brownii	deanei ssp deanei	farinosa	holosericea	leptonera
alleniana	(ulicifolia var	ssp paucijuga	fasciculifera	holotricha	leptopetala
amblygona	brownii)	debilis	fauntleroyi	horridula	leptospermoides
amoena	brumalis	declinata	filicifolia	howittii	leptostachya
ampleiceps	brunioides	decora	filifolia	hubbardiana	leucoclada
anatriceps	burbidgeae	decurrens	fimbriata	huegelii	ssp argentifolia
anceps	burkittii	deficiens	flagelliformis	hyaloneura	ssp leucoclada
ancistrocarpa	burrowii	deflexa	flavescens	hystrix	ligulata
aneura	buxifolia	delphina	flexifolia	Idiomorpha	ligulata prostrate
angusta	bynoeana	demissa	flocktoniae	imbricata	ligulata narrow leaf
anthochaera	caerulescens	dempsteri	floribunda	implexa	ligustrina
aphylla	caesiella	denticulosa	fragilis	inaequilatera	limbata
applanata	calamifolia	dentifera	frigescens	inaequiloba	limbata prostrate
aprepta	calantha	desertorum	gemina	incurva	linearifolia
aptaneura	camptoclada	dictyoneura	genistifolia	ingramii	lineata
araneosa	cardiophylla	dictyophleba	genistifolia	inophloia	lineolata ssp lineolata
argyraea	caroleae	dielsii	prostrate	intricata	linifolia
argyrophylla	celastrifolia	dietrichiana	gilbertii	irrorata	littorea
arida	chamaeleon	difficilis	gillii	iteaphylla	loderi
arrecta	cheelii	difformis	gittinsii	ixiophylla	longifolia
aspera	chinchillensis	dilatata	gladiiformis	ixodes	longifolia
assimilis	chisholmii	dimidiata	glandulicarpa	jamesiana	ssp longifolia
assimilis	chrysellia	diphylla	glaucissima	jennerae	longiphyllodinea
ssp atroviridis	chrysocephala	disparima	glaucoarpa	jensenii	longispicata
atkinsiana	cincinnata	divergens	glaucoptera	jibberdingensis	longissima
attenuata	clunies-rossiae	dodonaefolia	gnidium	johnsonii	longispinea
aulacocarpa	cochlearis	donaldsonii	gonocarpa	jonesii	loxophylla
aulacophylla	cognata	doratoxylon	gonoclada	jucunda	lucasii
auriculiformis	colei	drepanocarpa	gonophylla	julifera	lysiphloia
ausfeldii	colletioides	drummondii dwarf	gracilifolia	juncifolia	mabellae
axillaris	complanata	drummondii	gracillima	kempeana	macdonnellensis
baileyana	concurrans	ssp drummondii	grandifolia	kettlewelliae	macnuttiana
baileyana prostrate	conferta	ssp elegans	granitica	kybeanensis	macradenia
baileyana purpurea	consobrina	ssp affinis	grasbyi	laccata	maidenii
bancroftiorum	continua	ssp candolleana	guinetii	lamprocarpa	maitlandii
barakulensis	coolgardiensis	dunnii	hakeoides	lanigera	mangium
barattensis	coriacea	elata	halliana	lanuginosa	marramamba
barringtonensis	courtii	elongata	hamersleyensis	laracina	masliniana
baxteri	covenyi	empelioclada	hamiltoniana	var laracina	mearnsii
beauverdiana	cowleana	enervia	hammondii	lasiocalyx	megacephala
beckleri	craspedocarpa	ssp explicata	handonis	lasiocarpa	megacephala
betchei	crassa	enterocarpa	harveyi	var bracteolata	prostrate
bidwillii	crassicarpa	ephedroides	hastulata	var lasiocarpa	megalantha
binata	crassiuscula	eremophila	havilandiorum	var sedifolia	meiosperma
binervata	cretacea	eremophila	helicophylla	lateriticola	melanoxylon
binervia	cretata	var variabilis	hemignosta	latescens	melliodora
bivenosa	cultriformis			latipes	melvillei

ACACIA STUDY GROUP SEED BANK LIST 2020 (cont)

menzeli	obtecta	prainii	rigens	spondylophylla	tumida
merinthophora	obtusata	pravifolia	rossei	sporadica	tumida
merrallii	obtusifolia	pravissima	rostelifera	steedmanii	ssp pilbarensis
microbotrya	oldfieldii	prominens	rotundifolia	stereophylla	tysonii
var borealis	olsenii	pruinocarpa	rothii	stenoptera	ulicifolia
var microbotrya	omalophylla	pruinosa	rubida	stipuligera	ulicina
microcarpa	oncinocarpa	ptychoclada	rupicola	striatifolia	umbellata
mimica ssp angusta	oncinophylla	ptychophylla	sabulosa	stricta	uncifera
mimula	oraria	pubicosta	saliciformis	stowardii	uncifera x conferta
mitchellii	orthocarpa	pubifolia	salicina	suaveolens	uncinata
moirii ssp dasycarpa	oshanesii	pulchella	saligna	subcaerulea	uncinella
moirii ssp moirii	oswaldii	pulchella	schinoides	subflexuosa	urophylla
mollifolia	oxycedrus	var pulchella	scirpifolia	sublanata	validinervia
montana	oxyclada	'Kamballup dwarf'	sclerophylla	subulata	varia
monticola	pachyacra	var goadbyi	sclerophylla	sulcata	var parviflora
mooreana	pachycarpa	var glaberrima	var teretiuscula	sulcata	venulosa
mountfordiae	palustris	pulviniformis	var lissophylla	var planoconvexa	verniciiflua
mucronata	paniculata	pustula	sclerosperma	subtilinervis	verricula
ssp mucronata	papyrocarpa	pycnantha	semilunata	synchronicia	verticillata
ssp longifolia	paradoxa	(SA, NSW, VIC)	semirigida	tenuinervis	vestita
muelleriana	parramattensis	pycnostachya	semitrullata	tenuissima	viscidula
multispicata	parvipinnula	pyrifolia	sericophylla	teretifolia	victoriae
murrayana	pataczekii	quadrilateralis	sertiformis	terminalis	wanyu
myrtifolia	patagiata	quadrimarginea	sessilis	tetragonocarpa	wardellii
myrtifolia	pellita	quadrisulcata	sessilispica	tetragonophylla	wattsiana
ssp angusta WA	pendula	racospermoides	shirleyi	tetraptera	wilhelmiana
WA, Vic, SA, NSW	penninervis	ramulosa	sibina	tindaleae	willdenowiana
nana ssp nana	pentadenia	var, ramulosa	siculiformis	toondulya	williamsonii
nematophylla	perangusta	var. linophylla	signata	torringtonensis	xanthocarpa
neriifolia	phasmoides	redolens	silvestris	torulosa	xiphophylla
nervosa	phlebocarpa	redolens pr	simsii	trachycarpa	yorkrakinensis
neurophylla	phlebopetala	resinimarginea	sophorae	trachyphloia	ssp acrita
nigricans	phlebophylla	restiacea	sparsiflora	translucens	
nitidula	pilligaensis	retinodes	spathulata	trigonophylla	
notabilis	pinguifolia	retinodes	spathulifolia	trinervata	
nova-anglica	platycarpa	var uncifolia	spectabilis	trineura	
nuperrima	plectocarpa	Blue leaf form	sphacelata	triptycha	
nuperrima	ssp plectocarpa	retivenia	spinescens	triquetra	
ssp cassitera	ssp tanumbirensis	rhetinocarpa	spinosissima	tropica	
nyssophylla	podalyriifolia	rhigiophylla	splendens	trulliformis	
obliquinervia	polybotrya	rhodophloia	spongolitica	truncata	
obovata	polystachya	riceana			