

Eucalyptus Study Group Newsletter

April & July 2014
No. **61 & 62**

Study Group Leader
Warwick Varley
PO Box 456, WOLLONGONG, NSW 2520
Email: tallowwood@hotmail.com

Membership Officer
Steve Harries
50 Nardoo Rd., PEATS RIDGE, NSW 2250
Email: abodepool@bigpond.com

Eucalyptus Study Group Website
Web address: <http://asgap.org.au/EucSG/index.html>

Eucalyptus Facebook page
Web address: <http://www.facebook.com/pages/Eucalyptus-Trees/124249007754284?ref=hl>

Contents

- Tree grafting a way to bring koala habitat to urban areas; Source ECOS
 - Old trees work faster at storing carbon; Source University of Melbourne
 - Abstract: Genetic control of flowering in spotted gum, *Corymbia citriodora* subsp. *variegata* and *C. maculata*
 - By Gum: genetic secrets of eucalyptus tree revealed; Source: Sydney Morning Herald
 - Blotto on blue gums at Hampton Court by Tim Entwisle
 - Eucalyptus Tea
 - Eucalyptus, Cough, Lollies
 - Abstract: Unravelling the evolutionary history of *Eucalyptus cordata* (Myrtaceae) using molecular markers.
 - Abstract; Designing food and habitat trees for urban koalas: graft compatibility, survival and height of tall eucalypt species grafted onto shorter rootstocks.
 - Gene 'poaching' the secret to eucalypt resilience? By Mali Stanton
 - Gold found growing in Eucalyptus trees in world first CSIRO research; Source: CSIRO
 - Abstract: Xylem as the main origin of stem radius changes in *Eucalyptus*
 - Eucalyptus and wine
 - Eucalyptus genome could unlock the tree's biofuel potential; Source: Science Alert Staff
 - Abstract: Population biology of coppicing plants: survival of mallee (*Eucalyptus* spp.) populations exposed to contrasting fire and cutting regimes
 - Eucalyptus seed available; *Euc. pimpiniana* x *torquate*
-

Tree grafting a way to bring koala habitat to urban areas

Source: ECOS, Published: 28 July 2014

Tree species eaten by koalas are generally unpopular with both urban landowners and councils due to falling limbs and larger sizes. Grafting these species to smaller trees may boost koala forage and habitat in urban areas.

After a series of trials, researchers from the University of the Sunshine Coast have found at least one grafted combination that could provide a valuable habitat tree for koalas and other fauna in urban areas, according to a paper published in the *Australian Journal of Botany*.

‘We aimed to develop shorter koala trees for subtropical urban areas by using related short species as dwarfing rootstocks for tall species that are eaten by koalas’ says the paper’s lead author Stephen Trueman.

The koala is classed as vulnerable in Queensland, NSW and the ACT where their habitat is increasingly fragmented through urban development. Other threats to koala populations include disease, inbreeding, dog attacks, fire, drought and being hit by a car.

Koalas in urban and peri-urban areas are often forced out of habitat by development. Local councils are beginning to see an urgent need to revegetate urban areas with koala food and habitat trees.

‘The ideal koala food and habitat trees for planting in gardens and residential streets would be small, safe, and palatable to koalas’ says Dr Trueman.

After testing 14 graft combinations, they found one that was most successful. When grey box (*Eucalyptus moluccana*) was grafted to blue mallee (*Eucalyptus behriana*) the height of the tree was reduced from around 10 metres to 4 metres. There was a survival rate of 40% in the trial that may be improved in an urban setting.

Even though this research is now over and these trees are not yet available, the researchers hope that in the future grafted trees could be valuable habitat trees for koalas and other fauna in urban areas.



Grafting eucalypt species could result in smaller koala feed trees that do not drop limbs.

Credit: Thinkstock

Old trees work faster at storing carbon

Source: University of Melbourne Published: 3 February 2014

Old trees contribute more to carbon storage than previously thought in a new international study that included Australian researchers.



Mountain ash forest, Tasmania

Credit: scienceimage/CSIRO

The study – just published in the journal *Nature* – demonstrated that tree growth rates increased continuously with size, and in some cases, large trees appeared to be adding the carbon mass equivalent of an entire smaller tree each year.

The significance of this study is that big old trees are better at absorbing carbon from the atmosphere than previously thought.

‘Our research shatters the long-standing assumption that tree growth declines as individuals get older and larger,’ said contributing author, Associate Professor Patrick Baker from the Melbourne School of Land and Environment, University of Melbourne.

‘However, the rapid carbon absorption rate of individual large trees does not necessarily translate into a net increase in carbon storage for an entire forest.’

Coauthor, Dr Adrian Das, an ecologist at the US Geological Survey said, ‘Old trees, after all, can die and lose carbon back into the atmosphere as they decompose.’

‘But our findings suggest that while they are alive, large old trees play a disproportionately important role in a forest’s carbon dynamics. It is as if the star players on your favourite sports team were a bunch of 90-year-olds.’

Researchers compiled growth measurements of 673,046 trees belonging to 403 species from tropical, subtropical and temperate regions across six continents, calculating the mass growth rates for each species and analysing the trends.

The study was a collaboration of 38 researchers from research universities, government agencies and non-governmental organisations from Argentina, Australia, Cameroon, China, Colombia, Democratic Republic of Congo, France, Germany, Malaysia, New Zealand, Panama, Spain, Taiwan, Thailand, the United Kingdom and the United States.

‘What makes these results so compelling is the sheer scale of the datasets that we had available to work with,’ said Associate Professor Baker.

Associate Professor Baker and Will Morris, a PhD student in the School of Botany, involved in providing and analysing data from the thousands of trees from Thailand.

Abstract

Genetic control of flowering in spotted gum, *Corymbia citriodora* subsp. *variegata* and *C. maculata*

Myralyn Abasolo ^{A E}, David J. Lee ^B, Lyndon Brooks ^C, Carolyn Raymond ^D and Mervyn Shepherd ^{A D F}

^A Cooperative Research Centre for Forestry, Southern Cross Plant Science, Southern Cross University, PO Box 157, Lismore, NSW 2480, Australia.

^B Faculty of Science, Health, Education and Engineering, University of the Sunshine Coast and Department of Agriculture, Fisheries and Forestry, Locked Bag 4, Maroochydore DC, Qld 4558, Australia.

^C Division of Research, Southern Cross University, Lismore, NSW 2480, Australia.

^D Southern Cross Plant Science, Southern Cross University, PO Box 157, Lismore, NSW 2480, Australia.

^E Present address: Fairbank’s Selected Seed Co. Pty Ltd, 13/53 Gateway Boulevard, Epping, Vic. 3076, Australia.

^F Corresponding author. Email: mervyn.shepherd@scu.edu.au

Australian Journal of Botany 62(1) 22-35 <http://dx.doi.org/10.1071/BT13223>

Submitted: 23 February 2013 Accepted: 16 February 2014 Published: 28 April 2014

Genetically controlled asynchrony in anthesis is an effective barrier to gene flow between planted and native forests. We investigated the degree of genetically controlled variation in the timing of key floral developmental stages in a major plantation species in subtropical Australia, *Corymbia citriodora* subsp. *variegata* K.D. Hill and L.A.S Johnson, and its relative *C. maculata* K.D. Hill and L.A.S. Johnson. Flowering observations were made in a common garden planting at Bonalbo in northern New South

Wales in spring on 1855 trees from eight regions over three consecutive years, and monthly on a subset of 208 trees for 12 months. Peak anthesis time was stable over years and observations from translocated trees tended to be congruent with the observations in native stands, suggesting strong genetic control of anthesis time. A cluster of early flowering provenances was identified from the north-east of the Great Dividing Range. The recognition of a distinct flowering race from this region accorded well with earlier evidence of adaptive differentiation of populations from this region and geographically-structured genetic groupings in *C. citriodora* subsp. *variegata*. The early flowering northern race was more fecund, probably associated with its disease tolerance and greater vigour. Bud abundance fluctuated extensively at the regional level across 3 years suggesting bud abundance was more environmentally labile than timing of anthesis. Overall the level of flowering in the planted stand (age 12 years) was low (8–12% of assessed trees with open flowers), and was far lower than in nearby native stands. Low levels of flowering and asynchrony in peak anthesis between flowering races of *C. citriodora* subsp. *variegata* may partially mitigate a high likelihood of gene flow where the northern race is planted in the south of the species range neighbouring native stands.

.....

By Gum: genetic secrets of eucalyptus tree revealed

Source: Sydney Morning Herald; June 13, 2014

Eucalyptus leaves are the main food supply for koalas, but there is a lot more to the tree than that.

It is native to Australia but has become the world's most widely planted hardwood tree. The eucalyptus tree is a source of timber, fuel, cellulose and medicinal and industrial oils, and scientists are looking to maximize its potential in biofuels.

An international team of researchers this week unveiled the genetic blueprint of the tree species *Eucalyptus grandis* and identified among its 36,000-plus genes the ones involved in critical biological processes controlling tree growth and wood formation, flowering and other qualities.

The study was published in the journal Nature.

"The main interest is understanding how these trees grow so fast and how they are able to produce such large amounts of cellulose," scientist Zander Myburg of the University of Pretoria's Forestry and Agricultural Biotechnology Institute said on Thursday.

"There's an interest in cellulose in the context of breaking the cellulose down into sugars, which can be fermented into biofuels. But really these trees are widely used industrially for cellulose-related products and timber, pulp and paper production."

Also called gum trees, eucalyptus trees have grown for tens of millions of years across the Australian landscape, and are closely identified with that continent. The koala, one of Australia's characteristic marsupials, munches its leaves. Its wood also is used in making aboriginal tools and wind instruments such as

didgeridoos.

Eucalyptus trees, with their speedy growth rate and exceptional wood and fiber properties, are now grown in about 100 countries on six continents.

Some scientists see great potential in these trees as a biomass energy crop. The study identified genes controlling the final steps for the production of cellulose and "hemi-cellulose", both carbohydrates that can be used for biofuel production.

"We have a keen interest in how wood is formed," added Gerald Tuskan of the Oak Ridge National Laboratory and U.S. Department of Energy Joint Genome Institute, another of the lead researchers.

"A major determinant of industrial processing efficiency lies in the composition and cross-linking of biopolymers in the thick secondary cell walls of woody fibers. Our analysis provides a much more comprehensive understanding of the genetic control of carbon allocation towards cell wall biopolymers in woody plants - a crucial step toward the development of future biomass crops," Tuskan said in a statement.

Read more: <http://www.smh.com.au/environment/by-gum-genetic-secrets-of-eucalyptus-tree-revealed-20140613-zs6c2.html#ixzz366twYHrv>

Blotto on blue gums at Hampton Court

Tim Entwisle; July 3, 2014

Source: <http://gardendrum.com/2014/07/03/blotto-on-blue-gums-at-hampton-court/>

We are growing two kinds of gum tree in our Hampton Court Palace Flower Show garden. With a name like 'Little Boy Blue', the dainty cultivar of the Silver-leaved Mountain Gum (*Eucalyptus pulverulenta*) from grassy woodlands in southern New South Wales surely won't get you drunk. The other, the Cider Gum (*Eucalyptus gunnii*) from Tasmania, might just do it.



They both have waxy-blue, roundish leaves at first, and, if you allow them, longer sickle-shaped leaves (like those in frosty photo above) more typical of a eucalypt later in life: you can keep eucalypts forever young with regular and rather aggressive pruning.

Without pruning, *Eucalyptus* 'Little Boy Blue' could get to 20 metres, but it is bred from a mallee species, which means it's naturally multi-stemmed and typically more like large bush than a tree. Judicious trimming can keep it at 2-3 metres up and across. It should be hardy in much of the UK if given some protection from the worst of the weather (e.g. south side of a wall). We featured this cultivar in our gold-winning 2011 Chelsea Flower Show garden.

And the species, *Eucalyptus pulverulenta*, was featured recently on the Facebook page of the Australian Seed Bank Partnership, a national effort to conserve Australia's flora through seed collecting, banking, research and knowledge. On 13 May 2014 they excitedly informed their Facebook friends that seed from a natural population had been collected and stored.



Eucalyptus 'Little Boy Blue' in Spain

 Australian Seed Bank Partnership added 2 new photos. 22 hrs · 🌐

On April 17th we told you that we were looking for *Eucalyptus pulverulenta* to collect. We did it! 5 collections of this threatened species were made recently by the Australian PlantBank team from the Australian Botanic Garden, Mount Annan. Well done to everyone involved!



Like Cider Gum, the bark is flaky, the foliage good for cut-flower arrangements and the flowers creamy and fragrant in spring. But no-one drinks 'Little Boy Blue'. Cider Gum, on the other hand, has been drunk, and undoubtedly some have been drunk on it. Whether you should, and whether you would benefit from that experience, is a question I can't answer.

You can be pretty sure from its botanical name that *Eucalyptus gunnii* is from Tasmania. It was named by Sir Joseph Hooker, Director of Kew Gardens from 1865 to 1885, after the South-Africa-born plant collector and politician Ronald Gunn. Gunn spent most his life in Tasmania, gathering plants and plant enthusiasts, and he was highly regarded by Hooker. His name is hard to miss in any guide to Tasmanian native plants.

European settlers in Tasmania would tap Cider Gum like you would a Maple, to extract the sap from its trunk. Fermentation turned it into what has been described as a 'cider-like drink'. I suspect this means it has alcohol in it and tastes more like an apple than hops, barley or molasses. I think beer and rum were the other popular drinks of the time.



Eucalyptus gunnii in Spain

Like all eucalypts, it had other uses too. Any alcohol can make a handy antiseptic, but eucalyptus oil (unfermented) has been used to kill skin bacteria in Australia, and later around the world. These days eucalyptus oil is more commonly used to remove stains and treat colds and flu.



The first inhabitants of Australia were of course on the many uses of the gum tree already. Aboriginal people have used eucalyptus leaf oil as a disinfectant for tens of thousands of years. They also use sap for the same purpose, boiling it in water until dissolved and then rubbing into cuts and bruises. And heartwood diluted in boiled water was used to treat diarrhea.

Like the early European settlers, Aboriginal Australians do digest eucalypts, using seed to make flour for damper, roots as another source of starch, and nectar drinks from the flowers of species such as the Manna Gum (*Eucalyptus viminalis*).

Making cider from Cider Gum was their idea too. In spring, Tasmanian Aboriginal people cut a hole in the trunk of the Cider Gum, eating the sap or boiling in water to make a thick syrup. Sometimes the syrup is used to make a cider-like drink, favoured for corroborees. There are some who think there is a bigger market for a maple-syrup like product, or a fermented drink, from the Cider Gum.



Until then, enjoy its aromatic blue leaves as a garden plant at home, or in our aptly named 'Essence of Australia' garden at Hampton Court Palace next week.

[Images: the top and bottom pictures are from one of the large and beautiful eucalypts growing near the Jodrell Laboratory in Kew Gardens, photographed on a frosty morning in December 2012. The others are images (taken by Jim Fogarty) from Viveros Medipalm, the nursery in Spain from where we sourced most of our plants for the show garden.]

.....

Eucalyptus Tea

Source: <http://www.grandmas-wisdom.com/eucalyptus-tea.html>

Drinking eucalyptus tea has been found beneficial for sore throats, colds and flu. Eucalyptus is warm as well, and when applied as a compress it's effective in treating aching muscles and stiff joints. Thanks to its essential oil, which contains up to 80 percent of eucalyptol eucalyptus is antiseptic, antiviral, antifungal and antispasmodic.

Few trees in the world are as fast-growing and aromatic as the eucalyptus tree. Native to Australia and used by the Aborigines to reduce fevers, control coughs and relieve arthritis and skin sores, the eucalyptus made its first appearance in Europe in the nineteenth century.

The eucalyptus tree is grown in the tropical and temperate regions of the world today. Eucalyptus is primarily valued for its leaves, which are used to make an essential oil, eucalyptus tea and compresses.

The oil distilled from the eucalyptus leaves can be applied topically in warming ointments and balms to help relieve respiratory infections and aching joints and stiffness. This herbal tea works in much the same way, since the cineol found in the leaves and oil is both an expectorant and decongestant. Thus, the eucalyptus tea is effective in treating nasal stuffiness caused by a cold or flu and bronchitis. While the tea is considered safe, dosage should always be carefully monitored.

Caution: If you suffer from gastrointestinal or liver disorders, or if you are pregnant, do not take eucalyptus internally.

Eucalyptus Tea Recipes

To make eucalyptus tea, pour 1 cup of boiled water over up to 1/2 teaspoon of the dried eucalyptus leaves, which can be found at most health-food stores. Cover and steep for 10 minutes; strain. Sweeten with honey, to taste. You can drink up to 2 - 3 cups a day. **Caution: In large doses eucalyptus can cause nausea, vomiting or diarrhea. Don't use more than 1/2 teaspoon per cup of water.**

Herbal Tea Recipe for Asthma & Bronchitis

1 1/2 ounce dried eucalyptus leaves

1 ounce dried coltsfoot leaves

1 ounce dried thyme leaves

Use one teaspoon of this herbal mixture per cup of boiling water. Make this tea mixture to help open a tight respiratory tract and congested lungs. The herbal ingredients in this tea are known for their antispasmodic and disinfectant properties.

Herbal Tea Recipe for Acne

1 ounce dried eucalyptus leaves

1 ounce dried dandelion roots and leaves mixture

3/4 ounce dried licorice root

3/4 ounce fennel seeds

Use 1 teaspoon of this herbal mixture per cup of boiling water. You can drink this herbal tea as prescribed above, or use it as a facial wash. Either way, it is effective in healing such skin conditions as acne.

Eucalyptus Tea Recipe for Head Colds

1/2 ounce dried eucalyptus leaves

1 ounce dried peppermint leaves

1/2 ounce dried chamomile flowers

Use 1 teaspoon of this herbal mixture per cup of boiling water. Sweeten with honey to taste. These herbs are prescribed for their decongestant and expectorant effects. Eucalyptus is antiseptic, as well, and is very helpful for a head cold, sinus congestion and the flu.

Therapeutic Benefits of Eucalyptus Tea

Eucalyptus Benefits for the Skin

Your skin mirrors what's going on inside your body, reflecting the performance of such major organs as the kidneys and liver. Eucalyptus is among those herbs that detoxify and cleanse the kidneys and liver, helping these organs to function efficiently, which in turn benefits the skin. Drinking 3 cups of eucalyptus tea a day can clear up acne and minor bacterial infections. Applied topically, the tea may produce healthier looking

skin.

Eucalyptus Benefits for the Gums

The tissue-constricting tannins in eucalyptus make it an effective remedy for bleeding gums. Rinse with the tea two to three time daily.

Eucalyptus Benefits for Steam Bath for Bronchitis

Bronchitis and sinus congestion can be eased by inhaling the steam from eucalyptus tea. Pour 1 quart of boiling water over 1 tablespoon of dried eucalyptus leaves., cover to seal in the volatile oil, and steep for 5 minutes. Drape a towel over your head and shoulders to form a tent over the tea. close your eyes and for 10 minutes, breathe in the steam. Use this facial steam daily until your symptoms abate.

Caution: Do not leave young children unattended with the hot tea!

Eucalyptus Benefits for Compress for Inflammation

A traditional folk-medicine remedy, a eucalyptus compress is effective in treating painful joints, minor burns and sore muscles. the compress is particularly suitable for stiffness and swelling due to arthritis. Soak a clean cotton cloth in the cooled tea, wring out and apply 2 - 3 times a day for relief.

Eucalyptus Benefits for Gargle for Sore Throats

Make a cup of healing eucalyptus tea from equal parts of dried eucalyptus leaves and dried calendula flowers. The tannins in eucalyptus help reduce inflammation while calendula soothes. Let the tea cool, and then use it as a gargle 2 - 3 times a day until symptoms subside.

DISCLAIMER: The statements made here have not been approved by the Food and Drug Administration.

These statements are not intended to diagnose, treat or cure or prevent any disease. This notice is required by the Federal Food, Drug and Cosmetic Act.

Eucalyptus, Cough, Lollies

Source: <http://www.massrecipes.com/recipes/04/11...>

Ingredients

- 3 tablespoons honey
- 3 tablespoons sugar
- 1 tablespoon butter

- 1 tablespoon vinegar
- 1 tablespoon lemon juice
- 15 drops eucalyptus oil

Boil everything except eucalyptus oil for 8 minutes until it turns to toffee (when a small amount dropped in cold water goes brittle). Stir in eucalyptus and pour into greased shallow tray. When set break into small pieces and store in refrigerator.

.....

Abstract

Unravelling the evolutionary history of *Eucalyptus cordata* (Myrtaceae) using molecular markers

Peter A. Harrison ^{A B}, Rebecca C. Jones ^A, René E. Vaillancourt ^A, Robert J. E. Wiltshire ^A and Brad M. Potts ^A

^A School of Biological Sciences and National Centre for Future Forest Industries, University of Tasmania, Private Bag 55, Hobart, Tas. 7001, Australia.

^B Corresponding author. Email: P.A.Harrison@utas.edu.au

Australian Journal of Botany 62(2) 114-131 <http://dx.doi.org/10.1071/BT14019>

Submitted: 6 February 2014 Accepted: 16 March 2014 Published: 5 May 2014

We studied the evolutionary processes shaping the genetic diversity in the naturally fragmented *Eucalyptus cordata*, a rare homoblastic tree endemic to the island of Tasmania. A genome-wide scan showed that *E. cordata* and the endangered heteroblastic *E. morrisbyi* were closely related, suggesting a neotenous origin of *E. cordata* from an endemic heteroblastic ancestor. Bayesian cluster analysis based on nuclear microsatellites assayed in 567 *E. cordata* and *E. morrisbyi* individuals revealed five genetic clusters. Two clusters comprised populations that correspond to putative ancestral gene pools linking *E. cordata* and *E. morrisbyi*. Another cluster included populations that transgressed the drowned Derwent River valley, suggestive of a wider glacial distribution. However, the majority of individuals occurred in the two genetic clusters distributed in the south-west and north-east of the range of *E. cordata*. The elevated genetic diversity in populations comprising these clusters suggests that they represent two recently fragmented cores of the distribution. Genetic evidence suggests that the newly described, localised *E. cordata* subspecies *quadrangulosa* has been recently selected from within the morphologically diverse, south-western cluster. We argue that multiple phases of isolation and drift have led to the contemporary pattern of molecular variation and the scattering of relictual and more recently derived populations across the species distribution.

.....

Abstract

Designing food and habitat trees for urban koalas: graft compatibility, survival and height of tall eucalypt species grafted onto shorter rootstocks

Stephen J. Trueman^{A B}, Tracey V. McMahon^A, Elektra L. Grant^A, David A. Walton^A and Helen M. Wallace^A

^A Genecology Research Centre, University of the Sunshine Coast, Maroochydore DC, Qld 4558, Australia.

^B Corresponding author. Email: strueman@usc.edu.au

Australian Journal of Botany 62(3) 196-204 <http://dx.doi.org/10.1071/BT14060>

The *Corymbia* and *Eucalyptus* species eaten by koalas are generally large trees, but these are often unpopular with urban landowners and councils because of the dangers of limbs falling from a great height. We aimed to develop shorter koala food and habitat trees for urban areas by heterografting tall eucalypt species onto rootstocks of shorter species and comparing their survival and growth with homografted trees and control ungrafted trees. In total, 12 of 14 interspecific scion/rootstock combinations were grafted successfully in the nursery but graft compatibility and field survival depended on taxonomic relatedness. The six interspecific combinations that had multiple surviving trees at 5 years after planting were all between species within the same taxonomic section or between a species and its own interspecific hybrid. Almost all trees died from grafts between species in different taxonomic sections. In most cases, the height of surviving interspecific grafted trees did not differ from control intraspecific grafted trees or from ungrafted trees of their scion species. Grafting elicited a ‘thrive or not survive’ response that diminished its usefulness for producing shorter trees. However, one combination, *E. moluccana*/*E. behriana*, had field survival of 40% and reduced height (4.0 m vs 9.9 m). These could be valuable habitat trees for koalas and other fauna in urban areas.

.....

Gene ‘poaching’ the secret to eucalypt resilience?

By Mali Stanton; 19 May 2014

Source: <http://www.ecomagazine.com/paper/EC14108.htm>

Despite what most people think, identifying eucalypts is no easy task. A tree that may look like an alpine ash might also harbour genes more commonly found in a mountain ash tree downslope. In fact, this tendency of eucalypts to readily ‘poach’ genes from related species may hold the key to their survival in a rapidly changing climate.



Snow gum (*Eucalyptus pauciflora*): Different eucalypt species have adapted to diverse environments across Australia. How will current species distributions respond to climate change?

Credit: A. Crowe

Unlike most plant and animal species – where the DNA sequences of two different individuals from the same species will be similar – eucalypts have high levels of hybridisation. A first-generation hybrid might be easy to spot, because it combines features of two species.

However, if that tree breeds with a parent species, subsequent generations of hybrids will be hard to identify with the naked eye – they will look convincingly like the parent species. Not until you delved into the hybrids' genetic makeup would you find sections of 'poached' genetic material that might, at first, appear to belong to the wrong species.

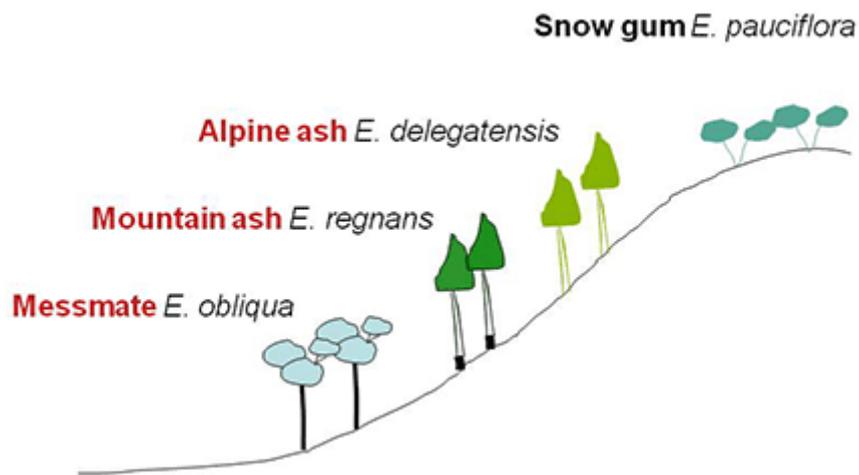
University of Melbourne Masters student, Alice Crowe, is researching eucalypt DNA sequences from mountain ash, alpine ash, snow gums and related species at five field sites in Victoria. She is trying to determine whether visual differences between species are matched by differences at a genetic level.

Surprisingly, previous research provides little evidence of genetic differentiation between closely related eucalypt species. Alice thinks that the evidence for gene poaching challenges the current basis for defining separate eucalypt species.

'It might sound dramatic, but we're really poking around in our ideas of what we call a species,' Alice says.

'If there's no way to tell one species from another at a genetic level, what have we got? Lots of different species, or just a big pool of genes that manifest differently in different places?'

'With this project, we're hoping to provide genetic tools to identify different eucalypt species – or at least determine whether that's possible.'



The typical altitudinal sequence of the four eucalypt species studied.

Credit: A. Crowe

Although such research was purely theoretical just a few years ago, rapid advances in DNA ‘barcoding’ have revolutionised taxonomy – the science of describing and naming different species.

With DNA barcoding, scientists can take a tiny sample of cells from an organism, run it through hi-tech machines, and compare the resulting gene sequence with a database to identify what they’re looking at. It’s far more convenient than conventional classification techniques that require a complete plant or animal for specimen identification.

For hybridised plants such as eucalypts, however, DNA barcoding is not as straightforward. Alice is hopeful that a solution may lie in the DNA of the cell nucleus, which contains the cell’s chromosomes, rather than in the DNA of chloroplasts – smaller intra-cellular components that contain chlorophyll, the green-coloured pigment that catalyses photosynthesis.

‘Quite a lot is known about gene swapping in eucalypts at the chloroplast level, based on comparisons of small fragments of chloroplast genes. There are few studies at the level of the cell nucleus.

‘We’ll be delving much deeper by comparing sequences of whole chloroplast genomes and a broad sample of DNA in the cell nucleus.’



Alice Crowe collects leaf samples in the field.

Credit: A. Crowe

When she's not out in the bush collecting leaves from a 40 metre tall eucalypt with a slingshot, Alice is in the lab, grinding up leaf and cambial (trunk) samples to isolate the DNA, which is then sheared into pieces using sound waves or enzymes.

A molecular 'tag' is then bound to each DNA fragment to identify the source tree. DNA from many different trees is put into the one tube and sent away for genome sequencing. What comes back is like a vast and complicated jigsaw puzzle: a series of partial sequences, each symbolised by a string of letters.

Alice's research group uses the molecular tags to work out which pieces of the 'puzzle' come from which sample, so they can piece together the genome for each individual tree.

The resultant database of samples from different species will be used to analyse the extent of gene swapping at each of the five field sites. The researchers want to know whether gene sharing is more prevalent at some sites, as well as the extent of any genetically fixed differences between species.

Alice thinks the gene swapping demonstrated by eucalypts is potentially evolution-in-action. As conditions on a mountainside change, populations of trees might be borrowing the genes they need to survive.

Understanding the extent of this genetic adaptation could help us understand the potential of eucalypts to cope with a changing climate. As warmer temperatures creep further up the slopes, how much flexibility will affected species have to adapt and survive?

The degree of genetic diversity within a single species could also affect how areas are marked for conservation. If stands of alpine ash at one site are genetically different from those at another, should we aim to conserve examples of both, or is it enough to protect habitat for 'the species' as a whole?



Who knows what eucalypt genes might lurk in this stand of mountain ash?

Credit: Patche99z

Alice has gone out on a limb to pursue a career in taxonomy. She spent 10 years as a litigation lawyer before deciding to pursue her passion for the natural world.

‘The chance to get out there doing field work is what life’s really about. I loved law, but this gives me a chance to unleash my curiosity and find out more about the kind of universe we live in.

‘People seem to think that science has already discovered everything there is to know about the world around us, but that couldn’t be further from the truth.’

Alice is being guided in her work by retired eucalypt taxonomist, Professor Pauline Ladiges, and University of Melbourne and Royal Botanic Gardens Melbourne senior researchers, Dr Mike Bayly and Dr Frank Udovicic.

‘There’s a whole generation of knowledge tied up in people like Mike, Frank and Pauline, and it’s crucial that we keep passing that experience down,’ Alice says.



Using a slingshot to collect samples from the tallest trees.

Credit: A. Crowe

Alice's project is backed up by a \$10,000 grant from the Australian Government, through the Australian Biological Resources Study. The grants aim to support a new generation of scientists to launch careers in taxonomy.

Senator Simon Birmingham, the Parliamentary Secretary to the Minister for the Environment, is a keen supporter of the grants.

'It's vital to build a new generation of Australian taxonomists, so as the profession evolves we don't lose our national knowledge base,' says Senator Birmingham.

'Without taxonomists, whole elements of Australian industry, agriculture and environmental management would be compromised, so these young scientists are well worth the investment.'

.....

Gold found growing in Eucalyptus trees in world first CSIRO research

Source: CSIRO

Geoscientists in Perth have discovered gold particles in the leaves, twigs and bark of eucalyptus trees, claiming a "eureka" moment which could revolutionise gold mining. CSIRO researchers believe the trees, sitting on top of gold deposits buried deep underground, suck up the gold in their search for moisture during times of drought. "We weren't expecting this at all," Dr Melvyn Lintern, a research geochemist at the CSIRO and the study's lead author, said. "To actually see the gold particles in the leaves was quite a eureka moment for us." Dr Lintern said the trees appear to be telling scientists what is happening under the earth's surface. "The particular trees that we did the research on appear to be bringing up gold from a remarkable 30 metres depth, which is about the equivalent of a 10-storey building," he said. The research group used the CSIRO's

Maia detector for x-ray elemental imaging at the Australian Synchrotron in Melbourne to analyse extremely small particles at high resolution. The portions of gold are about one-fifth the diameter of a human hair. Dr Lintern said even 500 trees growing over a gold deposit would only yield enough gold for a wedding ring. The researchers said they have also found gold in the leaves of other trees, such as the Acacia mulga. "We've actually found gold not only in trees but in shrubs that are growing beneath the trees as well, so (it is) not restricted to any particular trees at all," Dr Lintern said. Discovery could make exploration cheap, quicker. The discovery, the first of its kind in the world and the first time gold particles have been found in living material, will undoubtedly generate huge interest from within the gold mining and exploration industry. Former Newmont Mining Geochemist, Nigel Radford, says the implications for gold exploration are huge. "A lot of this stuff has been speculated about for some time, but the identification of the gold particles in the leaf materials is completely convincing and very, very important for the future of mineral exploration," said Mr Radford, who has worked in mineral exploration his entire working life, most recently with US-based Newmont, one of the world's biggest gold mining companies. Mr Radford believes it has the potential to make gold exploration much quicker and cheaper. "Ideally, any mineral exploration team would like to collect their samples on-surface," he said. "If you can sample on-surface, it saves all the cost and all the time involved in drilling holes."

.....

Abstract

Xylem as the main origin of stem radius changes in *Eucalyptus*

Roman Zweifel^{A B D}, David M. Drew^B, Fritz Schweingruber^A and Geoffrey M. Downes^{B C}

^A Swiss Federal Institute for Forest, Snow and Landscape Research WSL, Zuercherstrasse 111, CH-8903 Birmensdorf, Switzerland.

^B CSIRO Ecosystem Sciences, Private Bag 12, Hobart, Tas. 7001, Australia.

^C Forest Quality Pty Ltd PO Box 293 Huonville, Tas. 7109, Australia.

^D Corresponding author. Email: roman.zweifel@natkon.ch

Functional Plant Biology 41(5) 520-534 <http://dx.doi.org/10.1071/FP13240>

Submitted: 8 August 2013 Accepted: 8 December 2013 Published: 13 January 2014

The state-of-the-art interpretation of stem radius changes (DR_{Total}) for tree water relations is based on knowledge from mostly slow growing tree species. The ratio between diurnal size fluctuations of the rigid xylem (DR_{Xylem}) and the respective fluctuations of the elastic bark (DR_{Bark}) is known to be small (<0.4) and is of importance for the localisation of water storage dynamics in stems. In this study, fast growing *Eucalyptus globulus* Labill. in Tasmania were investigated by point dendrometers in order to investigate tree water relations. Unexpectedly, DR_{Xylem} was found to be the main driver of DR_{Total} with the bark acting as a passive layer on top of the fluctuating xylem under most conditions. Accordingly, the ratio between the diurnal fluctuations of the two tissues was found to be much higher (0.6–1.6) than everything reported before. Based on simulations using a hydraulic plant model, the high tissue-specific elasticity of the *Eucalyptus* xylem was found to explain this atypical response and not osmotically-driven processes or species-specific flow

resistances. The wide zone of secondary thickening xylem in various stages of lignification is proposed to be an important component of the high wood elasticity. The tissue acts as additional water storage like the bark and may positively affect the water transport efficiency.

.....

Eucalyptus and wine

In a recent Air New Zealand flight magazine it mentions that some Australian research explains how the scent of plants can be found in wine. A study by the Australian Wine Research Institute (AWRI) examined the source of a minty eucalypt character often found in wine made from grapes grown near eucalyptus trees. The AWRI found small levels of eucalypt character in grapes grown 25-50mtrs from eucalyptus trees and substantially higher levels in grapes grown closer to the trees. The flavouring compound from the trees is found in high levels on the skins of the grapes and is extracted during fermentation on skins. Red wines are traditionally fermented on the grape skins and white wines are not which explains why white wines are relatively unaffected by eucalypt character.

.....

Eucalyptus genome could unlock the tree's biofuel potential

Source: Science Alert Staff The University of Melbourne and ABC Science; 12 June 2014

Scientists have sequenced the genome of Australia's iconic eucalypt tree, and it could lead to better wood production, biomaterials and jet fuel.

The genome of Australia's Flooded Gum (*Eucalyptus grandis*) has been sequenced, and scientists are searching it for information that could help revolutionise the fibre and biofuels industries, and provide insight into how to help the species survive climate change.

The research on the trees, which are one of the world's leading hardwoods and home to Australia's koalas, has been published in *Nature*.

It's hoped the genetic sequence will help scientists work out how to grow eucalypts more sustainably and efficiently, as well as unlock the potential of the trees and their oil.

"Now that we understand which genes determine specific characteristics in these trees, we can breed trees that grow faster, have higher quality wood, use water more efficiently and will cope better with climate change," says Professor Zander Myburg from the University of Pretoria in South Africa and one of the project leaders, in a press release.

“Even more, we can turn well-managed Eucalyptus plantations into bio-factories to produce specific kinds of sought-after materials and chemicals.”

There’s also the possibility that eucalypt oil could one day form the basis of future jet fuels, and the scientists have already identified 113 genes responsible for synthesising the fragrant substance.

“This means that in future we could use specially selected Eucalyptus genes in bacteria and yeasts, turning them into bio-factories to manufacture advanced biofuels on a large scale,” Myburg says. “In future, jumbo jets may take off powered by renewable, Eucalyptus-based fuel.”

The research can also help scientists find out more about Australia’s critical ecosystems and lead to new koala protecting efforts.

Dr Carsten Kulheim, one of the lead Australian researchers on the project from the Australian National University, says in a press release that the research can also help scientists find out more about conserving Australian biodiversity. “The genetic code will help us understand a foundation species for the Australian ecosystem and how it affects other species, from fungi through to the koala,” he says.

“It will give scientists the tools to know what plants a koala will feed on and not feed on, which helps with measures to preserve koala habitat.”

In total, *Eucalyptus grandis* has more than 36,000 genes, almost double the number in the human genome. The entire sequence consists of 640 million base pairs and took more than five years to map.

Abstract

Population biology of coppicing plants: survival of mallee (*Eucalyptus* spp.) populations exposed to contrasting fire and cutting regimes

James C. Noble ^{A C} and Peter J. Diggle ^B

^A CSIRO Ecosystem Sciences, Canberra, ACT 2601, Australia. Present address: 10–12 Tyndall Street, Mittagong, NSW 2575, Australia.

^B Department of Mathematics and Statistics, Lancaster University, Lancaster LA1 4YF, England, UK.

^C Corresponding author. Email: jim.c.noble@gmail.com

Australian Journal of Botany 61(7) 552-557 <http://dx.doi.org/10.1071/BT13141>

Submitted: 23 May 2013 Accepted: 18 November 2013 Published: 11 February 2014

We examined data obtained from two experiments running concurrently over an 8-year period, designed

to investigate the survival of mallee eucalypts exposed to various decapitation treatments applied by either fire or axe at contrasting frequencies. Annual autumn decapitation, with or without combined spring decapitation, gave the most rapid rates of depletion. The estimated half-life, i.e. time to 50% mortality, ranged from 278 days when both autumn and spring fires were applied annually, up to 3366 days when plants were cut by axe every fourth autumn. These were followed in turn by autumn decapitation every second year, then spring annually and autumn every third year and finally autumn decapitation imposed every fourth year. With the marginal exception of one treatment (burnt every third autumn), the estimated rates of depletion were greater for the burning treatments than for their cutting counterparts. The ranking of the six treatments by estimated rates of depletion was the same in both the fire and cutting trials. Prescribed fire is a powerful and cost-effective management tool for manipulating semiarid woodlands in temperate Australia. In addition to reducing grass and litter fuel, prescribed fire has the potential to promote herbage production for domestic livestock. We provide clear evidence based on field experiments that a management strategy based on relatively frequent fires applied in the autumn will significantly reduce mallee density, thereby promoting herbage productivity

.....

Eucalyptus seed available

Christina Leiblich has kindly provided some seed (via Phil Hempil) for a unique Eucalyptus hybrid (*Euc. pimpiniana x torquata*), and I have this available for any interested members. The seed is available for those members who can send a request for this seed and please enclose a self addressed envelope. This can be posted to PO Box 456, WOLLONGONG, 2518.

New Membership Officer

The Eucalyptus Study Group has a new membership officer, Steve Harries. Steve has been a member of this group for many years and I would like to welcome and thank Steve for taking on this role and providing the group the opportunity to continue functioning. Could all future membership correspondence be directed to Steve, his contact details are provided below.

Steve Harries

50 Nardoo Road

PEATS RIDGE 2250 NSW

Articles, requests and questions are ~~most welcomed~~ (actually they are wanted).

Please send all correspondence to my;

email address; tallowwood@hotmail.com

or postal; PO Box 456, WOLLONGONG 2520

Membership

New members wishing to subscribe to the *Eucalyptus Study Group*, please fill out the following application and forward to Steve Harries at;

Email: aitchguy@gmail.com

Postal: No. 50 Nardoo Road, PEATS RIDGE NSW 2250

Annual membership costs are;

- \$A 10 per year national members, newsletter mailed (black and white).
- \$A 20 per year international members, newsletter mailed (black and white).
- \$A 5 per year, national and international, newsletter emailed, full colour PDF.

All subscriptions can be mailed via a cheque (made out to the *Eucalyptus Study Group*) or payment made via direct deposit into the account listed below. For payments made via direct deposit, please add your name as reference.

Post address; Eucalyptus Study Group c/- 13 Conos Court, DONVALE, VICTORIA 3111

Bank details:

BSB No: **033-044**

Account No: **289 847**

Account name: **ASAGP Euc. Study Group**

Application for membership to the *Eucalyptus Study Group*

Date:

Name:.....

Postal address: post code.....

Contact Phone number:.....

Email:

Payment method: Cheque Direct Deposit

