

# *Eucalyptus Study Group Newsletter*

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## Scientists hope to find way to stop mass eucalypt dieback in Australian Alps

Source: Tracey Ferrier, 11 March 2021, The Guardian

Researchers know insects are eating the gums but they want to discover the underlying stressor leaving the trees open to attack.



Snow gums have been dying in Kosciuszko national park due to attacks by a beetle, which have been made worse by climate change. Photograph: Gunter Ziesler/Getty Images

Across large swathes of New South Wales the stark skeletons of once healthy eucalyptus trees dot the landscape in alarming numbers.

From the manna gums of the Monaro high plains to the snow gums of the Australian alps, the scale of eucalypt dieback is confronting and it has accelerated dramatically over the past decade. Scientists know that in the case of the snow gums, the native wood borer is essentially eating trees from the top down. They also know that on the Monaro plains, manna gums have suffered the ravages of leaf-eating eucalyptus weevils.

But what they're yet to fully grasp is why those insects have been able to take hold in such numbers and do so much damage, and what underlying stressors have left eucalyptus trees vulnerable to attack.

On Wednesday, the NSW government stumped up \$1.2 million for six research projects that should add more detail to the big picture.

Climate change, drought, insects and soil microbes are all thought to contribute to dieback. The grants mean scientists now have the cash they need to try to work out exactly what's happening in terms of those potential influences.

Dr Matthew Brookhouse is an expert in plant physiology at the Australian National University and has been studying the devastating impact of native wood borers on snow gums in the high country.

He has a nice analogy that sums up the challenge he faces.

“We know who the doorman is,” he says of the borer that kills snow gums by essentially ringbarking them. “But we simply do not know what’s powering the whole process.”

“There is a bigger picture that we need to understand and that is what stressor, or stressors, are driving the insect outbreaks, and how they are driving it. How long have those stressors been in place, and has the impact of them become greater in terms of the last decade, when we’ve really seen this phenomenon take off?”

In the northern hemisphere, delving into the past is a relatively simple task.

There, the winters are cold enough to stop trees from growing, and halted growth is what creates annual rings that can tell scientists so much about the history of a tree, and what it was responding to at particular points in time.

But that’s generally not the case in Australia. Only the snow gum grows at a high enough altitude to stop growth during the winter and produce rings that can be reliably identified and measured.

One of two grants won by the ANU means that tree ring work can proceed.

“It’s a real opportunity for us to look back in time. We don’t just need a cause of death, we need to know what led to the death. That’s where the real action can happen,” Brookhouse says.

“We can date them and we can measure them and that opens the door for us to understand the ultimate drivers, not just the proximal cause, which in this case is an insect.”

The grants also mean money for more sophisticated mapping of dieback events, and gene-based research to identify eucalypt species that can cope with increasingly extreme conditions.

There is much at stake, the NSW environment minister, Matt Kean, said on Wednesday, with millions of trees killed over a relatively short time frame, from Bourke to the New England tablelands, north coast, Sydney’s hinterland and down to the Snowy Mountains.

The result is damaged ecosystems and decreased biodiversity.

“By engaging some of the country’s best scientific minds we are hoping to find ways to remedy the current dieback areas and prevent future outbreaks,” Kean said.

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## ABSTRACT

### Drought stress affects the germination of four co-occurring *Eucalyptus* species from north-west New South Wales

Nathan J. Emery and Justin C. Collette

*Australian Journal of Botany* 69(3) 143-151 <https://doi.org/10.1071/BT20138>

Submitted: 27 October 2020 Accepted: 2 March 2021 Published: 26 April 2021

The interactive effect of seasonal temperatures and water potential ( $\Psi$ ) were examined on the germination of four co-occurring *Eucalyptus* species (*Eucalyptus melanophloia* F.Muell., *E. pilligaensis* Maiden, *E. populnea* subsp. *bimbil* L.A.S.Johnson & K.D.Hill and *E. viridis* R.T.Baker) from

the Brigalow Belt South bioregion of New South Wales. These eucalypts are important canopy species, and are a key inclusion for restoring native vegetation to areas that have had significant landscape modification. Final germination, time to first germination, and time to 50% germination were recorded at three alternating temperature regimes for winter (day/night, 19/5°C), spring–autumn (27/12°C) and summer (34/20°C), and eight different  $\Psi$  treatments between saturation point (0 MPa) and permanent wilting point (–1.5 MPa) under controlled laboratory conditions. Final germination was highest in all species when seeds were incubated at winter conditions, but spring–autumn and summer temperatures had mixed effects on final germination, depending on the species. Final germination consistently declined with lower  $\Psi$  across all temperatures for *E. pilligaensis*, *E. populnea* subsp. *bimbil* and *E. viridis*, whereas *E. melanophloia* displayed a mixed response to temperature and  $\Psi$ . No germination occurred when  $\Psi$  was lower than –0.25 MPa. Time to first germination and time to reach 50% germination ( $t_{50}$ ) were lowest at summer temperatures for all species, and all species except *E. pilligaensis* experienced higher time to first germination and  $t_{50}$  (i.e. slower germination rates) as  $\Psi$  decreased from 0 to –0.25 MPa. Our results indicate that all four eucalypts should be treated as drought-sensitive species with a higher probability of field recruitment during cooler and wet conditions.

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### ***Eucalyptus tereticornis* (Queensland Blue Gum)**

Source: Robert M. Price, Native Plants Sunshine Coast Newsletter No. 21.

Prominent as a remnant tree in Tewantin where I live are Queensland Blue Gums (*Eucalyptus tereticornis*). They are recognizable for their smooth mottled grey bark which is shed in summer as the trunk grows in girth, to reveal fresh bark in shades of blue-grey and salmon-pink. Sometimes at the base, particularly of older trees, is a short stocking of rough bark.



Used in heavy construction for posts and piles, railway sleepers etc., the heartwood is hard, durable and red, giving the tree its alternative common name, Forest Red Gum. It is closely related to the River Red Gum (*Eucalyptus camaldulensis*), Australia's most widely distributed and probably best-known eucalypt. *E. tereticornis* also has affinities with other Red Gums native to the Sunshine Coast such as *E. kabiana* (Beerwah Red Gum), *E. bancroftii* (Tumbledown Gum) and *E. exserta* (Queensland Peppermint), the latter being notable for having

fibrous rather than gum bark. What they do have in common is fruit with exserted (protruding) valves and long conical opercula (flower bud caps). It is the nature of the operculum that is described by the plant's botanical name – *Eucalyptus* meaning well covered (referring to the flower) and *tereticornis* meaning horn shaped.

The flowers, generally white but sometimes pink on older trees, are an important source of nectar and pollen for birds, animals and insects.

This alone is good reason to value their place in the local landscape, but the character they lend locations such as the Noosa River foreshore at Noosaville and much of Tewantin is invaluable. They are also a primary food tree of koalas.



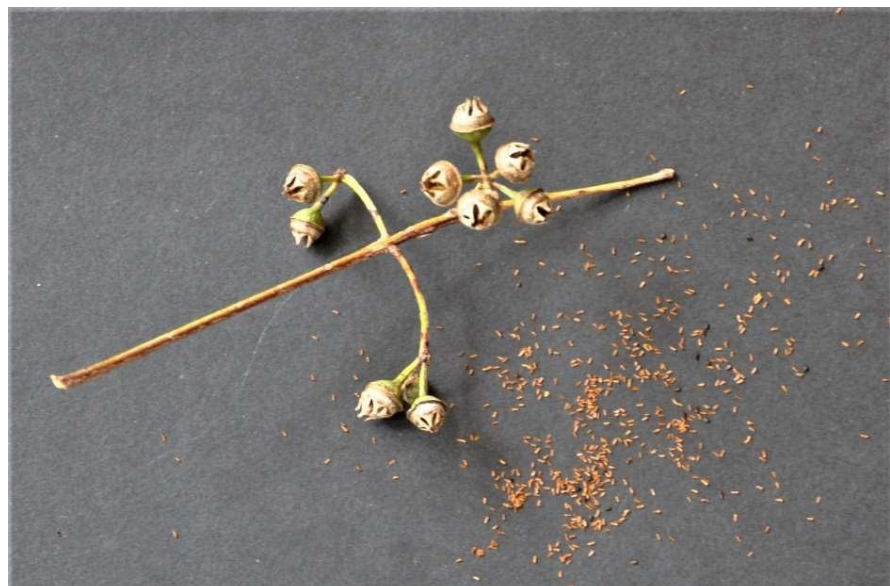
As older parts of Tewantin face the pressure of popularity, houses are being demolished or moved to be replaced by two or more new houses on narrow blocks of land with little room for trees. As a consequence, the spacious character of Tewantin is being lost and barely a month goes by without the removal of another Blue Gum – on footpaths, in front and back yards, even from parks. I'm aware that in some cases this is necessary if the tree is in dangerous condition. Sadly however, healthy Blue Gums that are an inconvenience are also being cut down.



At least twenty in my immediate neighbourhood have been removed in the last few years and, if street trees, often replaced by Noosa Council with non-local natives such as Pongamias and Golden Pendas, both of which are becoming weedy in nearby bushland.

With this in mind, the North Tewantin Bushcare Group has been propagating Blue Gums of local provenance for planting in suitable places. Note in the photo the black seed amongst the brown chaff released by the fruit.

When Noosa Shire was nominated for Biosphere status, Tewantin was declared an area that valued its remaining indigenous trees. Although common in the bush – their natural distribution extends from Gippsland, Victoria to Laura in North Queensland – Blue Gums in urban areas all over the Sunshine Coast are steadily disappearing. I would urge anyone who has the room to grow a magnificent and iconic Queensland Blue Gum.





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## ABSTRACT

### **Growth response following green crown pruning in plantation-grown *Eucalyptus pilularis* and *Eucalyptus cloeziana***

Philip J. Alcorn, Jürgen Bausch, R. Geoff B. Smith, Dane Thomas, Ryde James, and Adrienne Nicotra

Published on the NRC Research Press Web site at [cjfr.nrc.ca](http://cjfr.nrc.ca) on 18 March 2008

Submitted: Received 16 February 2007. Accepted 21 September 2007.

Pruning of live branches is performed to enhance wood quality in plantation trees. Stem, branch and wood properties may be altered following pruning from below, but the extent and duration of such effects are unknown for many plantation *Eucalyptus* species. The effect of 0%, 20%, 50%, and 70% green crown length removal on growth and wood quality was examined in 3.5-year-old plantation-grown *Eucalyptus pilularis* Sm. (blackbutt) and *Eucalyptus cloeziana* F. Muell. (Gympie messmate) trees on two subtropical sites in eastern Australia. Growth increment of the stem at breast height was not affected by 20% crown removal. However, stem increment at breast height was reduced for up to 8 months with 50% crown removal and up to 12 months with 70% crown removal. Pruning had no impact on height growth. However, the height of trees pruned to 70%, relative to the height of the surrounding unpruned trees, was temporarily reduced 12 months after pruning in both species. Stem form, stem taper, wood density, and residual branch growth above the pruned zone were unaffected by pruning. Owing to the fast vertical crown expansion, trees were able to rapidly compensate for leaf area removal without long-term reductions in stem growth. The implications for management operations utilizing pruning as a means of enhancing timber quality are discussed.

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## *Eucalyptus bancroftii* (Tumbledown Gum)

Source: Robert M. Price, Wallum Study Group Newsletter No. 47.

The common name Tumbledown Gum is an apt description of the twisted, crooked appearance of this small tree. The leathery leaves are concolorous, the same dull blue-green colour on both sides, and form a wide crown. It occurs on coastal plains and low hills from Port Macquarie to Woodgate, invariably found growing in poorly drained soils in association with wet heath or wallum plant communities.



An alternative common name for the tree, Bancroft's Red Gum, indicates it belongs to the Red Gum group of Eucalypts. Closely related local species include Forest Red Gum (*Eucalyptus tereticornis*), Mt. Beerwah Red Gum (*Eucalyptus kabiana*) and Queensland Peppermint (*Eucalyptus exserta*), the latter being notable for having fibrous, not smooth (gum) bark.

The bark of *E. bancroftii* is shed annually in large pieces but not all at the same time. Differing exposure to weathering causes mosaic patterns of colour to develop on the trunk. This is a feature most Red Gums have in common but Tumbledown Gum is considered to be the most striking example.



Another feature of Red Gums is the long opercula (flower bud caps) which, in the case of Bancroft's Red Gum, drop off in summer to expose the large white flowers.



The woody fruit or gum nuts that follow have characteristic exsert (projecting) valves, prominent after the seed has been released.





These distinctive qualities – small size, interesting habit, attractive bark – make the tree a suited subject for garden or street planting and a prime candidate for bonsai. The pot plant in the photo below is about ten years old and less than a metre tall.



## ABSTRACT

### Are phytotoxic effects of *Eucalyptus saligna* (Myrtaceae) essential oil related to its major compounds?

Eliane R. Silva, José M. Igartuburu, Gerhard E. Overbeck, Geraldo L. G. Soares and Francisco A. Macías

*Australian Journal of Botany* 69(3) 174-183 <https://doi.org/10.1071/BT20082>

Submitted: 21 July 2020 Accepted: 5 April 2021 Published: 12 May 2021

We evaluated whether phytotoxic effects of the essential oil from *Eucalyptus saligna* Sm. leaf litter were related to its major compounds 1,8-cineole (eucalyptol) and  $\alpha$ -pinene. Effects of the essential oil and its major compounds, combined and alone, were tested on germination and growth of the weed *Eragrostis plana* Ness. Volatile organic compounds (VOCs) emitted from the essential oil were determined in the airspace of Petri dishes during the experimental period. These volatile fractions were obtained by solid-phase microextraction (SPME) followed by gas-chromatography coupled to mass spectrometry (GC-MS). Effects of the oil and its major compounds were also assessed in aqueous solution on coleoptile growth of *Triticum aestivum* L. The essential oil showed the strongest phytotoxic effects on *E. plana*, followed by eucalyptol, eucalyptol +  $\alpha$ -pinene, and  $\alpha$ -pinene. A similar order of phytotoxicity was observed on coleoptile growth of *T. aestivum*. The proportion of oxygenated monoterpenes increased along the experimental period, mainly eucalyptol, and of monoterpene hydrocarbons diminished in the volatile fractions. We conclude that phytotoxicity of *E. saligna* leaf litter essential oil may be mainly related to eucalyptol and additive or synergistic effects of other minor compounds. Analysing VOCs emission is relevant to elucidate compounds involved in phytotoxicity of a plant species.

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## Mission to save Sydney's rarest eucalyptus species from extinction

Source: By Peter Hannam, The Sydney Morning Herald

<https://www.smh.com.au/environment/conservation/mission-to-save-sydney-s-rarest-eucalyptus-species-from-extinction-20210505-p57p4h.html>

When Steve Douglas was a budding ecology student, a quarter of a century ago, he discovered what turned out to be a new species of tree on a street corner just a few hundred metres from his home in Sydney's Hills District.

"It was more a case of driving past it [than walking by]," Dr Douglas, now a private ecologist said.

The multi-trunk tree was, on closer inspection, not a common scaly bark eucalyptus like a neighbouring tree. "So what was it?"



Ecologist Steve Douglas beside the eucalyptus species, dubbed *E. Cattai*, that he discovered walking near his home in the Hills District of north-western Sydney.  
*WOLTER PEETERS*

The protracted assessment process to determine and name a species gathered dust for years as the tree became increasingly threatened by land development. (And Dr Douglas earned no credit from his discovery for his master's research on "Significant Plants of the Greater Cattai Region".)

The government gave it an initial listing as endangered in 1999 before finally declaring it to be critically endangered in 2015. It is dubbed *Eucalyptus sp. Cattai* pending the granting of a final name for what is now greater Sydney's rarest eucalypt.

The fate of the Cattai has taken a few twists down the years, offering insights into the management of rare plants and animals and how at-risk species can be held back from the brink of extinction.



Seed pods on the *E. Cattai* species were collected from a range of plants by Enhua Lee and colleagues in the NSW Department of Environment to be grown into seedlings. Puzzlingly, no juvenile plants have been found in the wild.  
*WOLTER PEETERS*

The NSW government has given the tree a priority on its Saving Our Species program – a scheme itself up for review by the end of June – and started replanting in a national park more than 50 kilometres from natural stands. Predicted climate change was one factor in the locality choice.

The program now counts 152 projects and is investigating similar actions for more than 400 threatened species and animals, and 39 ecological communities. NSW has about 1000 species known to be threatened.

That the Cattai might need some extra help was clear to Enhua Lee, a conservation ecologist within the Environment Department, who counted some 660 of the 4-5 metre trees in the wild with their leathery and lance-shaped leaves but found only mature individuals.

“I’d like to know the answer to that – why are there no seedlings?” Dr Lee said. “We don’t know what stimulates natural germination.”



Ecologist Steve Douglas with one of the seedlings bred for replanting in the wild at the Australian Botanic Garden at Mount Annan. *WOLTER PEETERS*

That the plant generates seeds is obvious enough. A visit by the *Herald* with Dr Douglas to the original tree he spotted found it producing seeds but there was no sign of any taking hold nearby.

A team at The Australian Botanic Garden at Mt Annan, led by Brett Summerell, stepped in to investigate the genetics of the Cattai between October 2018 and February 2019, and breed a variety of the plants.

These were then moved to a secret location in the national park starting last August, beginning with a batch of sixty plants with another sixty to come.



One of the plantings that is taking hold in its new home. The secret location was chosen because of its suitable soils but also because it will likely be suited to predicted climate change in the region. *WOLTER PEETERS*

“We obtained a significant proportion of the total variety [of the Cattai],” Dr Summerell said. “We managed to get good genetic variability, which is not always the case.”

Out in the national park, each of the plantings is protected with a metal mesh, with most doing well despite signs of wallaby tastings. “They’re all looking good, although they have been chomped on a bit,” he said.

Dr Lee set the plants up at distances of at least eight metres in groups of six. “I’d noticed that they have this tendency to clump up, so I’m mimicking this natural feature,” she said.

Even though wet weather has been good, Dr Lee will still water the plants if they don’t receive at least 1 millimetre of rain over five days. Monitoring will last until at least 2026.



Ecologist Enhua Lee (left) from the NSW Government’s Saving Our Species unit checks on progress of one of the plantings of the Cattai tree in its new climate-friendly location south of Sydney. She is joined by Brett Summerell, director Science and Conservation at the Royal Botanic Garden. *WOLTER PEETERS*

The decision to relocate the plant was prompted by the trees restricted range and the fact that most were on private land in one of Sydney’s fastest-growing development zones.

Researchers picked the new home in part because future predictions indicate it will still be suitable if conditions dry and heat up as expected.

Dr Summerell said similar calculations are being applied for other species being moved, such as the *Hibbertia fumana*, Rothbury *Personia* and some orchids.

“Most of these don’t necessarily have an explicit climate change perspective, but as the technology has developed we are starting to include the genomics and climate modelling in both the location selection and in the way in which plants are arranged to maximise genetic exchange,” he said.



Ecologist Enhua Lee and botanist Brett Summerell at the secret replanting site to Sydney's south.

*WOLTER PEETERS*

Dr Douglas, who has identified at least five new species, said “there’s an absolute warehouse full of species likely to need translocation due to climate change”.

“Most of these will be at high elevations where there simply isn’t anywhere higher for them to move or even to be moved locally,” he said.

Those challenges, combined with current threats from habitat loss and invasive pests among others, mean that many more species are going to need interventions like those for the Cattai in the future.

“There needs to be recurrent funding – not just for five years...to recruit and retain staff with the appropriate skills,” Dr Douglas said. “You’d be losing things before they have got a name and even before they get [an endangered] listing.”

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## Research suggests eucalyptus trees can be genetically modified not to invade native ecosystems

Source: Steve Lundeberg, Oregon State University, ECOS, Published: April 7, 2021

<https://phys.org/news/2021-04-eucalyptus-trees-genetically-invade-native.html>



Credit: Oregon State University

Eucalyptus, a pest-resistant evergreen valued for its hardy lumber and wellness-promoting oil, can be genetically modified not to reproduce sexually, a key step toward preventing the global tree plantation staple from invading native ecosystems.

Oregon State University's Steve Strauss led an international collaboration that showed the CRISPR Cas9 gene editing technique could be used with nearly 100% efficiency to knock out LEAFY, the master gene behind flower formation.

"The flowers never developed to the point where ovules, pollen or fertile seeds were observed," Strauss said. "And there was no detectable negative effect on tree growth or form. A field study should be the next step to take a more careful look at stability of the vegetative and floral sterility traits, but with physical gene mutation we expect high reliability over the life of the trees."

Findings were published in *Plant Biotechnology Journal*.

Strauss, Ph.D. student Estefania Elorriaga and research assistant Cathleen Ma teamed up with scientists at the University of Colorado, Beijing Forestry University and the University of Pretoria on the research. The greenhouse study involved a hybrid of two species, *Eucalyptus grandis* and *E. urophylla*, that is widely planted in the Southern Hemisphere; there are more than 700 species of eucalyptus, most of them native to Australia.

"Roughly 7% of the world's forests are plantations, and 25% of that plantation area contains nonnative species and hybrids," said Elorriaga, now a postdoctoral researcher at North Carolina State. "Eucalyptus is one of the most widely planted genera of forest trees, particularly the 5.7 million hectares of eucalyptus in Brazil, the 4.5 million hectares in China and 3.9 million hectares in India."

Those plantings, the scientists note, can lead to undesirable mingling with native ecosystems. Thus eliminating those trees' ability to sexually reproduce without affecting other characteristics would be an effective way to greatly reduce the potential for invasive spreading in areas where that is considered an important ecological or economic problem.

"This was the first successful application of CRISPR to solve a commercial problem in forest trees," Elorriaga said. "Research with CRISPR in forest trees to modify different traits is ongoing in many laboratories around the world. Global warming is having large impacts on forests of all kinds, and gene editing may be an important new breeding tool to supplement conventional methods."

Strauss points out that despite the promising findings, trees genetically modified as they were in this research could not legally be planted in Brazil, a nation with some of the largest economic value from eucalyptus tree farming.

"The trait could not be used there due to laws against modifying plant reproduction with recombinant DNA methods," he said. "It would also be disallowed for field research or commercial use under sustainable forest management certification in many parts of the world—something scientists have come together to severely criticize in recent years."

A little more than two years ago, Strauss was part of a coalition of forestry researchers to call for a review of what they see as overly restrictive policies regarding biotech research.

"Hopefully, studies like this one, that show how precise and safe the technology can be in modifying traits, and that help to promote ecological safety, will help to change regulations and certification rules," he said. "Happily, such discussions are well underway in many nations."



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## ABSTRACT

### Beneficial and Healthy Properties of Eucalyptus Plants: A Great Potential Use

*Maria Gabriella Vecchio,, Claudia Loganes and Clara Minto*

*August 2016The Open Agriculture Journal 10(Suppl 1: M3):52-5*

*DOI:10.2174/1874331501610010052*

*Received: December 04, 2015 Revised: May 09, 2016 Accepted: May 11, 2016*

Eucalyptus (*Eucalyptus* spp.), an evergreen tall tree native to Australia and Tasmania, has been used since ancient times by the aboriginal population for several purposes. In particular, the species *E. globulus* is widely used in the pulp industry, as well as for the production of eucalyptus oil extracted on a commercial scale in many countries as raw materials in perfumery, cosmetics, food, beverages, aromatherapy and phytotherapy. The 1,8-cineole (eucalyptol), the principal and the most important constituent extracted from eucalyptus leaves, demonstrated an antimicrobial and anti-inflammatory activities. Despite the fact that the healthy effects of eucalyptus have been well established by research, further studies are necessary to investigate other prime effects of the plant and its possible implication in the treatment of a greater number of pathological conditions.





## Wine with a touch of Eucalyptus?

### The science of Indigenous Australian fermentation.

Source: 11 September 2020, Cosmos

<https://cosmosmagazine.com/earth/agriculture/wine-with-a-touch-of-eucalyptus/>

Australian wine scientists are exploring the traditional practices Aboriginal people used to produce fermented beverages, with a view to trying something non-traditional.

A team from the University of Adelaide and the Australian Wine Research Institute (AWRI) has discovered there are complex microbial communities associated with the natural fermentation of sap from the Tasmanian cider gum (*Eucalyptus gunnii*).

*Eucalyptus gunnii*, from the Central Plateau of Tasmania. Credit: University of Adelaide / AWRI

“Cider gums produce a sweet sap that was collected by Aboriginal people to produce a mildly alcoholic beverage,” says the AWRI’s Cristian Varela, lead author of a paper in the journal Scientific Reports.

“The drink known as way-a-linah was made by the Tasmanian Palawa people in a traditional practice where the sap was given time to spontaneously ferment.



*Eucalyptus gunnii*, from the Central Plateau of Tasmania. Credit: University of Adelaide / AWRI

“To the best of our knowledge, the microorganisms responsible for this traditional Australian fermentation have never been investigated or identified.”

*E. gunnii* is native to the remote central plateau of Tasmania but is also commonly planted as an ornamental tree in parts of Britain and Europe – perhaps because it shows exceptional cold tolerance for a eucalypt (which likely also explains the high concentration of sugars in its sap).

It has been well studied as a possible source of bioenergy, phytochemicals and essential oils, the researchers say, but not in relation to its fermentation potential.

In fact, they say, while many indigenous fermented beverages have been produced worldwide – from the Ethiopian honey wine tej to the maize-based chicha of Peru – only a few have been characterised from a microbiological perspective.



Credit: University of Adelaide / AWRI

For their study, Varela and colleagues worked with the Tasmanian Aboriginal Centre and the Tasmanian Land Conservancy to collect 84 cider gum samples – 45 from sap, 29 from bark and 10 from soil – from three locations in Tasmania.

Using DNA sequencing, they identified the bacterial and fungal communities they found. Some could not be matched to existing databases, suggesting they represent completely new classifications.

Analysis showed that although the same main fungal classes were common for cider gum and winemaking, genus diversity and/or relative abundance differed. Interestingly, the main genus responsible for alcoholic beverage fermentation, *Saccharomyces*, was barely found in the cider gum samples.

Research leader Vladimir Jiranek, from the University of Adelaide, says the work is shining a light on both the unique fermentations and their cultural significance.

“It also allows us to identify new strains, or species, of yeast and bacteria from the fermentations that are unique to Australia. Further work will characterise single microorganisms that have been isolated and grown from the cider gum.

“We are particularly interested in their fermentative abilities, their potential flavour impacts, how they’ve adapted to the cider gum environment and the possible symbiotic relationship they have with the trees.”

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## ABSTRACT

### Tissue Culture of *Corymbia* and *Eucalyptus*

Stephen J. Trueman , Cao Dinh Hung and Ivar Wendling

*Forests* 2018, 9(2), 84; doi:10.3390/f9020084

Received: 15 December 2017 / Revised: 7 February 2018 / Accepted: 7 February 2018 /

Published: 9 February 2018

Eucalypts are among the world’s most widely planted trees, but the productivity of eucalypt plantations is limited by their often-low amenability to true-to-type propagation from cuttings. An alternative approach to cutting propagation is tissue culture, which can be used to micropropagate valuable genotypes rapidly while simultaneously preserving germplasm in vitro. This review describes the use of tissue culture methods such as shoot culture, organogenesis, and somatic embryogenesis for micropropagating eucalypts. This

review also discusses the use of cool storage, encapsulation, and cryopreservation methods for preserving eucalypt germplasm and delaying tissue maturation under minimal-growth conditions.



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## The Sexy Gum: a love story

Dr Michael Whitehead is campaigning to rename the Gimlet Gum to the Sexy Gum

Source: April 12, 2019, The Conversation; <https://theconversation.com/the-sexy-gum-a-love-story-115363>.

It is perhaps poetic that a region most famous for its lack of trees lies so close to one of Australia's greatest tree-based spectacles. The Nullarbor Plain, our famous, flat, featureless expanse is literally named for its absence of trees ("arbor" being Latin for tree).

And if you ever get to drive west along the longest stretch of dead-straight road across this iconic landscape, you will come to know the highlights that characterise the experience: the cliff-top views of the Great Australian Bight and the idiosyncratic roadhouses.

Then finally, a landscape of low shrubs gives way to mallee trees and woodland vegetation. Somewhere between Caiguna and Fraser Range you'll see your first *Eucalyptus salubris*, also known as a gimlet gum, or joorderee by the Ngadju people.

It was on a recent botanical research trip chasing scraggly emu bushes that I stumbled upon, and fell in love with, *Eucalyptus salubris*. The trunks were what instantly caught my eye, slender with graceful twists, all the more observable for the brilliantly shining coppery bark.

### The sexy gum

The tree first appears in European record during early explorations crossing east of the Darling Range. Then, it was called "cable gum" after the gently twisting grooves in the trunks.

Later the tree was given the common name of "gimlet" after a form of hand drill. Unfortunately this name stuck and today the species remains "gimlet" – a wholly unattractive moniker for such a splendid tree.

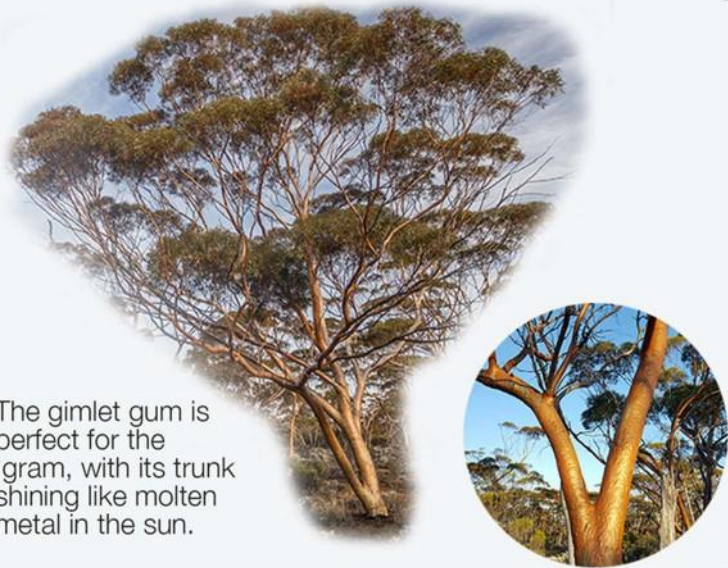
But our imaginations need not be held hostage by the stubborn colonialists who named our flora after such dreary things.

That's why I'm campaigning to update the common name to something more universal, more marketable, something truer to its sensual twists and smooth, glowing bronze surface.

## Gimlet gum

Botanical name: *Eucalyptus salubris*  
Family: Myrtaceae

Height: up to 24m



The gimlet gum is perfect for the 'gram, with its trunk shining like molten metal in the sun.



You'll find extensive populations of *Eucalyptus salubris* in Western Australia's Great Western Woodlands.

They provide habitat for several endangered animals, including the Mallee fowl.

The Conversation

Beating  
around  
the bush

*Eucalyptus salubris* is the Sexy Gum.

Love goes where my eucalypt grows

*E. salubris* is a dominant species forming woodlands on deep soils east of the Darling Range. And while much of its former range in the Wheatbelt of Western Australia has been cleared, extensive populations of *E. salubris* remain in the astonishing stronghold of the Great Western Woodlands.

Those who have walked in a mature woodland understand the pleasure of wandering unimpeded in the shade of widely spaced trees.

The Great Western Woodlands offers this experience on a grand scale. At around 16 million hectares they are the largest tracts of intact temperate woodlands on Earth, occupying an area larger than England and Wales combined.

And it is not just size that is impressive about these woodlands.

The Great Western Woodlands are a renowned hotspot for eucalypt diversity, home to around 30% of Australia's eucalypt species in just 2% of its land area.

As one of the more common species throughout the area, *E. salubris* plays a critical ecological role, providing habitat for several threatened bird species including the rotund and charismatic Mallee fowl.

Due to its remoteness and unreliable rainfall, the Great Western Woodlands has avoided the widescale grazing and clearing that has degraded neighbouring areas to the south and west.

But despite the value of this untouched landscape, most of the area is "orphan country" with no formal management policies in place. Some 60% of the Great Western Woodlands is unallocated crown land, unmanaged and open access.

This is a plus for visitors wanting to experience it now, but raises important concerns about the long-term security of the area.

While remote, threats to the Great Western Woodlands do exist. Chief among them is the increasing frequency and intensity of bush fires.

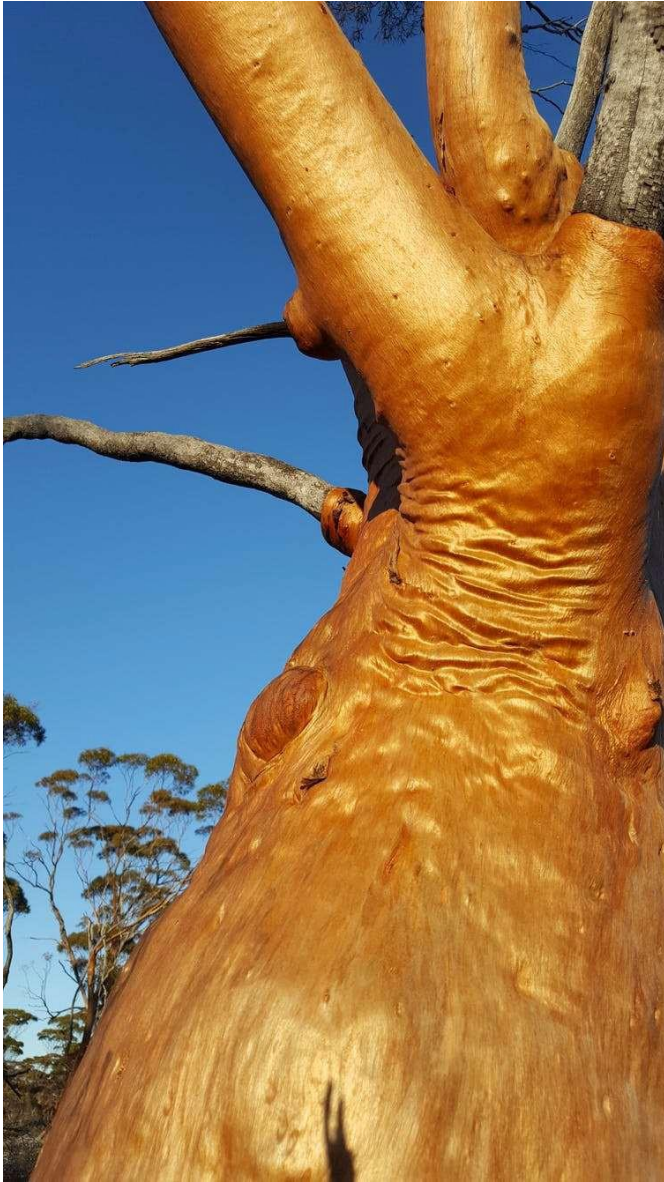


Widely spaced trees of the Great Western Woodlands. Keren Gila/Wikimedia, [CC BY](#)

Most eucalypts are resprouters with the ability to regenerate burned canopies from buds under the bark. There are, however a number of species, such as Mountain Ash, that will die following canopy fires and can only regenerate from the soil seedbank (called “reseeders”).

*E. salubris*, the sexy gum, is one such reseeder. While the traditional occupants of the land used fire as a land management tool, they also knew *E. salubris* woodland took hundreds of years to regenerate and were careful to never burn the canopy of old growth forests.

The eye-pleasing spectacle of mature open *Eucalyptus salubris* woodland above red soil and blue-bush therefore exists today thanks to careful management from this era, and deserves careful handling to ensure its ongoing future.



### An ambassador for the Great Western Woodlands

Late in the day, when the Sun's glancing rays light up the bark of *E. salubris*, punctuating a pastel blue-green woodland with glowing streaks like molten metal, it's hard to not stop for at least a moment and be impressed.

And while *E. salubris*' role as keystone species might be important ecologically, I think the Sexy Gum can be similarly important as ambassador and draw-card for the Great Western Woodlands.

Its golden tones and metallic lustre conjures just the appropriate impression for the WA Goldfields. It is totally Instagram-able, and I don't think it's a hard sell to convince people *E. salubris* is a spectacle worth getting off the beaten track for.

The glowing bronze surface of the *Eucalyptus salubris*.

**Species profile:** *Eucalyptus salubris* F.Muell., Fragm. 10: 54 (1876). Common Name: Gimlet

Source: Euclid

Location: between Queen Victoria Spring and Ularing, Western Australia.

Description: Mallet to 15 m tall, stems fluted. Non-lignotuberous.

Bark: smooth throughout, shiny, steely grey or olive green to tan, coppery or yellow.

Juvenile growth (coppice or field seedlings to 50 cm) : stems rounded in cross-section, non-glaucous, the very base will have started to develop typical adult bark; juvenile leaves always petiolate, opposite for up to 5 nodes then alternate, lanceolate, 6.5–9.5 cm long, 2–3 cm wide, dull, grey-green or slightly glaucous, weathering green, glossy.

Adult leaves : alternate, petioles 0.7–2 cm long; blade lanceolate to narrowly so, 6.5–10.5 cm long, 0.7–1.5 cm wide, base tapering to petiole, margin entire, apex pointed, concolorous, glossy, green, side-veins at an acute or wider angle to midrib, reticulation sparse to moderate, intramarginal vein more or less remote from margin, oil glands irregular in outline, island.

Inflorescences :

axillary unbranched, peduncles stout, broadened apically, 0.4–2 cm long; buds 7, pedicellate (pedicels 0.1–0.7 cm long). Mature buds ovoid to broadly fusiform (0.6–1.2 cm long, 0.3–0.7 cm wide), scar present, operculum obtusely conical, all stamens inflexed but to varying degrees, anthers narrowly oblong, versatile, sub-basifixed, dehiscing by longitudinal slits, style long and straight, stigma blunt, locules 3, the placentae each with (5)6 vertical rows of ovules. Flowers white.

Fruit normally pedicellate (pedicels (0)0.1–0.6 cm long), obconical to hemispherical, 0.3–0.6 cm long, 0.5–0.7 cm wide, disc level to descending, valves 3, exerted.

Seed pale to dark brown, 1–2 mm long, ovoid or flattened-ovoid sometimes polygonal in outline, dorsal surface deeply, narrowly and closely fissured, margin ragged, hilum ventral. (Seedcoat often referred to as being honey-combed.)

Cultivated seedling (measured at ca node 10): cotyledons Y-shaped (bisected); stems square in cross-section, smooth or slightly warty; leaves always petiolate, opposite for ca 5 nodes then alternate, lanceolate, 7.5–10.5 cm long, 1.5–3 cm wide, dull, grey-green.



Notes: A small mallet, endemic to Western Australia. It is very widespread in the wheatbelt and Goldfields from Mullewa in the north-west, south-east to near Pingrup and Mt Short near Ravensthorpe, extending east and north to Norseman and Zanthus and Lake Minigwal in the western part of the Great Victoria Desert and north to Admiral Flat near Laverton. The bark is smooth, brilliant coppery in season. The adult leaves are very glossy, green. Buds are in 7s on prominently flattened peduncles.

*Eucalyptus salubris* belongs

in *Eucalyptus* subgenus *Symphyomyrtus* section *Bisectae* subsection *Glandulosae* because the buds have two opercula, the cotyledons are bisected and the branchlets have numerous oil glands in the pith. Within this subsection *Eucalyptus salubris* belongs to a well known small group,

the gimlets (series *Contortae*), a group notable for the slender fluted, twisted shiny colourful trunks. The gimlets are further recognised by very irregular island oil glands in the leaves and irregularly and deeply pitted seed -coats.

*E. salubris* is one of 6 true gimlet species with buds in 7s – the others are *E. campaspe*, *E. effusa*, *E. ravidia*, *E. terebra* and *E. tortilis*. The mallee species, *E. effusa*, is a slightly atypical gimlet in having scruffy-ribbony lower stems. The non-glaucous *E. salubris* is easily distinguished from *E. ravidia* and *E. campaspe* both of which have conspicuously glaucous branchlets. *E. terebra* has larger, sessile, crowded buds and fruit (pedicellate in *E. salubris*). *E. tortilis* is morphologically closest to *E. salubris* differing only in having larger buds with more acute operculum and slightly larger fruit.

Flowering Time: Flowering has been recorded in August, September, November, December, February and March.

Formerly used for minor construction and as firewood in the Goldfields. It produces a light amber honey. Sometimes *E. salubris* is grown as an ornamental for its colourful bark.

Origin of Name: *Eucalyptus salubris*: Latin *salubris*, healthful, wholesome, beneficial, reference obscure.





Articles, requests and questions are needed.

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