

Eucalyptus Study Group Newsletter

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Do Australia's giant fire-dependent trees belong in the rainforest?

By EurekAlert!

Australia's giant eucalyptus trees are the tallest flowering plants on earth, yet their unique relationship with fire makes them a puzzle for ecologists. Now the first global assessment of these giants, published in *New Phytologist*, seeks to end a century of debate over the species' classification and may change the way it is managed in future.

Gigantic trees are rare. Of the 100,000 global tree species only 50, less than 0.005 per cent, reach over 70 metres in height. While many of the giants live in Pacific North America, Borneo and similar habitats, 13 are eucalypts endemic to Southern and Eastern Australia.

The tallest flowering plant in Australia is *Eucalyptus regnans*, with temperate eastern Victoria and Tasmania being home to the six tallest recorded species of the genus. One Tasmanian tree was measured at 99.6 m, while a tree in Victoria achieved the historic record of 114.3 m.

‘The conifers of North America are often thought of as the largest trees on earth, yet the flowering eucalyptus trees of Australia reach comparable heights,’ Professor David Bowman, from the University of Tasmania's School of Plant Science.

‘This is surprising as Australia is the world's driest inhabited continent. Yet, this apparent paradox may explain the evolutionary advantage of gigantism in trees.’

Wildfires are common in dry and arid environments such as Australia, but *Eucalyptus regnans* has evolved a unique dependency on fire for regeneration.



Young mountain ash saplings in at the edge of temperate rainforest in Tasmania.
Credit: CSIRO Publishing

While fire may kill the trees, their seeds are protected in aerial capsules, which are then released on to the scorched earth. The fire not only clears away potential seed predators and any forest canopy which may block sunlight; it also releases nutrients in the soil which encourages seed growth.

‘This unique relationship with fire helps us understand how these giants evolved,’ said Bowman. ‘Our research suggests gigantism in eucalypts evolved opportunistically within the last 20 million when the ideal environmental conditions for rapid tree growth were combined with the presence of wildfire.’

However, fire dependency now threatens the trees' future as much as it has shaped their past. Due to this trait, foresters classify the tree as a unique type of Australian vegetation, rather than considering it a rainforest tree.

‘This classification has serious scientific and conservation implications for the remaining forests of mature (old growth) giant eucalypts,’ said Bowman. ‘Giant trees have huge value for the timber industry, yet there are strong environmental reasons for their protection. Classification as rainforest trees would support arguments in favour of conservation.’

Dr Bowman's team presents a comparative analysis clarifying the relationship between the giant eucalypts and other rainforest species. Their findings suggest that while the species has evolutionary advantages that allow it to outcompete other species, they do coexist on the margins of rainforests and should be considered part of that ecosystem.

‘Our work seeks to resolve a century old dispute about rain forest classification,’ concluded Professor Bowman. ‘Rather than seeing them in isolation we place these giants into their global context by recognizing them as species of rainforest tree, albeit trees with a unique dependence on fire.’

Source: <http://www.ecosmagazine.com/paper/EC12472.htm>

Published: 5 November 2012

Giant Eucalypts sent back to the rainforest

By Rachel Sullivan (ABC)

Standing tall Giant fire-dependent eucalypts should be classified as rainforest species, a new study has found, ending decades of debate over the species' classification.

The research, published in the journal *New Phytologist*, was the first international study to examine gigantism in global tree species.

Of the world's 46 living giant tree species - those exceeding 70 metres in height - most are either conifers found along the Pacific North West Coast of North America or eucalypts from Southern and Eastern Australia.

"Australia is an epicentre of giant trees," says Professor David Bowman, a forest ecologist at the University of Tasmania. "Of these, the tallest is *Eucalyptus regnans* with temperate eastern Victoria and Tasmania being home to the six tallest recorded specimens."

"One Tasmanian tree was measured at 99.6 metres while a historical records suggest a Victorian tree reached a record 114.3 metres."

According to Bowman, most people think the conifers of North America are the largest trees on Earth, despite the flowering eucalyptus trees of Australia reaching comparable heights.

"This is surprising as Australia is the world's driest vegetated continent," he says. "Yet, this apparent paradox may explain the evolutionary advantage of gigantism in trees."



Mellowing with age

The researchers looked at the ecological and phylogenetic distributions of giant trees, the characteristics eucalypts share with other giants, their relationship with fire and the unique ecological relationship eucalypts have with rain forest.

They found that gigantism in eucalypts evolved within the last 20 million years as a recovery response following bushfire during ideal environmental conditions for explosive tree growth.

"Giant eucalypts have been a puzzle because they require fire to regenerate, yet tower over the rainforest tree canopy that regenerates without fire," says Bowman. "They are incredibly competitive when they are young, yet once established, co-exist happily with invading rainforest species.

"Their evolutionary advantages allow them to outcompete other species, however they occur on the margins of rainforests."

"Rather than seeing them in isolation they should be regarded as long-lived rainforest pioneers and a part of that ecosystem."

In fact, says Bowman, they are remarkably long-lived, with other research by his team showing that they can live for up to 500 years.

Unique type of vegetation

Giant eucalypts were originally classified as rainforest species, but were reclassified as a unique vegetation type after it was discovered by foresters in 1959 that they needed the ash bed that follows a bushfire for their seeds to germinate.

"This classification has serious scientific and conservation implications for thinking about the remaining forests of mature (old growth) giant eucalypts," says Bowman.

"Giant trees have huge value for the timber industry, yet there are strong environmental reasons for their protection.

"Classification as rainforest trees, albeit those with a unique dependence on fire, adds support to arguments in favour of old growth conservation."

Source: <http://www.abc.net.au/science/articles/2012/11/01/3623363.htm>

Published: Thursday, 1 November 2012

Dual mycorrhizal associations of jarrah (*Eucalyptus marginata*) in a nurse-pot system

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Abstract

Jarrah (*Eucalyptus marginata* Donn ex Sm.) plants, like many other eucalypts, can form symbiotic associations with both arbuscular mycorrhizal (AM) and ectomycorrhizal (ECM) fungi. To study this tripartite relationship we developed a novel nurse-pot system to allow us to investigate the extent and

temporal colonisation dynamics of jarrah by two AM species (*Rhizophagus irregularis* (Błaszk., Wubet, Renker & Buscot) C. Walker & A. Schüßler comb. nov. and *Scutellospora calospora* Nicol. & Gerd.) and two putative ECM species (*Austroboletus occidentalis* Watling & N.M. Greg. and *Scleroderma* sp.) and their potential effects on jarrah growth and nutrition. Our nurse-pot system, using jarrah as both the nurse plant and test plant, was developed to establish extraradical hyphal networks of both AM and ECM fungi that act as single or dual inoculum for test plants. Mycorrhizal colonisation was described and quantified, and growth and nutritional effects measured and analysed. Mycorrhizal colonisation increased with time for the test seedlings exposed to hyphae networks from *S. calospora* and *Scleroderma* sp. The nurse-pot system was effective at initiating colonisation of functioning AM or (putative) ECM systems separately but the ECM symbiosis was inhibited where a dual AM + ECM inoculum (*R. irregularis* and *Scleroderma* sp.) was present. The presence of *S. calospora*, *A. occidentalis* and *Scleroderma* sp. individually significantly increased the shoot biomass of seedlings compared with non-mycorrhizal controls. The two AM isolates had different physiological effects on jarrah plants. *S. calospora* improved growth and micronutrient uptake of jarrah seedlings whereas no positive response was observed with *R. irregularis*. In addition, as an interesting observation, the non-responsive AM fungus *R. irregularis* suppressed the ECM symbiosis in dually inoculated plants where ECM structures, positive growth response and nutritional effects were absent. When inoculated individually, ECM isolates dominated the growth response and uptake of P and other nutrients in this dual symbiotic plant. Despite the positive growth response in the *A. occidentalis* treatment, ECM structures were not observed in either nurse or test seedlings. From the effects of *A. occidentalis* on jarrah we hypothesise that this fungus forms a functional mycorrhizal-type partnership even without forming archetypal structures in and on the root.

Source: *Australian Journal of Botany* 60(8) 661-668 <http://dx.doi.org/10.1071/BT12152>

Submitted: 8 June 2012 Accepted: 27 September 2012 Published: 7 November 2012

The Eucalypt's survival secret

By Danny Kingsley (ABC Science Online)

The eucalypt trees burnt in Australia's recent bushfires are already sprouting again — and one botanist has worked out how they do it.

Dr Geoff Burrows from the Department of Agriculture at Charles Sturt University has discovered that eucalypts regrow in a way unlike any other tree in the world.

His findings have overturned long held beliefs about eucalypts, which had always been assumed to 'bud' like all Northern Hemisphere trees.

"People just assumed that because all trees in the Northern Hemisphere are the same, eucalypts will be too," explained Dr Burrows, who has spent the past five years on the research.

Northern Hemisphere trees like oak and willow have buds near the bark surface. They can resprout from the ground if they are chopped down but, unlike eucalypts, are unable to regenerate if they are burnt in a fire, because the buds are killed.

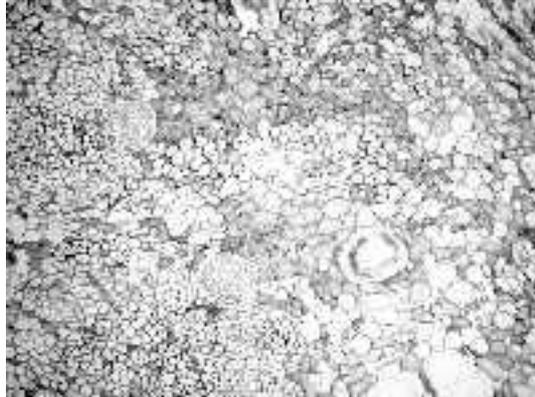
Dr Burrows has found that the lumps on the bark of eucalypts are not actual buds but are connected to bud-forming tissue located beneath the bark. The connection is via tubes called "bud traces" which run from the centre of the tree through the wood to the bark.

"If you follow one of the lumps back in along the tube, when you get near to the bark or the inner wood, you find cells that will make buds if the tree gets the signal," he said.

While all trees have bud traces, including those in the Northern Hemisphere, eucalypts bud traces are the only ones that don't end in an actual bud.

The placement of the bud-forming tissue in the eucalypt bud trace means it can lose 2 cm of bark in a fire and still be able to regenerate.

"As long as the whole tree doesn't get killed, there will still be some of this bud-forming tissue somewhere in what's left of the bark," explained Dr Burrows.



A thin section of a eucalypt showing the bud-forming cells. (Pic: Dr Geoff Burrows)

The bud-forming tissue forms buds in response to signals such as a lack of photosynthesis, which happens when green leaves are burnt off a tree.

Unlike other trees, eucalypts are not restricted to sprouting from the ground. They can resprout from any point on the tree even five to 10 metres up in full sunshine.

"It gives them a real head-start on other plants that might be trying to restart after a fire," said Dr Burrows.

He said the difficult task of cutting thin sections of eucalypt involved the use of a new technique in which liquid plastic was poured into the wood and then set before cutting.

"It's nice that eucalypts really are different," said Dr Burrows. "Because of the environmental pressures they have been under they have come up with something that has enabled them to get a competitive advantage on other plants."

Dr Burrows' research was published in the January 2002 issue of the journal *New Phytologist*.

Source: <http://www.abc.net.au/science/articles/2002/02/11/477019.htm>

Tree Profile; *Corymbia gummifera*

By Tony Popovich

Corymbia gummifera (Gaertn.) K.D.Hill & L.A.S.Johnson (named and published) syn. *Eucalyptus gummifera* (Sol.ex Gaertner) Hochr, *Eucalyptus corymbosa*

Common name: Red Bloodwood

Family: Myrtaceae

In 1770 the first specimen of *Corymbia gummifera* were collected by Joseph Banks and Daniel Solander in Botany Bay. *Corymbia gummifera* is adaptable in a wide range of soil types and mild climates. Not

commonly used as a specimen or ornamental tree. Very rare to find good individual specimen trees. A good supplementary plant for mass planting with other native plants species.

Origin

Corymbia gummifera an evergreen tree originates in open to tall open forests, dry sclerophyll forest or woodland, coastal heathlands on low fertility sand to moist richer loams, gravelly loams or shallow sandy soils on sandstone.

Distributed on 'coastal plains, lower Blue Mountains and ranges of NSW, south eastern Queensland (to Fraser Island and Mount Walsh) and far eastern Victoria'¹.

Corymbia gummifera is associated with many communities and species including and not limited to: *Eucalyptus punctata*, *E. agglomerata*, *E. capitellata*, *E. pilularis*, *E. sieberi* and other bloodwoods.

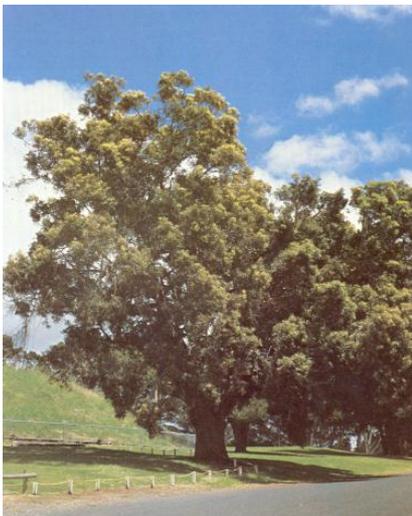
Low elevations eg. near-coastal, open forests on flats and hills, rocky ridges and lower Blue Mountains of the Hawkesbury sandstones. From sea level up to 300m altitude.

Mean annual rainfall, varies from 1210mm to 700mm per annum taking in all various locations and seasons. The temperatures range from the coast to the lower Blue Mountains from 1 – 8 degrees. Winter months in the mountains can be very cold and night-time frost is very common with occasional sleet and snow. Warmer months temperatures range from 24 to 32 degrees.

Typical habit

A medium to tall forest-sized Australian native tree, often shows variations within single species. It usually grows as a tree with erect trunk and open crown, but may take the form of a mallee on shallow sandy soils over sandstone, while in better fertile soils will grow into a tree up to 60m in height. A smaller stunted tree is typical with gnarled branches up to 15-20m in height on harsher sites.

The trees' age span will vary both within the urban environment and their natural habitat.



A rare individual species located in a park



Trees in their natural habitat

Tree description

The name *gummifera* meaning "gum bearing" referring to kino exudations, with the common name of bloodwood, referring to the colour of the heartwood/sap or the 'trickle of blood red gum from damaged

¹ Brooker M.I.H and Kleinig D.A (1983). Field Guide to Eucalypts page 47.

parts². The trunk has a distinctive rough tessellated bark persistent to the smaller branches, smaller branches may be smooth.



Red kino exudation and typical tessellated bark

As a tree it typically grows to a height of 20 to 35 metres and a trunk diameter of 1 metre diameter at breast height (dbh). However, exceptional trees may reach 60 metres high at 4 metres dbh³. The width of the tree varies from 10 to 20m depending on the trees location within a forest situation or as an individual tree within an open space. Soil type will also influenced size.

The juvenile leaves have a distinctive pubescent (simple hairs) on the on the leaf stems and underside of the mid rib and the leaves can be opposite for a few pairs.

The adult leaves are alternately arranged, strongly discolorous (top of the leaf being darker green than underneath). Leaves lanceolate to broad-lanceolate, with strong leaf venations.

The flowers are hermaphrodite (have both male and female organs) with large creamy white flowers arranged in conspicuous clusters (inflorescence) of 7 - flowered, during January to June (summer to autumn time). The small flower buds of pyriform shape have a slightly beaked or hemispherical operculum and the fruit distinctly woody urn shaped with a small neck, 15 to 20 mm long by 11 to 18mm diam. with enclosed disc and valves.



Urn shaped fruits and creamy white flowers

Corymbia gummifera naturally hybridizes with *Corymbia intermedia* (Pink Bloodwood).

² Baker. M, Corringham. R, Dark.J (1985) Native Plants of the Lower Blue Mountains, *Corymbia gummifera*,page 8.

³ Boland D.J. Brooker M.I.H, Chippendale G.M, Hall N, Hyland B.P.M, Johnston R.D, Kleinig D.A, Turner J.D (1984). Forest Trees of Australia. CSIRO Publishing, Australia. Victoria .

A study on mallee type lignotuber suggest's, 'the *high proportion of storage tissue in the lignotuber wood in comparison with stem wood suggests that food storage is an important function of lignotubers*'⁴.

Uses

Corymbia gummifera is very adaptable and tolerant. Preferring warm humid to temperate and cooler conditions of the lower Blue Mountains. Will tolerate well-drained non-limy soils and moist areas. Can tolerate maritime exposure.

Tree best used as a specimen tree in parks or in mass planted areas with other native plants. Possible use as a screen planting for coastal areas.

Timber

Taking its common name from the appearance of its heartwood, Red Bloodwood ranges from a dark pink to dark red colour, with much paler sapwood. It has a coarse texture, with the grain of Red Bloodwood usually interlocked.

Due to the presence of concentric gum veins, Red Bloodwood is not ideally suited for use as sawn timber as gum veins - or the red-coloured kino veins - can open up during drying.

This species is mainly used for round timber applications and very durable in the soil such as for Sills, poles, keels of vessels, piles and wharf piles, sleepers and posts, although untreated sapwood is susceptible to lyctid attack. Due to its attractive grain pattern, Red Bloodwood is also used for veneers and decorative panelling.

Red Bloodwood can be painted, stained and polished. It glues satisfactorily, but any surface preparation or machining should be done so immediately prior.

Its heartwood is very strong and durable, but has extensive gum lines. It is used for rough construction purposes, such as poles, heavy construction such as bridge work, sleepers, fencing and mining timbers.

Rarely attacked by white ants, it is used mainly as a fuel, for which it is very good.

CLASSIFICATION OF TIMBERS INTO DURABILITY CLASSES

Durability Class .1 – very durable timber.

Medicinal

The flowers produce copious amounts of nectar which can be sucked from the flowers or mixed with water to make a sweet drink that is called 'bool' in Australia.

Antiseptic - Preventing sepsis, decay or putrefaction, it destroys or arrests the growth of micro-organisms.

Astringent - Produces contraction in living tissue, reducing the flow of secretions and discharges of blood, mucus, diarrhoea etc.

Parasiticide - Treats external parasites such as ringworm.

Skin - Plants used in miscellaneous treatments for the skin.

Antiseptic; Astringent; Parasiticide; Skin.

Eucalyptus leaves are a traditional Aboriginal herbal remedy. The essential oil found in the leaves is a powerful antiseptic and is used all over the world for relieving coughs and colds, sore throats and other infections. The tannin and is powerfully astringent, it is used internally in the treatment of diarrhoea and bladder inflammation, externally it is applied to cuts etc.

Known pests and diseases

Corymbia gummifera is susceptible to Lyctid borer which attacks the sapwood.

⁴ <http://www.publish.csiro.au/paper/BT9780015.htm> CSIRO PUBLISHING PAPER on *Corymbia gummifera* study of lignotubers. RK Bamber and KJ Mullette Australian Journal of Botany 26(1) 15 – 22 abstract.

'It is termite resistant of the heartwood and 21 to 40 year marine borer resistance life expectancy'⁵.
somewhat troubled by the Winter Bronzing Bug and also troubled by lerps (psyllids) in particular the psyllid, *Glycaspis baileyi* or the Bell bird (miner)
psyllid is the main species associated with Bell Miner Associated Dieback (BMAD).

Trees can also be infested lightly with Scale insects and followed by Sooty Mould, especially noticed on younger plants and trees.

Stressed or wounded trees are also susceptible to borer activity and fungal fruiting bodies eg. Bracket fungus.

Eucalyptus xtrabutii (M. Vilm)

By Warwick Varley

I recently received a parcel containing a letter, photos and packet of seeds care of Sue Guymer from Christina Leiblich (Kimba S.A) about the Eucalypt- *Eucalyptus x trabutii*. Christina mentions that a tree of this type was planted within the local school oval back in the early 1980's, and this tree was grown by Christina from seed that she had purchased from a seed merchant⁶ in NSW. It was accompanied with a note on the seed packet that read "*Eucalyptus trabutii*, Trabuts Mahogany, A hybrid developed in France. Very hardy and fast growing. " Christina goes onto mention that the tree was shedding seeds at the time of writing her letter (30th October 2012), and that she has collected some and propagated them, from where they sprout quickly after 3 days. Christina has sent a packet of these seeds (35 gms) to be divided between any interested members. Details are at the end of this article.

I was intrigued to receive information about this hybrid, and then started scouring my library and the internet for any information about the tree. My own library on the subject of Eucalypts (just over 30 books) contained only one reference⁷ of the hybrid, and searching the internet offered little more data. What I found I have listed below.

Eucalyptus x trabutii was described in 1912 by Maurice de Vilmorin. The name is considered as validly published. The specific epithet is a tribute to the botanist Louis Charles Trabut (1853 – 1929). The hybrid was developed in France in 1903, and is a result of the hybridisation between *Eucalyptus camaldulensis* and *Eucalyptus botryoides*. No botanical description was found of the hybrid, however the following photos of the tree, leaf, capsule, and bud have been provided by the author.

Publication notes refer to the following data⁸ relating to the hybridisation registration

Nomen number: 16047

Place of publication: Rev. Hort. (Paris) 75:325. 1903

Comment: presumed hybrid of cultivation, *E. botryoides* × *E. camaldulensis*

Name verified on: 27-Oct-2009 by ARS Systematic Botanists. Last updated: 27-Oct-2009

Species priority site is: Natl. Germplasm Repository – Miami, Florida, 33158

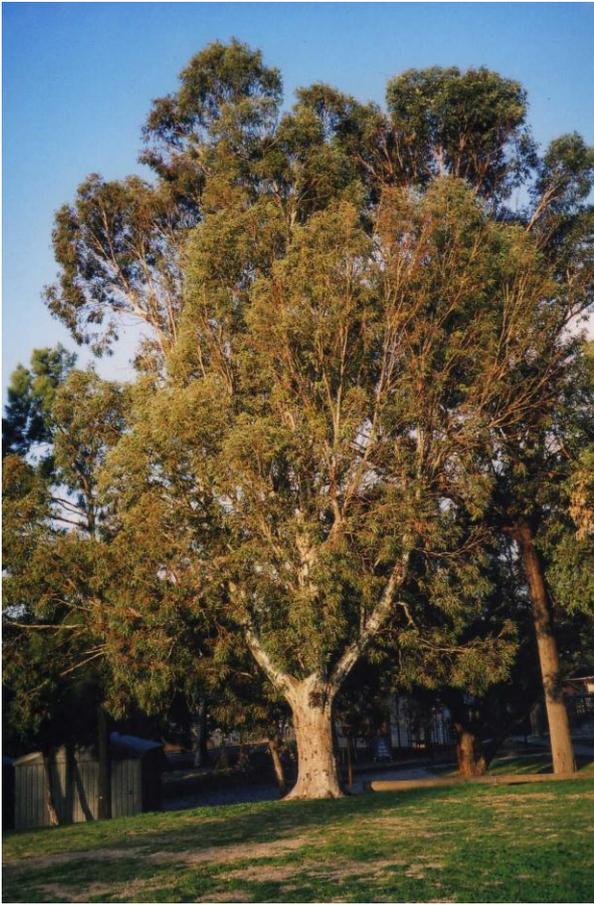
⁵ Australian Standards; AS 5604-2005

Timber –Natural durability ratings, Standards Australia

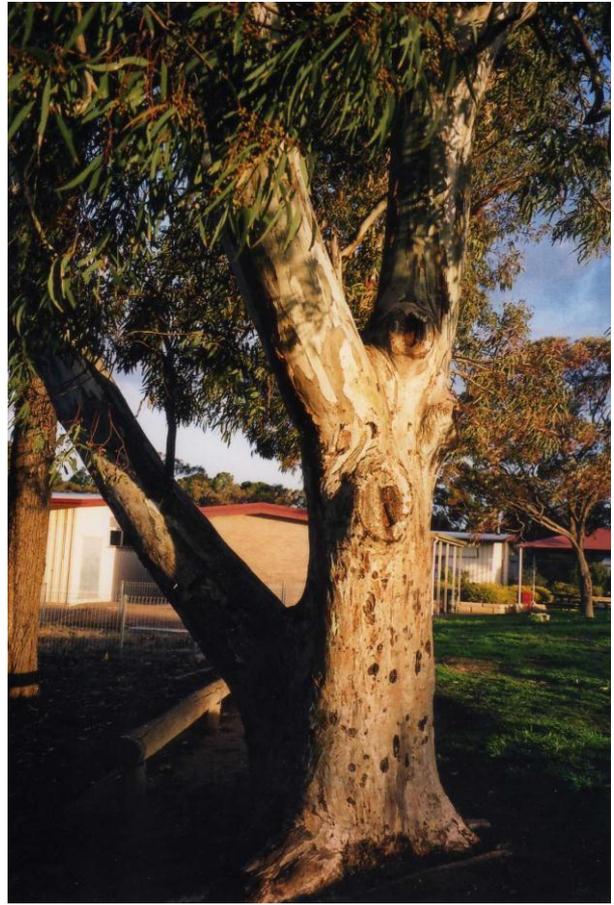
⁶ "Seeds of the World" PO Box 266, Nowra, NSW

⁷ Flora of Australia, Aust. Gov. Pub. Serv. Vol. 19, page 441

⁸ Source: <http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?16047>



Tree habit



Bark



Leaf, capsule and bud

Two further research papers were found which had used the hybrid as a test sample. The former indicates that the choice of this species for use within this study⁹ was due to its widely planted status within the Mediterranean region, therefore suggesting that the hybrid was well marketed within parts of Europe. The other study¹⁰ involved genetic DNA image cytometry, and it is unknown why such a choice was made for the test material, however the abstract does mention *Eucalyptus x trabutii* as a “natural hybrid”, which other than the known history and registration of the hybrid, the fact that the natural geographical occurrence of the parent species reside such a large distances away from one another clearly indicates that *Eucalyptus x trabutii* is highly unlikely to be a natural occurring hybrid.

It is extraordinary what prompted the breeder to attempt such a cross. *E. camaldulensis* is a smooth barked gum, the species (now divided between six sub species) is the most wide spread Eucalyptus species in Australia, with a geographical range covering all mainland Australia except Tasmania and the eastern side of the Great Dividing range. *E. botryoides* on the other hand is almost all rough bark, and is a known estuarial type species, growing close to the beach front and tidal waterways between Newcastle NSW and Bairnsdale Victoria. The photos provided by Christina certainly illustrate the characteristics of *E. camaldulensis* to be the dominant parent.

For those of you whom would like some seed, please send a letter containing a self addressed stamped envelope to the following address with your request, and I will forward some of this seed to you.

Seed request: *Eucalyptus x trabutii*
C/- Warwick Varley
PO Box 456
WOLLONGONG NSW 2520

Thankyou Christina for bringing to light this little known Eucalyptus hybrid, together with sharing the seeds you have collected.

SUBSCRIPTION TIME

Subscriptions are now due, so if you wish to be continue being part of the Eucalyptus Study group and receive the Eucalyptus newsletter, please forward your subs through to Sue Guymer.

Thank you to those members whom have paid

Could other members please send subs to Sue, or let Sue or Warwick know if they have decided not to continue their membership.

**Merry Christmas to all fellow Eucalyptus enthusiasts,
and have safe and prosperous New Year for 2013.**

⁹ Valentini R, Mugnozza GS, Giordano E, Kuzminsky E.
Influence of cold hardening on water relations of three Eucalyptus species
Tree Physiology. 1990 Mar;6(1):1-10.

¹⁰ Ruggeri, C.
Chromosome number in *Eucalyptus x Trabutii* Vilmorin (Myrtaceae).
Pubblicazioni del Centro Sperimentazione Agricola e Forestale 1960 Vol. 4 pp. 41-44

Articles 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 Sue Guymer at;

Email: aitchguy@gmail.com

Postal: No. 13 Conos Court, DONVALE, VICTORIA. 3111

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

