

Castlemaine Naturalist

August 2024

Vol. 49.7 #533

Monthly newsletter of the
Castlemaine Field Naturalists Club Inc.



Pisolithus microcarpus is a
mycorrhizal fungus.
Photo:- Dr. Jonathan Plett

Translating the Language of Ectomycorrhizal Fungi

At our CFNC July Zoom meeting Associate Professor Jonathan Plett from Hawkesbury Institute for the Environment at Western Sydney University fascinated us with his research into communications between ectomycorrhizal fungi and their host plants, in particular *Eucalyptus grandis*.

Fungal 'lifestyles' can be described as saprophytic/commensal (the decomposers), pathogenic (parasitic, disease-producing), or ectomycorrhizal (having a symbiotic, mutualistic or mutually beneficial relationship with their host plant). With eucalypts there are dozens if not hundreds of different ectomycorrhizal fungi that will associate with their roots. Much of Jonathan's work has involved *Pisolithus*, one genus of ectomycorrhizal fungi.

In Australia *Pisolithus* is at its most biologically diverse. It can be found typically in drier areas of sclerophyll mixed forests (below left) and frequently in harsh places, disturbed and even bare ground, roadsides (below right) and even pushing through in carparks! In such cases it can be difficult to



determine its host plants, so essential in terms of nutrients and particularly carbon supplies. *Photos: Jonathan Plett.*

It is known that carbon is essential to the reproductive spore-producing processes of these fungi and it is estimated that around 30% of the massive amount of carbon that a tree takes out of the air goes into the fungi that it associates with below ground. In return *Pisolithus* is valuable to eucalypt growth. Used in the nursery as an inoculant, the fungus can significantly improve plant growth, establishment and plant volume.

Clearly therefore *Pisolithus* is valuable both ecologically and industrially. It has the potential to be used in reforestation and revegetation of disturbed woodlands. However it is a poor competitor with other fungi and typically in Australia spreads out to an area of only one square metre, rather than the potential 120 m² area occasionally seen. A better understanding is required of what enables the fungus to colonise the host, to establish and to do well.

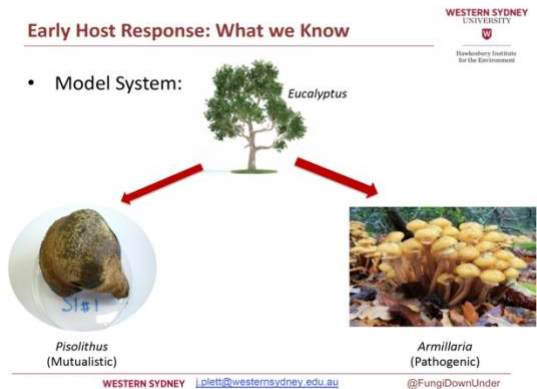
Jonathan's research focuses on the communications between the fungi with plants/hosts and with each other. All fungi secrete chemicals (metabolites) and proteins that they use as forms of language for these communications. The challenge is to decode this fungal 'language' or 'languages'. How does the host plant for example know whether a fungus is mutualistic or pathogenic? Do different fungi use similar or unique languages? Is the metabolic profile of mutualists such as *Pisolithus* different from that of pathogens such as *Armillaria* genus?

To explore such questions much of the research work is laboratory based. Using *Eucalyptus grandis* as the host plant, communications between it and *Pisolithus*, *Armillaria* and dozens of other fungus species are observed and analysed. Refer to diagram right.

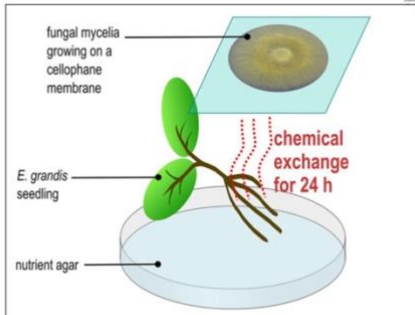
Tiny *E. grandis* seedlings are grown individually in petri

Early Host Response: What we Know

- Model System:



Pre-Symbiosis Model



dishes on nutrient agar. The seedling roots are then covered with active fungal mycelia of each fungus species growing on a cellophane membrane and the exchanges between seedling and fungus are analysed. Refer to diagram left.

With respect to metabolites Jonathan's research has shown, via the metabolic

profiles of the species of fungi tested, that almost every single fungus releases *almost* the same types of chemical signals in interactions with plants. However there was one metabolite, threitol, that is produced by the pathogenic *Armillaria*, but not present in the profiles of mutualistic fungi such as *Pisolithus* or saprophytic fungi.

To explore its role, threitol was applied to the roots of eucalypt seedlings followed by *Pisolithus*. Despite *Pisolithus* being beneficial, the seedling had induced an immune response to the threitol such that when the *Pisolithus* came along it was killed off, the plant sacrificing its roots to avoid association. In other words, the eucalypt has evolved the ability to 'read' the fungal language of the *Armillaria* and induce an immune response.

With respect to fungal proteins in mutualistic fungi, Jonathan's research has involved sequencing genomes and looking for different genes that could encode proteins to be secreted and taken up by the plant, allowing colonisation. One example protein was shown. When the fungus is growing by itself, it doesn't produce this protein. The minute the fungus senses a potential host plant root nearby, it produces massive amounts. The protein interferes with the hormone receptor of the plant, allowing root colonisation. But when you take away just this one protein the plant hormone system kicks in, detects the fungus, mobilises the immune response, and the fungus is no longer able to associate with, colonise or form symbiosis with the plant.

Pathogenic fungi such as *Armillaria* also have these secreted proteins, but they do something slightly different. Jonathan's research has identified specific proteins that can be produced by these fungi and which plants can identify. In plants such as *E. grandis*, which is a host plant to *Armillaria* and can be killed by it, the plant mounts an immune response. In plants that are not host to the pathogen, the protein does nothing.

Jonathan's work is amazing and important. We thank him very much for so carefully walking us through its scientific complexity. Mez Woodward

CFNC Excursion, 13 July 2024 Castlemaine Street Trees

On a cold, grey, but thankfully not rainy, day a group of 21 members and visitors led by Sue Luke and Rosemary Turner explored a number of streets in Castlemaine, looking at trees that have either been planted or that are growing naturally in the area. The 2.5 kilometre circuit included Campbell St, Kennedy St, Forest St, Goldsmith Cres, Camp Cres, Yandell St and a stretch along Barkers Creek.



Arborist Sue Luke describes the features of the trees.



John Lewis elaborates on the history of some trees of importance. *Photos: L. Citroen.*

We saw 18 different species of Australian trees, many of which are really fine specimens (although we were disappointed to see that the avenue of trees along Kennedy St has been aggressively pruned recently).

Most of the trees we saw were eucalypts and, of these, the majority were Yellow Gums of various sub-species, so this was a good follow-up excursion to Greg Moore's talk in May. We learnt the importance of examining the fruit of the eucalypts in order to identify and differentiate them – so much so that we thought the excursion could have been called "It's all about the nuts"! The various sub-species of Yellow Gum that we saw, including our local sub-species *Eucalyptus leucoxylon subsp pruinosa*, had markedly different bark and flowers, although the nuts all have a distinctive wine-glass shape. Along Kennedy St there are red, pink, coral and cream flowering Yellow Gums.

The eucalypts we saw on the walk were: *Eucalyptus camaldulensis* (River Red Gum); *E. crenulata* (Buxton or Silver Gum); *E. lansdowneana* (Crimson Mallee); *E. leucoxylon* and *E. leucoxylon subsp pruinosa* (Yellow Gum); *E. melliodora* (Yellow Box); *E. microcarpa* (Grey Box); *E. nicholii* (Narrow-leaved Black Peppermint); *E. saligna* (Sydney Blue Gum); *E. scoparia* (Wallangarra White Gum); *E. viminalis* (Manna Gum); and *E. yarraensis* (Yarra Gum).

The two oldest trees we saw are both on the National Trust Significant Tree Register. A River Red Gum located at the eastern end of Yandell St, which is also the junction of Barkers, Forest and Campbells Creeks, is called Howe's Survey Tree. This magnificent tree was marked by the Government Surveyor William Weston Howe in the 1840s (that is, before the gold rush), hence its name. The mark is no longer visible. An equally impressive tree is the Grey Box in Goldsmith Cres that is called, perhaps erroneously, the Prisoner Tree.

John Lewis, who is keenly involved in the history of the area, spoke to us about these two trees and other trees of importance that we saw. John suspects that the tree was not used to tie prisoners up when the nearby gaol was full, but, rather, was used to tether horses. Regardless, the tree has survived for hundreds of years and presumably would have many tales to tell, pre- and post-colonisation. Other trees in Goldsmith Cres are host to nesting Black Ducks (a Yellow Box) and Cockatoos (a River Red Gum), and around the corner in Yandell St we were thrilled to see a pair of Tawny Frogmouths, which we hoped were also on the lookout for a nesting site.



Howe's Survey Tree
E. camaldulensis. Photo: N. Young



Sydney Blue Gum, *Eucalyptus saligna*. Mature tree – left, nuts - right.
 Photos: Left - L. Citroen. Right - N. Young.

Although we saw more eucalypts than other species, we did also see *Acacia dealbata* (Silver Wattle), *Acacia mearnsii* (Black Wattle) and *Melaleuca decussata* (Totem Poles) along Barkers Creek, as well as *Melaleuca linariifolia* (Snow in Summer), *Melaleuca styphelioides* (Prickly Paperbark) and *Geijera parviflora* (Wilga) in Campbell St and *Melia azedarach* (White Cedar) at the northern end of the Goods Shed in Kennedy St.



Melaleuca linariifolia: Mature tree – Middle, Leaves - bottom of hand
Melaleuca styphelioides: Mature tree – Right, Leaves - top of hand
 Photos: Trees – N. Young. Leaves in hand – L. Citroen.

Our return route took us past the Camp Reserve oval where we saw the spectacular avenue of elms (*Ulmus procera*) that was planted in the 1880s and heard from John Lewis and Marli Wallace about the disputed plans for development of the Reserve. In this context we were interested to see the archaeological dig underway at the southern end of the Reserve and the two River Red Gums that have been a particular bone of contention.



Yarra Gum, *Eucalyptus yarraensis*. Mature tree – left, nuts - right. Photos: N. Young

Castlemaine has a wonderful array of native trees in its streets. The CFNC working group that has been reviewing our 2010 brochure 'Native Street Trees and Shrubs of Castlemaine' is intending to produce new brochures, including one detailing the walk we did for this excursion, and another taking in Greenhill Ave, Andrew St and Mostyn St.

Cathrine Harboe-Ree

Observations

Deb Worland is a past member who has been a keen observer, photographer, protector and promoter of swifties in our area for many years. – “I would just like to sincerely thank past, present and members of the Castlemaine Field Naturalists who are no longer with us for fighting to protect the land out at Muckleford in their different ways. This year because of the land being protected we have had 10% of the whole population of our critically endangered swifties at Muckleford since March and they are still here this morning as I write this. I truly feel our group of people, with their diverse knowledge of our flora and fauna need to be thanked, so once again to each and every one I say THANK YOU”.



Swift Parrot, *Lathamus discolor*
Photo: Mick Roderick, Birdlife Australia.

Editor:- A preview of Deb's DVD 'The Swift Parrots of Muckleford' can be viewed at

https://www.swift.net.au/cb_pages/sp_swift_parrot.php



Left: **Jill Williams** was slightly surprised to see magpies commence nest building, July 8th, while she was still standing on crispy frosty ground and the temperature hovering at 0°C.



Right: **Noel Young** took this photo of a pair of Tawny Frogmouths which John Lewis had observed / adopted on his morning walks near Goldsmith Crescent.

Biodiversity Assessment of the Larni Barramal Yaluk using eDNA

Every species has a unique DNA sequence. Because all plants, animals and microbes shed DNA into the environment, sequencing of the DNA (eDNA) can map the distribution and diversity of species (native and introduced) and the health of ecosystems. eDNA methods are becoming a powerful tool in the fight to protect our environment and its diverse species.

Water samples taken from 3 sites of the LBY downstream from Shepherds Flat/Franklinford were analysed for vertebrate species using eDNA. Short stretches along this section of the LBY have been restored from contamination of introduced noxious weeds and runoff from agricultural land but long stretches are still heavily contaminated.

Primarily to assess for Platypus and Rakali the methods applied also reveal the vertebrate biodiversity present. Neither Platypus or Rakali were detected at the surveyed sites at the time of sampling – May 2024. However previous sightings confirm that these 2 species have been observed and identified. Overall, 18 vertebrate taxa were detected including 6 introduced species – 4 fish, 9 bird and 5 mammal taxa. 83% of all taxa were resolved at the species level. The fact that some taxa could not be resolved to species level is likely due to inadequate genetic sequence data available in the reference library for the region.

Group	Species	Common Name
Birds	<i>Anatidae</i>	Family of ducks, geese & swans
	<i>Chenonetta jubata</i>	Australian Wood Duck
	<i>Gallinula tenebrosa</i>	Dusky Moorhen
	<i>Gymnorhina tibicen</i>	Australian Magpie
	<i>Malurus</i>	Genus of Fairy Wrens
	<i>Microcarbo melanoleucos</i>	Little Pied Cormorant
	<i>Pelecaniformes</i>	Order of waterbirds
	<i>Platycercus eximius</i>	Eastern Rosella
	<i>Sericornis frontalis</i>	White-browed Scrubwren
Fishes & Eels	<i>Perca fluviatilis</i>	Redfin
	<i>Philypnodon grandiceps</i>	Flatheaded Gudgeon
	<i>Salmo trutta</i>	Brown Trout
	<i>Tinca tinca</i>	Tench
Mammals	<i>Bos taurus</i>	Cattle
	<i>Macropus giganteus</i>	Eastern Grey Kangaroo
	<i>Oryctolagus cuniculus</i>	European Rabbit
	<i>Rattus rattus</i>	Black Rat
	<i>Trichosurus vulpecula</i>	Common Brush-tailed Possum

Common names in red are introduced species.

A positive detection is a good indication that the DNA from the species of interest may be present at the sampling location. This doesn't necessarily mean that there is an established population, because the eDNA test doesn't distinguish between live and dead sources, or stationary versus mobile ones. A negative result may not mean that a species is not present; detection failures can happen as a result of insufficient sampling, environmental inhibitors or too little DNA being present.



Above – The filtered water samples packaged ready to post to EnviroDNA.
 Left – The Larni Barramal Yaluk, water sample site 3 at Franklindorf.

It can be argued that both positive and negative findings require that natural waterways must be protected to maintain and improve water quality for native flora and fauna species. This initial eDNA testing at these sites of the LBY lays a foundation for future testing.

Jill Williams

Conservationists unite to save charming spider orchid as habitat loss threatens survival

Lou Citroen submitted reference to this article published on the ABC Ballarat news site. It describes how Garry French and other Australasian Native Orchid Society members work with the Nillumbik Shire and the Victorian Environment Department on a project to conserve the Charming / Dainty Spider-orchid, *Caladenia amoena*.

Orchids, as a family, are not especially uncommon. They represent the second-largest family of flowering plants on the planet, behind the daisy family. All have evolved to be dependent on mycorrhizal fungi for their nutrients.

Editor's note – refer to the lead article at the top of this newsletter issue.

This highly evolved nature and symbiotic relationship with fungi and other organisms, such as insects, made many orchids vulnerable to habitat change, Mr French said. The Charming Spider Orchid's range is limited to small clusters in central Victoria.

Caladenia species are deciduous terrestrial orchids that die back annually to small, spherical subterranean tubers that are protected by a tough, fibrous tunic. They have a single green basal leaf, which is generally long, narrow and conspicuously hairy. Plants flower for only a very limited time each year.

Many spider-orchids have specific pollinators that are attracted to the flowers under the false pretence of copulating with what they believe to be a female of the species. Once pollination has occurred, the flower closes and a capsule is formed containing the microscopic seed.

The Charming Spider-orchid and other *Caladenia* taxa are listed as threatened for varied reasons. Most of the taxa have small distributions, restricted habitats and a large proportion of their total



Caladenia amoena, Charming Spider Orchid.
Photo: Garry French

population occurs at one or a few locations. The single biggest issue for the decline of most of the taxa is habitat destruction whether that be from weed invasion, grazing (kangaroos, slugs and snails), inappropriate fire regimes, illegal collection etc.

Caladenia amoena is not listed on the CFNC 'Rare, Threatened and Endangered Plants of the Castlemaine District' list, but five other species are listed:-
C. clavescens, *C. clavigera*, *C. filamentosa*, *C. ornata*, *C. stricta*.

From the Committee

Changes to excursion meeting places

Please note that for our excursion on **10 August** we are meeting in Heathcote at 1.00pm, **not** in Castlemaine. Our **September** excursion is to The Grampians, and Geoff Harris will provide advice to participants about all the arrangements relating to that. Then **from October on our new meeting place for excursions will be in the car park in Kennedy St immediately to the north of the Goods Shed**. We have decided to make this change because the traffic in Forest St is now very busy.

July 2024 - The CFNC sent a letter to 'Forest Fire and Operations Division, Bushfire and Forest Services, Department of Energy, Environment and Climate Action. The CFNC was invited to comment on elements of the Draft Loddon Mallee Joint Fuel Management Program (JFMP) plan. In response the CFNC highlighted issues where the program may impact on locally rare, fragmented populations of native plant species and the possible spread of diseases such as Phytophthora. The CFNC believes that planned burns in areas renowned for the wildflowers of the Box-Ironbark forests should be carried out in Autumn, not Spring.

COMING EVENTS

Wednesday Wildflower Wanders

Join us on some leisurely strolls through different areas of our local bushland to enjoy the springtime flowers.

Dates: Wednesdays 4th, 11th, 18th, 25th September.

Meet: New meeting point for excursions - Car park north of the Railways Goods Shed, Kennedy Street.

Time: Departing 4pm sharp

Return time: The aim is to return by 5.30pm

What to bring: Clean sturdy shoes, water, hat, sunscreen.

Travel: Most sites will have a short drive to get there.

Great Southern Bioblitz 2024

The 'Great Southern BioBlitz', is an international period of intense biological surveying in an attempt to record all the living species within several designated areas across the Southern Hemisphere in Spring. The Great Southern BioBlitz for 2024 will run from September 20th - 23rd. Participants in the event will then have a further 14 days to upload and identify all of their observations made during this period to the iNaturalist platform.

CFNC and Mez Woodward will be preparing information sessions and possible workshops. More details will be announced closer to the event.

COMING EVENTS

Monthly Meeting: Friday 9th August, 7.30pm by Zoom Speaker: Reece Pianta (Invasive Species Council)

“Fire ants - threats and eradication”

Fire ants could potentially inflict a multi-billion dollar hit to Australia's economy. They are three times more venomous than other stinging insects. They threaten iconic Australian wildlife populations like koalas, platypus and echidnas. Overseas, fire ants are causing agricultural land to become unviable.

As expert stowaways they have crossed oceans and continents in cargo. These invaders threaten to spread across the entire country if we don't stop them in their tracks.

At our August Monthly Meeting, Invasive Species Council advocacy manager Reece Pianta will describe the current fire ant threat and his experience with eradication of a previous outbreak.

How to join the Zoom meeting – you need to register in advance to receive the link for joining the Zoom session. To register, please click on the following link or copy this url into your browser:

https://us06web.zoom.us/meeting/register/tZMpdeqhgTstGdBV-N2es212ZFUi_Fl0d8zu

Observations: Members and visitors are invited to share their interesting observations at the meeting. Please email any photos to illustrate your report as JPEG file(s) to **Jill Williams** (jillwill33@gmail.com) by noon on the day of the meeting.

Excursion - Saturday 10th August, 1.00pm, “Restoring leaky landscapes”, Spring Plains, Heathcote (Biolinks Alliance project) Leader – Cameron O'Mara (Biolinks Alliance ecologist)

As we heard from Executive Director Dr Sophie Bickford at our November Monthly Meeting last year, the Central Victorian Biolinks Alliance aims to work with partner organisations to restore and reconnect large landscapes across Central Victoria. For our August Excursion, we now have the opportunity to visit a Biolinks Alliance project site in the Spring Plains Nature Conservation Reserve near Heathcote.

Here, innovative ecological interventions are being trialled to restore hydrological function to a landscape in the Box-Ironbark Forest extensively degraded by gold mining, agriculture and forestry. Ecologist Cam O'Mara will lead us on a walk around the site demonstrating the different approaches being trialled - contour ripping, ponding along the valley bottom and ecological thinning. He will also describe the monitoring program underway to measure the project impacts on both wildlife and hydrology in comparison with a matched control site nearby. The walk will be about 2km max. and easy walking along tracks. We will contribute a bird and flowering plant list to Cam at the end of the walk.

Meet: 1.00pm opposite the Information Centre and toilet block, Barrack St, Heathcote, just around the corner from the main road (Northern Highway/High St). See Google Maps [link](#). We will then travel in convoy to the Project site, about 15 mins away. There are many local cafes where lunch could be had beforehand or have a picnic lunch in the park next to the Information Centre.

Bring: Water, snacks, **clean** sturdy shoes, chairs and afternoon tea.

Castlemaine Field Naturalists Club PROGRAM

Monthly meetings – August will be the last of our three winter meetings held via Zoom commencing at 7.30pm. Please register in advance (see “Coming Events” page) to receive the link for joining the meeting.

Members and visitors are invited to share their interesting observations at these meetings. Please email any photos to illustrate your report as JPEG file(s) to **Jill Williams** (jilliwill33@gmail.com) by noon on the day of the meeting.

See “Coming Events” page for more details about August events.

Fri Aug 9th, Meeting 7.30pm (by Zoom). Guest speaker: Reece Pianta (Invasive Species Council) “Fire ants – threats and eradication”.

Sat Aug 10th, Excursion 1.00pm Heathcote “Restoring leaky landscapes”, Biolinks Alliance Spring Plains project.

Fri Sept 13th-Sun Sept 15th, Grampians weekend – contact Geoff Harris geoffreyharris@fastmail.fm or 0418 392183.

Wednesdays during Sept 4pm, Wednesday Wildflower Wanders
New meeting point for excursions: Car park north of the Railway Goods Shed, Kennedy St.

Castlemaine Naturalist - email newsletter material to: newsletter.cfnc@gmail.com

* Deadline for the September edition: **August 30th**

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Ordinary membership: Single \$35, Family \$50

Pensioner or student: Single \$25, Family \$30

Subscription includes the monthly newsletter, Castlemaine Naturalist.

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