

THE QUEENSLAND MYCOLOGIST



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The Queensland Mycological Society

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Society Objectives

The objectives of the Queensland Mycological Society are to:

1. Provide a forum and a network for amateur and professional mycologists to share their common interest in macro-fungi
2. Stimulate and support the study and research of Queensland macro-fungi through the collection, storage, analysis and dissemination of information about fungi through workshops and fungal forays
3. Promote, at both the state and federal levels, the identification of Queensland's macrofungal biodiversity through documentation and publication of its macro-fungi
4. Promote an understanding and appreciation of the roles macro-fungal biodiversity plays in the health of Queensland ecosystems
5. Promote the conservation of indigenous macro-fungi and their relevant ecosystems.

Membership

Membership of QMS is \$25 per annum, due at the beginning of each calendar year, and is open to anyone with an interest in Queensland fungi. Membership is **not** restricted to people living in Queensland. Membership forms are available on the website, <http://qldfungi.org.au/>.

Please notify the membership secretary (memsec@qldfungi.org.au) of changes to contact details, especially your email address.

The Queensland Mycologist

The Queensland Mycologist is issued quarterly, **but issues may be combined if there is insufficient material for four**. Members are invited to submit short articles or photos to the editor for publication. It is important to note that it is a newsletter and not a peer-reviewed journal. However we do aspire to high standards of accuracy and there is an extensive review process.

Material can be in any word processor format, **but not PDF**. The deadline for contributions for the next issue is **15 February 2022**, but if you have something ready, please send it **NOW!** Late submissions may be held over to the next edition, depending on space, the amount of editing required, and how much time the editor has, or the newsletter may come out late.

Photos should be **submitted separately at full-size** to allow flexibility in resizing and cropping to fit the space available while minimising loss of quality. Authors who have specific preferences regarding placement of photos should indicate in the text where they want them, bearing in mind that space and formatting limitations may mean that it is not always possible to comply. Material from published sources (including internet sites such as Wikipedia) may be included **if that complies with copyright laws and the author and source are properly acknowledged**. However extensive verbatim copying is not acceptable.

Cover Illustration

This fungus was found during the Cooloola BioBlitz earlier in 2021. It is thought to be a species of *Panus*, but does not match anything found in the literature, so has been tagged as *Panus* sp. "Cooloola".

Photo © Sandra Tuszynska.

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QMS activities

Meetings

Meetings are held on the second TUESDAY of the month at the National Heavy Vehicle Regulator, Level 3/76 Skyring Terrace, Newstead QLD 4006, from 6:30 – 8:30 pm. If you are parking underground at Gasworks Plaza, please remember that parking is free for two hours, entrance to the venue is on the ground floor of the Plaza, directly opposite Woolworths.

For those unable to attend, meetings can also be attended virtually on Zoom. Details will be provided via email.

Meetings are held monthly from February (no January meeting), unless otherwise scheduled. **Check the website for details and any changes.** There are typically 3-4 guest speakers invited during the year, with the other meetings informal. Suggestions from members for topics or names of potential speakers will be welcome at any time. Please contact a member of the Committee.

We like to publish notes from presentations in the *Queensland Mycologist*. However, the notes never do justice to the topic as they do not reflect the enthusiasm of the speaker or cover the discussion that follows, and not all talks are written up for the newsletter. If you do present at a meeting, a summary of that presentation that can be turned into a newsletter article will be greatly appreciated. But it is better to attend the meetings, get the information first hand, and participate in these invaluable information sharing opportunities.

Forays

QMS holds regular forays during the first half of the year. The dates are nominally the 4th Saturday of the month, but actual dates may vary and additional forays may also be held. Field trip details may change as a result of drought or other unforeseen circumstances. Check the website for changes.

Members are invited to suggest venues for additional forays. If you have any suggestions, (and especially if you are willing to lead a foray), please contact Wayne Boatwright or another member of the Committee.

Workshops

What do you, our members, want to learn more about that could be presented in a workshop? QMS is always on the lookout for workshop ideas. Members are encouraged to suggest topics, whether new or reruns of past workshops. Send your ideas to Wayne Boatwright (info@qldfungi.org.au).

Details of workshops will be included in newsletters and on the QMS website as they become available.

The Australasian Mycological Society

A reminder that the Australasian Mycological Society is well worth joining.

Their home page is at:

<https://www.australasianmycologicalsociety.com/>

They also have virtual seminars, though the 2021 series has finished. For more information visit the website.

QMS Program 2022

MONTH	MEETINGS	FORAYS/WORKSHOPS
Check the website for updates on QMS meetings and forays, and on the impacts of COVID-19 on QMS activities., and look out for emails from Wayne Boatwright.		
February	8 th : Dr. Adam Frew: Plant Defence Responses and the Fungal Network	12 th : Foray - Ben Bennett 26 th : Foray - Linda Garrett
March	8 th : Landscape Architects: Mycoremediation - Floating Fungi Infrastructure - "Mooshi"	25 th to 27 th : Residential foray, Tamborine Mountain
April	12 th : Myco-cycling	9 th : Foray - Chermshire Hills 23 rd : Foray - Annie Hehir
May	10 th : QMS AGM	7 th : Foray - Cooloolah NP 21 st : Foray - Maroochy Bushland
June	14 th : TBA	4 th : Foray – Triunia Environmental Reserve, Dulong 18 th : Foray - Bellthorpe
July	12 th : TBA	2 nd : Foray - Maroochy River National Park (Daisy's Place, Glenview)
August	9 th : TBA	
September	13 th : TBA	
October	11 th : TBA	
November	8 th : TBA	
December	13 th : TBA	

Editor's Comments

I seem to be always apologising for late newsletters. This time it largely is down to me because I have had enough material for a while, just not enough time to get it all edited and set out. However, there was some contentious material that required a lot of attention and regrettably after many hours of work I was unable to deal adequately with issues raised by several reviewers, even after adding so much commentary that it all but buried the article. Then Christmas was upon us and key reviewers were away. But here it is at last!

The Cooloola BioBlitz was held in May and turned up some interesting fungi, and is the subject of a report by Pat Leonard and Sandra Tuszynska. A caveat there is that it is not clear if specimens were dried, labelled and submitted to the Herbarium. Without specimens, the Bioblitz records cannot be reconciled with future developments in systematics of those species, and nor can the identifications be

confirmed and records corrected if need be. That applies to QMS forays as well.

Vanessa Ryan attended the Australasian Systematic Botany Society Conference 2021 online, and has written a comprehensive report that is well worth reading. I draw your attention to Matt Barrett's work greatly expanding the number of genera and species of polypores, so that much earlier literature may well have been rendered obsolete. The lesson here is that reliable identification from photographs and even keys is all but impossible for many species, and not just polypores. Field identifications are always interim at best.

Finally, Theresa Bint has produced a short note on preparation of Reishi tinctures from *Ganoderma* species, with some great photos.

Happy New Year!

David Holdom

Some links

Sheryl Backhouse sent this link to an article on *Omphalotus nidiformis* in the permaculture organisation Milkwood's newsletter. Great photos!

<https://www.milkwood.net/2015/02/16/glow-dark-mushrooms-omphalotus-nidiformis/>

The Fungi Foundation

<https://www.theguardian.com/commentisfree/2021/nov/11/fungi-earth-secret-miracle-weapon>

<https://ffungi.org/>

Environment-driven control of fungi in subterranean ecosystems: the case of La Garma Cave (northern Spain)

<https://link.springer.com/article/10.1007/s10123-021-00193-x>

Cooloola BioBlitz

Patrick Leonard and Sandra Tuszynska

The Cooloola BioBlitz was held at Rainbow Beach over the weekend of 14 – 16 May 2021. It was a well attended event with natural historians from a whole range of disciplines including botany, mycology, entomology, herpetology, ornithology and bryology. Sixteen specialists led groups of participants to sites in the Cooloola area on Saturday and Sunday. The aim of a BioBlitz is to try to record as complete as possible snapshot of all the wildlife in the study area. In 2021, participants were encouraged to use the iNaturalist app to make their records. Introductory sessions on how to use this mobile phone based system were delivered on the Friday afternoon.

The fungi group led by Patrick Leonard and Sandra Tuszynska visited two main sites:

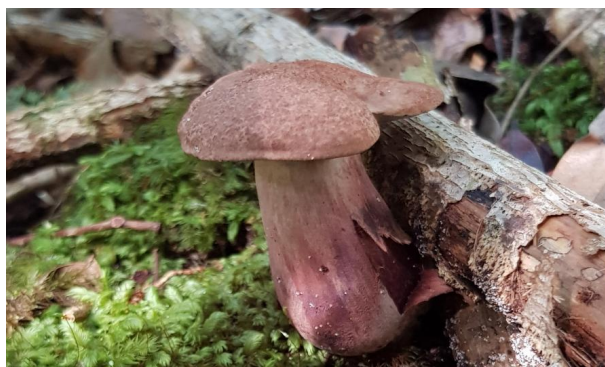
1. The Bymien Forest: from the picnic site going along the track towards Lake Poona
2. Pettigrews Road: from the Rainbow Beach Road to the ancient blackbutt

A number of other sites were briefly visited along the way and *Chlorophyllum molybdites* was recorded growing beside the back door of the Rainbow Beach Community Hall where the event was held. The use of iNaturalist also allowed others to contribute records and the Bryologists, Entomologists and Herpetologists all contributed.

Prior to the BioBlitz, a check of WildNet revealed that 161 species in the Agaricomycetes had been recorded with a further 76 recorded to genus only, for the whole of the Great Sandy National Park. A remarkably low total for what must be one of the best studied sites in Queensland. The 2021 BioBlitz recorded 93 Agaricomycetes, 44 records of 35 species and a further 30 to genus, over the two days.

Some fungi seemed to be at almost every site visited. *Trametes coccinea*, *Omphalotus nidiformis*, *Chlorophyllum molybdites* and *Trametes modesta* were all found at two or more sites. The Bymien Forest is a rainforest site, very similar to some of the forest on K'Gari/Fraser Island. Amongst the interesting finds here was one identified as *Gyroporus australiensis*, a recently described brown *Gyroporus* with flesh that stains blue on exposure to air.

A large fungus with a strigose cap (radially arranged stiff adpressed hairs) and pink spores was thought to be a *Clitopilus* when we found it on account of its



Gyroporus australiensis © Linda Tabe

being robust and possibly growing on wood. Examination under the microscope revealed pentagonal spores, placing it clearly in the genus *Entoloma*. A search through the Noordeloos and Gates keys to the Entolomataceae of Tasmania and Grgurinovic's key to the Entolomas of South Australia did not produce a match.



Entoloma aff scabiosum © Sandra Tuszynska

We made an interesting collection of *Ganoderma chalceum* on a fallen tree trunk where one fruiting body that had originally grown on the upright tree was now at a 90° angle to the ground and a further fruiting body that had grown since the tree had fallen was horizontal to the ground – a perfect example of geotropism. *Ganoderma* certainly seems to know which side is up.



Ganoderma chalceum © Patrick Leonard



The fungi group at lunch in Bymien Forest.

On returning to the Community Hall to examine our finds we were shown a picture of a very small mycenoid fungus growing on a rotting log. It was clearly different from anything recorded. We asked Amber Forbes, who had taken the photograph, whether we could see the specimen, but it emerged that it had been left in the field. It was getting on towards 4 pm by this time but Amber bravely said she would go back and find it. Some of us who had experienced the frustration of ‘going back to find it’ were very sceptical about this suggestion. Just over an hour later a triumphant Amber reappeared with the specimen, which had a cap less than a millimetre in diameter and was barely 3 mm tall. How she found it revealed one of the great values of iNaturalist; for the coordinates recorded for each photo run to several decimal places and will allow you to recover a specimen. “Icing sugar” on the cap and its minute size suggested the genus *Hemimycena*, but microscopic examination matched the collection to Grgurinovic’s *Mycena piringa*.



Mycena piringa © Amber Forbes

The caulocystidia (hairs on the stipe) are quite long and have minute excrescences as do the broom cells that form the cheilocystidia along the gill edge. This is only the second record of this fungus in Queensland. There are quite a few records with photographs on the ALA from Victoria and Tasmania. They are all of small white fungi but some have a basal disc on the stipe and some do not and others lack the “icing sugar” effect on the cap, so one must



Mycena piringa caulocystidia (left) and cheilocystidia (right) © Patrick Leonard

suspect that they have not been examined microscopically to determine whether they really are members of *Mycena* section *saccariferae*.

Pettigrews Road goes through a forest with varying ecosystems and is probably closer to wet sclerophyll than rainforest. We were surprised to find the same *Entoloma* aff. *scabiosum* again. Five *Russula* species were seen at this site. *Russula iterika* and *Russula viridis* are published species and have been recorded in the Great Sandy National Park before.

A large fungus that is secotoid when young, *Russula* sp. 10 is an unpublished species recorded once previously in the Great Sandy National Park.



Russula sp. 10 © Patrick Leonard

Nearby, we found a fungus growing on roots or buried wood. It had very tough rubbery flesh, and applanate to slightly depressed apricot brown cap with strongly decurrent pale orange gills. We thought it might be an odd form of *Omphalotus nidiformis*. Under the microscope there were two or three different kinds of hyphae as you would expect to find in a polypore. The few spores that were seen were oblong rather than ellipsoid, suggesting this might be a *Panus*. A search through Pegler’s world monograph on *Lentinus*, which includes *Panus*, did not reveal an exact match. We have tag named it *Panus* sp. ‘Cooloola’.



Panus sp. 'Cooloola' © Patrick Leonard

A truffle was collected near the Carlo Sandblow by a University of Queensland Entomologist, Jessa Thurman. It was very brightly coloured in shades of orange, with vacuoles in the interior, and it had spores that were fusoid, like those of a bolete. It was identified a few days after the foray by Susie Webster as *Soliococcus polychromus*, a species described by J. Trappe. There have been nine previous collections made in Queensland, the Northern Territory and Papua New Guinea.



Soliococcus polychromus © Jessa Thurman

Another interesting discovery was made by Majenta Lehr-Reid, who has always dreamed of seeing an entomopathogenic or "zombie fungus" in action. She was engaged in a botanical survey at Seary's Creek and noticed some white fluffy objects on some Tassel Cord Rush plants, *Baloskion tetraphyllum*. Upon closer inspection, she realised that these were in fact zombie ants. Majenta brought some back and we viewed them under magnification with a dissecting microscope attached to a big screen. The ants were identified as belonging to the genus *Polyrhachis*. Several fungal pathogens of ants have been reported as members of the family Ophiocordycipitaceae in the order Hypocreales. A couple of us went to find and collect some more zombie ants as a finale to the BioBlitz. Many entomopathogens are difficult to culture, but it would be interesting to grow it up for molecular analysis.



Zombie ant © Majenta Lehr-Reid

One other highlight of the BioBlitz was the discovery of the giant dragon springtail *Acanthanura*, when examining fungi on very decomposed wood. These ancient invertebrates, known as Collembola, are mostly very tiny – some only fractions of a millimeter long and very understudied, much like fungi. They are mycophagous, meaning that they eat fungi. As a result, the nutrient content of fungal hyphae are released into the environment and made available to plants.



Acanthanura sp., a giant collembolan

This is extremely important in forest and other soils' nutrient cycling. There are perhaps forty different species of giant springtails in subtropical rainforests across Australia, but very few have been described so far.

The above two examples of fungus-insect interaction illustrate one of the important features of a BioBlitz; it encourages the interchange of biological information between different disciplines.

Conclusion

The BioBlitz demonstrated that there is a real interest in fungi in Queensland's wider community. There is nothing more powerful than a collaborative effort of citizen scientists to shine the spotlight on and help brighten up the future of mycology.

More images from the Cooloola BioBlitz



Fungi foray fun in the field. © Sandra Tuszynska



Checking the pore structure of a polypore decomposing a log. © Sandra Tuszynska



Taking good images can be tricky. © Sandra Tuszynska



Fungi ID session. © Sandra Tuszynska



Amber measures a tiny *Mycena*. © Sandra Tuszynska



Patrick, Tina and Gillian working to identify a *Marasmius*. © Sandra Tuszynska



Australasian Systematic Botany Society Conference 2021

12-16 July 2021

Vanessa Ryan

What is the ASBS?

The Australasian Systematic Botany Society Incorporated (ASBS) is, not surprisingly, an association of people who are interested in the systematics of Australasian plants, fungi and lichens. The Society began in 1973 and it currently has around 300 members. Most are professionals and post graduate students but a few, like myself, are keen amateurs.

Wikipedia describes (biological) systematics as: "... the study of the diversification of living forms, both past and present, and the relationships among living things through time."¹

Systematics includes taxonomy – which is the science of discovering, describing and naming of species - and phylogenetics – which is the science of discovering the evolutionary history of and relationships between species.

The annual conference

Each year, the ASBS holds a conference which is usually located somewhere in Australia or New Zealand, although one year (1992) it was held in Hawaii. Last year the conference was scheduled to be held in Cairns, but it had to be postponed due to Covid-19.

This year the conference was held entirely online, which was a first for the Society. More than 200 delegates attended, the virtual platform allowing easy access for people from such far flung places as China and the United Kingdom, as well as closer to home locations such as New Zealand and Papua New Guinea.

Two bioinformatics workshops were held the week before the conference began and a pre-conference mixer was held the Sunday evening of the weekend between. The mixer was a great way for attendees

to familiarise themselves with the virtual networking space and to catch up with old friends before the start of business.

Each year, the conference has a theme and this year it was "Biodiverse Futures - Systematics in a Changing World". The conference included presentations about genomics, creating digital collections, using artificial intelligence and machine learning, and how these and other new technologies are helping scientists face the huge challenges of climate change, habitat degradation and invasive species which result in the loss of biodiversity.

A lot of the talks discussed the use of DNA analysis, but some other technical advances were also touched upon – such as the development of optical character recognition software to assist in species identification. It is still very early days for that particular project, but the results are promising.

Citizen scientists were also mentioned – in particular the online volunteers who assist in databasing herbaria specimens via the Australian Museum and Atlas of Living Australia's online crowd-sourcing platform, DigiVol. It was clear that the assistance of these volunteers is hugely appreciated by the professionals.

About the virtual environment

The ASBS organisers chose to use the Babl Global virtual platform on which to host the conference. I found their environment extremely easy to use. The user's screen was designed to look like a conference centre, with different "floors" divided into smaller "chat" rooms where private conversations could be held. By simply clicking on an empty "chair" you could move from room to room to join in the conversations that were heard only within that room.

If you didn't feel like communicating (or you had to leave your computer for a short time), all you had to do was to turn off your camera and microphone, using the provided icons.

Alongside the main area were places for advertising (conference sponsors) and poster displays and at one end of the main floor was a staging area where the presenters gathered and waited before giving their talks.

For the presentations, attendees were brought into a Zoom-like environment, where the speaker shared their screen.

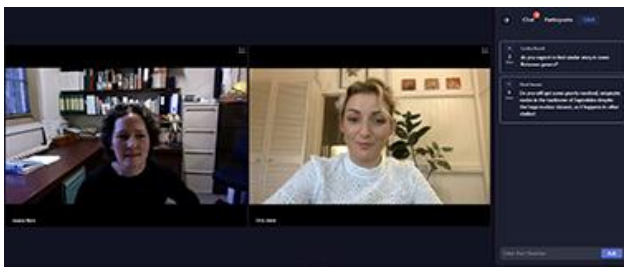
There was a chat area down the side where people could type in their questions, or they could raise a

1 <https://en.wikipedia.org/wiki/Systematics>



The Babl online conference area.

virtual “hand” and be invited to speak. At the end of the talk, the chairperson for that session read the questions out for the presenter to address. A lot of light-hearted teasing and in-joking was also a feature of the chat. It was obvious that the banter was all between good friends and colleagues and it often made me smile.



The full conference program was available on the ASBS website and attendees could log in there and make a personal schedule.

The timetable for each day’s activities, and links to them, were emailed out the day before. All attendees had to do was click on the appropriate link in the message and they’d be taken into that session of the conference. A session was the series of talks scheduled for a morning or afternoon and they were numbered sequentially throughout the week.

The conference area could take up to ten different floors. We had three floors available, but we mostly only used two of them. I could see that there were also other options – such as two person chat areas (near the trees “outside”), but I didn’t see anyone

using them.

The down side of the virtual experience was that a number of people (including myself) had connection issues. The scheduling of talks had to occasionally be rearranged on the fly because of presenters’ internet dropping out or not being able to connect at all. The organisers did a very good job on those occasions by quickly swapping to the next speaker who was waiting in the virtual wings.

Attendees had been advised beforehand to use Google Chrome and Mac users were also given special instructions, which was a help, but the foibles of personal internet connections were inescapable.

One of the more memorable (and humorous) examples of this was that the treasurer of the Society had to give his annual report from the back seat of his ute. He had to park the car halfway down the long driveway of his rural property to be able to get a stable internet connection.

Fungi and lichen talks

The main bulk of the conference was taken up with botanical subjects, but as an amateur mycologist I was particularly interested in the presentations about fungi and lichens. The botanists sometimes mentioned fungi and lichens in passing, but there were five talks that were focused on them.

Day 1 Session 1

Nigel Fechner, Senior Mycologist, Queensland Herbarium: "Biodiscovery: What do we really know?"



Nigel spoke about how relatively few accurately identified specimens of fungi are held in herbaria/fungaria and about how very little we actually know about our Australian fungi.

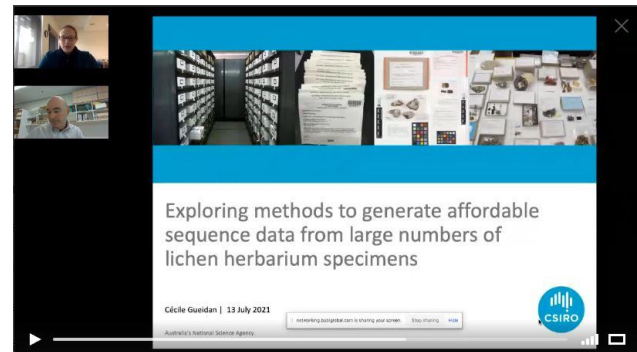
He gave the example of how he had recently gone on a few expeditions to some mountains located within 100 kilometres of Brisbane. These mountain refuges are separated by agricultural lands and don't particularly cover a very large area. Despite their proximity to a large city, there were no, or very few, pre-existing collections from them. It has been assumed that these places have been well collected. They are not. (Surprisingly, the same goes for the plant species from those mountains.) He pointed out that the area immediately around Brisbane is relatively well collected, but the locations of collections quickly become a lot sparser further out.

Nigel stressed that we need good quality specimens with good quality data accompanying them. These are needed as they provide the foundations for most mycological research – needed for scientific rigour and for good information for developing management systems and rehabilitation. And we need good quality specimens – not just photos. The actual fungal material is necessary for DNA analyses and for other emerging technologies.

At this time, Nigel believes that Australian mycologists and mycophiles, whilst focusing on priority groups, still need to be collecting as many other fungi groups as time and resources permit. They need to get whatever they can while keeping the end user in mind. We don't know what data might be important until someone starts working on a group. For example, things like staining is often overlooked and not noted down, but it is very important to the taxonomy of some particular groups.

Day 2 Session 4

Cecile Gueidan, Research Scientist, CSIRO National Research Collections Australia: "Exploring methods to generate affordable sequence data from large numbers of lichen herbarium specimens"



Identifying lichens from their morphology can be very challenging. There can be a lack of diagnostic characters, critical diagnostic characters can be hard to observe, and many lichen species look very similar to each other while a single species might be extremely variable in its morphology.

Historically, chemical spot tests have been a very useful tool for lichenologists to use, but these days molecular data is becoming more common in research and collection management. The problem is, gathering that molecular data is expensive and technically challenging.

Cecile has recently tested two different methods of generating molecular data from large numbers of specimens with the aim of finding out which would garner the most data, while at the same time being the most cost effective.

The two methods she chose were Amplicon Sequencing – which focuses on the universal fungal barcode (ITS², long read) and Genome Skimming – which looks at the entire genome.

Both methods turned out to have the same challenges. One such challenge is that many lichens are often quite small, so there is limited material to work with. Someone has to do the job of carefully picking out the lichen from its substrate with a razor blade and that takes time and effort. Another is that lichens are composite organisms so there is the danger of getting the genomic DNA from not only the primary fungus, but also the other minor fungi within the lichen's thallus (yeasts, pathogens).

- 2 "The ITS region is the most widely sequenced DNA region in molecular ecology of fungi and has been recommended as the universal fungal barcode sequence." Quoted from Wikipedia, https://en.wikipedia.org/wiki/Internal_transcribed_spacer

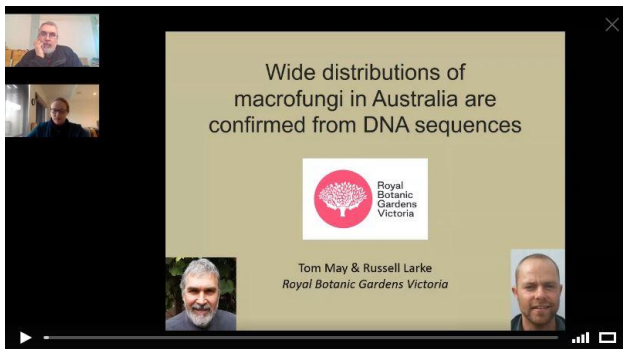
Her results were:

- Amplicon - high quality data, low quantity of data, about \$27 per sample – by multiplexing the sample even more she could significantly lower the cost. (As an aside, it turned out that the ages of the specimens didn't have much of an impact on their result.)
- Genome Skimming – not as good quality data, but a high quantity, at a cost \$70-\$80 per sample.

So, there is a trade-off between getting more samples tested (high throughput) and cost reduction.

Day 2 Session 5

Tom May, Principal Research Scientist (Mycology), Royal Botanic Gardens Victoria: "Wide distributions of macrofungi in Australia are confirmed from DNA sequences"



Knowing the distribution of an organism is fundamentally important for understanding biodiversity, biogeography, ecological niches and conservation. The last couple of decades have had a large increase in distribution data for Australian macrofungi.

The ALA makes this information easy to get to. Its data comes from Fungimap and various fungaria upon the digitisation of their collections. The ALA database currently contains information for the specimens of 6,600 Australian species, as well as over half a million observations.

Some individual species have more than 2,000 observations and specimen records collectively within the database. Maps of those species are starting to look like those for a well known plant or bird species.

Tom's question was – given that a lot of the data comes from observations, are these real representations of the species' distribution? And, given that there are large gaps between some of the

populations – eg between southern Australia and northern, or eastern and western regions, are these truly all the same species?

Tom and Russell Larke, also from Royal Botanic Gardens Victoria, synthesised available DNA sequence data to see whether or not fungi with wide distributions are indeed the same species.

They used an international tool called UNITE – which is coordinated globally. It uses the ITS sequence and regularly updates and cleans the data. Many of the fungi in UNITE aren't formally named yet but it is still clear that they are unique species. Tom and Russell found that it worked well.

One of the fungi they looked at was *Hebeloma aminophilum*. It turned out that the eastern and western populations were the same species on the DNA data, but sequences were not available for records from coastal New South Wales and Queensland. Further sequences, particularly from outlier records in north Queensland, would be useful to confirm the complete spread of distribution.

Another was the truffle-like fungus *Stephanospora sheoak*, which is found both in far northern Qld and in Tasmania. It also turned out to be all the same species.

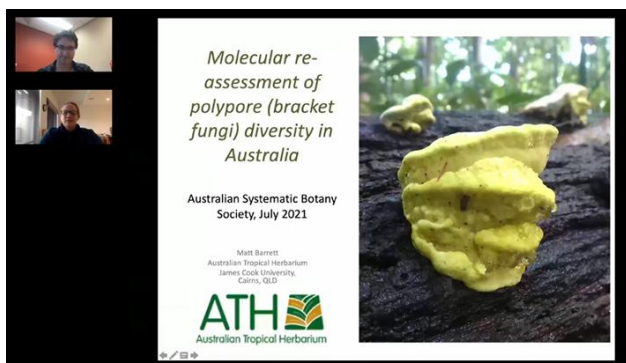
Their conclusion: the apparent wide distribution of Australian macrofungi was confirmed by DNA sequence data, however there were many outliers that still needed checking.

Tom pointed out that:

- when choosing specimens to sample in taxonomy, it would be ideal to choose them from across the known distribution and especially to include apparent geographical outliers.
- High quality metadata is really useful – particularly the latitude and longitude of where the specimen was collected. If the sequence didn't have that information (lacking in many cases for GenBank sequences), it took a long time to work it out.
- UNITE was useful for data exploration.
- There is a need for seamless aggregation of different databases through the one portal, as some information had to be pieced together manually (such as chasing up a specimen in a specimen database to determine the location, as only the specimen accession number was mentioned in GenBank).

Day 2 Session 5

Matt Barrett, Postdoctoral Research Fellow, Australian Tropical Herbarium: "Molecular re-assessment of polypore (bracket fungi) diversity in Australia"



Matt began his presentation by pointing out that fungal taxonomy lags a long way behind that of vascular plants. This prevents a lot of conservation and ecological work. His particular interest is polypores and worldwide there are thought to be more than 200 genera and 2,000-5,000 species of them. Their taxonomy is currently in a great state of flux and it is very important that Australian taxa are included in global studies because we have some quite divergent lineages that will affect the global classifications.

Matt is working on the molecular re-assessment of Australian polypores. He has sequenced 1,135 Australian samples, including major collections from the Kimberley, the Top End, and the Wet Tropics. Revisions are ongoing because it is such a huge group.

He spoke about his findings on *Laccocephalum*. This was thought to have just five species in a single genus in Australia, but it turns out that there are at least eight species in five genera, from at least three families. So our polypore biodiversity is much greater than we originally thought.

He also spoke about *Coltricia* and *Phylloporia*. *Coltricia* was initially thought to have only one or two species in Australia, but Matt has found there are fifteen. They are all morphologically very similar. *Coltricia*'s closest relatives are all saprophytic, but it is generally thought that *Coltricia* is ectomycorrhizal even though only a few species have actually been proven to be so. Australia has several basal lineages of *Coltricia*, so it will be interesting to find out where and when the ectomycorrhizal habit arose. Research has shown that there have been repeated intercontinental dispersals of *Coltricia*

species back and forth between Australia and southeast Asia.

A few years ago it was thought that there were only five to ten species of *Phylloporia* globally, but with the advent of molecular technology it has been shown that there are more than fifty, over thirteen of which are in Australia and most are undescribed.

Matt pointed out that having good data with a specimen to back it can be of paramount importance. It is essential to note with collections whether the fungus was found on living or dead wood as it might mean the difference between the fungus being a pathogen or a saprophyte. Unfortunately, this detail is often not recorded by collectors.

Matt stated that we still have a lot to learn about our polypores and what we do know is often very outdated. His preliminary estimate is that there are 684 Australian species, based on the data that have been uploaded to the ALA.

However, Matt has determined that many of the names in the records are incorrect and, frustratingly, there are many records from the 1800s with no specimens to validate them. In 1965, Cunningham estimated there to be 201 species and the taxonomy has been partially updated by Peter Buchanan from New Zealand. Much more work needs to be done as a lot of the taxa still require validation.

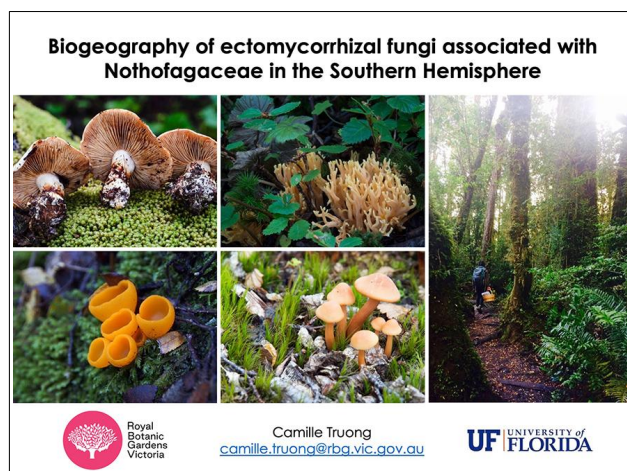
Matt's study has identified 445 ITS lineages (many not yet named) plus 100 or more from good morphological studies in the DNA database and, using a Chao1 diversity estimate³, he has worked out that there should be approximately 665 polypore species in Australia. This is more diverse than North America (492) and Europe (400), both of which are much more studied regions.

Within those 665 species, Matt has discovered at least eighty new records for Australia, with about 150 potentially undescribed species and twenty to fifty potential undescribed genera. He stressed that these are not just Australian genera – many are also found overseas and are being worked on there. He concluded his talk by saying that there is a need to convert the putative species concepts to taxonomy. He will attempt to do this through the UNITE community.

³ A statistical method. See <https://journals.asm.org/doi/10.1128/AEM.67.10.4399-4406.2001>

Day 5 Session 18

Camille Truong, Research Scientist, Royal Botanic Gardens Victoria: "Biogeography of ectomycorrhizal fungi associated with Nothofagaceae in the Southern Hemisphere"



Camille began her presentation by explaining that ectomycorrhizal (ECM) fungi form symbiotic mutualisms with the roots of many widely distributed trees – such as trees from the genera *Pinus*, *Quercus*, *Eucalyptus* and *Nothofagus*. Even though ECM symbioses occur in less than 4% of plant species, they represent a major carbon sequestration sink in many ecosystems. There are thought to be more than 20,000 different species of ECM fungi that have risen independently from multiple ancestral lineages in the phyla Ascomycota, Basidiomycota and Mucoromycota.

It is known from pollen records of *Nothofagus* species that the land masses of Australasia, Antarctica and South America were once joined together, making up the southern regions of the ancient super continent of Gondwana. Some of the plants and animals that originated in Gondwana are quite well known, such as possums and *Nothofagus*, but not much is known about the fungi.

Camille asked the question, do the ECM fungi associated with *Nothofagus* share the same biogeographical pattern of distribution as their host trees, and also possibly originated in Gondwana?

Very little was known about the biodiversity of these fungi in South America, so Camille and her team began an extensive inventory and ITS barcoding of Patagonian macrofungi. So far, they have collected and sequenced more than 2,000 fruiting bodies. When they compared these sequences in GenBank, they found that the closest matches corresponded to sequences from an Australasian source for approximately 20% of them. This is a good indication

of the connection between Patagonian and Australasian fungi. Examples of ECM lineages that are exclusively found in the southern hemisphere include the genera *Austropaxillus* (basidiomycete) and *Geomorium* (ascomycete), among others.

The next question that arose was: did these related ECM fungi originate in southern Gondwana or were their locations simply a matter of long distance spore dispersal through the atmosphere?

To answer this question, Camille and her team built a large phylogeny of 181 basidiomycete genera, using three markers. It was calibrated with five fossil fungi to estimate the ages of several clades that were subsequently used as secondary calibration in detailed phylogenies at family and generic level.

For ascomycetes, since there are very few fossils available, they used a molecular clock rate following Bonito et al.⁴ Such methods include some bias in terms of sampling and modelling, but the end goal was to establish some general patterns among all groups.

The resulting mean ages – even though there was a large variation between them (135-26.1 million years ago) - showed that the origin of most southern temperate ECM fungal clades precede the onset of the Antarctic glaciation, which was about 35 MYA. Most of these ECM fungi likely originated in ancient southern Gondwana, but their results also detected some long-distance dispersal events.

Both Australia and Patagonia have a great variation of hypogeous (truffle-like) fungi, however based on Camille's results, their diversification was quite recent, much later than the Antarctic glaciation. In Australia, small mammals that eat fungi are responsible for the spreading of spores, but in Patagonia small mammals are not very diverse and birds likely play a role for fungal dispersion and diversification.

Other conference highlights

A large part of the conference – three whole sessions in fact - was dedicated to the plant sciences of Papua New Guinea. The PNG delegates managed to overcome a number of technical challenges (mostly those pesky internet dropouts) and presented a wide range of very interesting talks – including topics such as local

4 Historical Biogeography and Diversification of Truffles in the Tuberaceae and Their Newly Identified Southern Hemisphere Sister Lineage
<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0052765>

taxonomy, the current state of PNG's systematic research and the restoration of the Lae National Botanic Gardens. This mini symposium hopefully represents the beginning of a much closer collaboration between Australian and PNG botanists.

The presentation which created the most reaction wasn't about botany, it was about managing a healthy work/life balance. Kelly Shepherd (Senior Research Scientist, Western Australian Herbarium) gave the talk and drew upon her own sometimes difficult life experiences. It was a very moving talk and it definitely touched the hearts of many of the attendees. The chat area was a quickly scrolling column of comments where her fellow Society members admitted that they, too, often felt depressed and helpless about the rapidly declining state of the environment. Many had assumed that they were alone in feeling this way and were surprised that they were not. It was very clear that this is a serious health issue that requires addressing. I can only hope that Kelly's talk was the first of many more to come on this topic.

I was impressed by the number and quality of presentations that were given by students. They are doing some amazing and inspirational research.

The virtual format provided the ability to include a video amongst the posters that were on display. The video was a sixty second long animation which illustrated the impact of the 2019-2020 bushfires on southeastern Australian plant species. It was very impressive, but very depressing at the same time.

The conference wasn't all business, there were some fun sessions as well.



A purely social get-together was held in another networking platform called Gather.town. In Gather.town, you make an avatar of yourself which you can move around to interact with other people's avatars.

You can approach someone and start a conversation, or play simple games together and so forth. Gather.town was very easy to use and a lot of fun. There was some concern at the time that it had been hacked when plants, furniture and noisy sound effects started appearing seemingly at random, but it turned out that the developer had accidentally left the program in administration mode so some curious attendees (such as myself – mea culpa!) could play around with the developer's toolkit.

One of the highlights of the social event was a recorded video of Bob Marley's "Three little birds" performed by Katharina (the conference's chairperson) and her husband. There were also games of trivia and bingo (my group came third in the trivia) and a prize was given for the best tropical outfit.

Conclusion

It quickly became very clear to me that having good data to work with is of major importance for good science. Being able to draw on substantial records of what is growing where and when is essential to anyone working in systematics.

It also became clearly apparent to me that the science of botany in Australasia is leagues ahead of mycology and lichenology. There is so much more information available about the vascular plants because there are so many more collections and so many more people working on them.

Nigel pointed out how much we don't know about our native fungi – even those that are close to home. Cecile's presentation highlighted that, even when there are collections, there aren't enough people to work on identifying them and the cost of using technology can be prohibitive. Tom was able to use human observations in his project, but that was only for fungi that were easily identifiable from photographs and also had fungaria specimens from the same locations to back them. Matt's presentation showed that even the records that we do have need to be scrutinised and updated and that our Australian fungi are truly of global importance. And finally, Camille's talk also demonstrated how what we know about our Australian fungi can impact the science of mycology overseas.

This was the first time I have been able to attend an ASBS conference. I had an absolutely wonderful time. Everyone was friendly and helpful and I learned a lot. I really do hope that I can attend more of their conferences in the future – maybe even in person!

Thanks to the organisers

The conference organisers did a fantastic job under sometimes difficult circumstances. Their names are Katharina Nargar (Chairperson), Darren Crayn, Ashley Field, John Clarkson and Frank Zich.

Recordings and screen shots were not allowed during the conference, so my thanks must also go again to Frank Zich for the captured screen images.

Postscript

While writing this article I tried to find the Babl (no e!) Global website and couldn't. It seems that the company no longer exists. (It is apparently in liquidation-ed.)

Websites

ASBS website:

<http://www.asbs.org.au/asbs/index.html>

DigiVol: <https://volunteer.ala.org.au/>

Gather Town: <https://www.gather.town/>

Lae National Botanic Gardens:

<http://laebotanicgardens.com/>

Systematics Association of New Zealand:

<https://www.math.canterbury.ac.nz/bio/pages/SYSTANZ/systematics.html>

Reishi

Theresa Bint

I like mucking about with fungi in lots of ways – foraging, growing, studying, writing about, cooking and fabricating cups and bowls. I've made my own kits for growing oyster mushrooms on a paper and coffee substrate and have inoculated eucalypt logs for growing shiitakes. I'm generally "myco-curious".

I'd read about the many claimed health benefits of Reishi –(including longevity, disease resistance and wisdom!) - and making a Reishi tincture sounded like an interesting project. I acquired a couple of growing kits (I believe these were "Australian Reishi" - *Ganoderma steyaertanum*) and promptly forgot about them for two weeks. This turned out to be a fortunate mistake – because the bags had not been cut open to introduce more oxygen, elevated CO₂ levels resulted in the formation of many more primordial shoots than usual - about twenty (check photos) primordia in each kit. The contents of each

bag developed from white and yellow stubs into miniature twisted forests of antlers: dark red-brown, sculptural trunks developed hard, shiny conks and then incredible quantities of brown spores. It was fascinating.

I harvested the Reishi sporophores after a few weeks, once the caps stopped expanding.

The tincture was made using a dual extraction method. The first stage is steeping the mushroom pieces in alcohol (vodka) for four – six weeks to extract the alcohol-soluble volatile compounds and then the same pieces are boiled in water for a couple of hours to extract the polysaccharides. The alcohol is combined with the water-extraction part and *voila!* we have our tincture. A few drops in my morning glass of juice is not at all like having a vodka and orange for breakfast – cheers!

References

Stamets, Paul. Growing Gourmet and Medicinal Mushrooms 3rd edition. Top Speed Press 2000.



