

# THE QUEENSLAND MYCOLOGIST



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# The Queensland Mycological Society

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Internet: <http://qldfungi.org.au/>

Email: [info@qldfungi.org.au](mailto:info@qldfungi.org.au)

Address: [PO Box 5305, Alexandra Hills, Qld 4161, Australia](#)

## 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; and
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/>.

Could members please notify the membership secretary ([memsec@qldfungi.org.au](mailto:memsec@qldfungi.org.au)) of changes to their contact details, especially e-mail addresses.

## The Queensland Mycologist

*The Queensland Mycologist* is issued quarterly. 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.

Material can be in any word processor format, **but not PDF**. The deadline for contributions for the next issue is **15 June 2018**, 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. The standard font used for text is Gothic 720BT, 9pt, with other sans serif fonts used for headings and captions. Font sizes may vary if required to make articles fit the available space, and text may be edited for the same purpose.

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 the 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

*Podoccypha pusio*, found during the Linda Garrett foray in June 2018 (see page 5). Photo © Pat Leonard.

## QMS Committee

### President

Wayne Boatwright  
[info@qldfungi.org.au](mailto:info@qldfungi.org.au)

### Vice President

Diana Leemon

### Secretary

Judith Hewett  
[info@qldfungi.org.au](mailto:info@qldfungi.org.au)

### Treasurer

Diana Leemon

### Minute Keeper

Judith Hewett

### Membership Secretary

Frances Guard  
[memsec@qldfungi.org.au](mailto:memsec@qldfungi.org.au)

### Foray Coordinator

Susie Webster  
[info@qldfungi.org.au](mailto:info@qldfungi.org.au)

### Other office holders

#### Collection Permit Holder

Susie Webster

#### Permit Data Collector

Vivian Sandoval Gomez

#### Webmaster

Dave Wood

#### Website Coordinator

Solveig Gillis  
[webmaster@qldfungi.org.au](mailto:webmaster@qldfungi.org.au)

#### Librarian

Judith Hewett

#### Newsletter Editor

David Holdom  
[david.holdom@inet.net.au](mailto:david.holdom@inet.net.au)

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## QMS Activities

### Meetings

Meetings are held in the F.M. Bailey Room at the Queensland Herbarium, Mt Coot-tha Botanic Gardens, Mt Coot-tha Road, Toowong, commencing at 7pm on the second Tuesday of the month from February (no January meeting), unless otherwise scheduled. Check the website for details and any changes. There will be 3-4 guest speakers invited during the year and other meetings will be informal. Suggestions from members for topics or names of potential speakers or talks will be welcome at any time. Please contact a member of the Committee.

To assist those unable to attend meetings, notes on the talks are included in the Queensland Mycologist and on the website if possible. 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. So remember, where possible it is better to attend the meetings, get the information first hand and participate in the invaluable information sharing opportunity.

Suppers are provided by volunteers. Please bring a plate if you can.

### Forays

QMS hold regular forays during the first half of the year. The dates are nominally the 4<sup>th</sup> 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 Susie Webster 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 Judith Hewett or Wayne Boatwright ([info@qldfungi.org.au](mailto:info@qldfungi.org.au)).

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

## QMS Calendar – 2018

MONTH	MEETINGS	FORAYS/WORKSHOPS
December	11 <sup>th</sup> Dr Diana Leemon – The Santa Claus story, witchcraft, economic boom and bust, Irish diaspora: how fungi have shaped human history. Christmas Party	Christmas Break

### Editor's comments

We have another foray report from Pat Leonard, this time from Linda Garrett Reserve. Pat has also written an update on a blue *Mycena* found during the Cairns foray reported in the December 2015 QMS Newsletter

A milestone this year has been the release of the report of the State of the World's Fungi (SOTWF) Symposium held recently at Kew in the UK. This very important report is the subject of an article by Alison Pouliot. SOTWF has received coverage from at least some serious media, and I have included some links to that coverage below Alison's article.

I can only agree with Alison's comments on the term "ecosystem disservices" (page 15). Yes there are invasive exotic fungi such as *Favolaschia* that may be doing harm, and also exotic pathogens such as myrtle rust that are of great concern, but those are biosecurity issues, not something to be lumped in "ecosystem disservices" in the same sentence as "ecosystem services."

Alison, along with Tom May has also written an article, first published in the Wombat Forestcare newsletter, Issue 45, September 2018, on naming fungi, a topic that is important to all of us. Getting names right, and applying appropriate labels to unidentified specimens is very important, not just in conservation, but also critically so in the fields of biological control and biosecurity where I work. Taxonomy is a critical foundation subject in biology,

and scandalously under-supported in Australia.

Alison and Tom also discuss using tag names rather than the "aff," that we have been using. It might be appropriate for interested members of the Society to discuss the topic. Should we keep using "aff", at least some of the time, such as when we have something that almost but not quite fits, or drop it? What other aspects of naming (and labelling) specimens might we discuss?

Barry Muir, who produces an excellent newsletter from Cairns, has sent two articles. One is on suppression of fungi by a heavy wet season, previously published in his newsletter (Cairns Fungi Forager No. 10, August 2018). The second raises questions about the role of colour in fungi. That is another topic that could be the subject of discussion among members. Colours do vary, and fade, and it can also be quite hard to decide which colour on a colour chart is closest to that of a specimen. And why are certain colours relatively rare in fungi?

I still need material for the final issue of the year, due out in December, and of course for next year. Foray and workshop reports are especially welcome, even if the events they report on occurred a long time ago. Reports on any fungi-related topics are welcome (this Newsletter is a good example of the range), no matter how short, for example interesting observations of fungi you have found, or summaries of reports you have come across.. Short notes under about half a page are great for filling spaces. Links to interesting websites are also welcome.

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### Linda Garrett foray - June 2018

#### Pat Leonard

The 2018 Linda Garrett foray was held on 23 June, late in the year and after a week of cold night time temperatures and drying winds, so we did not expect to see many fungi. It is surprising how much can be turned up by a dozen enthusiastic members of QMS. The table below shows the number of records made each year over the last seven years and the percentages that we have been able to track down to species level, to genus only or which have remained unknown. The high proportion of

unknowns in the current year is the result of a combination of factors including dried out specimens due to the weather and higher numbers of Ascomycetes and polypores, which are not covered by FunKey. These groups are also ones in which few, if any members of QMS have expertise. It is hoped that the August workshop on polypores improved skills for that group.

Our first interesting find was a white agaric with a pink tinged cap and pink sinuate gills. Several specimens were growing in a tight cluster. They looked a bit too robust to be an *Entoloma* and

microscopic examination of the spores revealed that they were angular but also had rounded warts (pustulose). This is characteristic of the genus *Rhodocybe*. A previous record of a *Rhodocybe* species in Queensland from Linda Garrett was recorded as *Rhodocybe* aff *pallidogrisea*. This year's collection appears to be the same species, and is likely not *R. pallidogrisea* or any of the other species in this genus described for Australia and New Zealand.



*Rhodocybe* aff *pallidogrisea*. © Wayne Boatwright

Whilst examining the *Rhodocybe* we came across a poor specimen of a very tall agaric with very dark spores and a white edge to the gills. The stipe was white and shiny. These characters suggested it might be a *Psathyrella* and microscopic examination helped key it out to *P. bambra* for which there is an earlier record from Mary Cairncross.



*Psathyrella bambra*. © Wayne Boatwright

Disc fungi (Ascomycetes) are seldom recorded on QMS forays. Many specimens of an orange disc with a distinct stipe were found covering a log and surrounding woody litter that seemed to fit either *Hymenoscyphus* or *Lanzia*. There are 11 previous records in Queensland for *Hymenoscyphus*, none for *Lanzia*. It could not be identified to species.



An unidentified Ascomycete, probably either *Hymenoscyphus* or *Lanzia*. © Wayne Boatwright

Truffles are also under-recorded on forays. Two were found on this occasion and may well be the same species, a small white secotioid *Russula* with amyloid spores with short blunt warts. Secotioid fungi are more usually found growing above the ground but both these were unearthed. It may be that floods in the summer buried the mycelium under soil and debris.



*Russula* sp. © Pat Leonard

*Podoserpula pusio* is a common fungus in south-eastern Australia and Tasmania with over 1500 records. There are only 4 records of it in Queensland, however, so it was good to see the pagoda fungus on this foray.

Year	2012	2013	2014	2015	2016	2017	2018
Number of records	34	47	46	67	59	60	38
To species %	33	70	56	68	54	30	57
To genus only %	55	23	35	24	37	27	27
Unknowns %	12	7	8	5	9	43	16
New %	73	33	6	4	4	3	5



*pusio*. © Pat Leonard.

Two separate sightings of fungi in the *Cortinarius archeri* group were made. It is frequent in the Linda Garrett Reserve and seems to have a preference for fruiting late in the season.

*Humidicutis arcohostata* is continuing to fruit on the same mossy log where we first found it on a foray eight years ago. It does not seem to have spread to other parts of the forest and one can only wonder at what special characteristics have made it favour this spot and this particular log which is now in an advanced state of decay. Known from one site in Victoria and one in Tasmania, this is still the only known site for the species in Queensland.



*Cortinarius archeri*. © Wayne Boatwright



*Humidicutis arcohostata*. © Wayne Boatwright

## Impact of Above Average Rainfall in 2018

Barry Muir & Raymond Palmer.

Most fungal observations depend on the fruiting of fungi after periods of rainfall. But can there be too much of a good thing? Observations in Tropical North Queensland (TNQ) suggest that under certain circumstances fruiting body production can slow or stop temporarily after excessive rainfalls. Ray Palmer has been collecting observations on fungal fruiting at Redlynch in the Cairns region since 1980. Observations suggest that, in most years, fungal fruiting follows roughly the same pattern: a bout of heavy rain quickly triggers many fruiting bodies and some perennial species are stimulated to reproduce again after a period of dormancy. In 2018, however, the wet season (primarily from January to March inclusive in Cairns) was more intense than it has been for several years in the region of TNQ between Cow Bay near Daintree in the north and Tully in the south, a distance of about 200 km (Figure 1).

Interestingly, Daintree near the north of the study area and Babinda at the south both received below



Figure 1. Area Under Discussion

average rainfalls. This resulted from monsoon troughs and low-pressure systems (see Cairns Fungi Foragers No. 3, 2017) which hovered over the study area for the whole three months of the 2018 wet season.

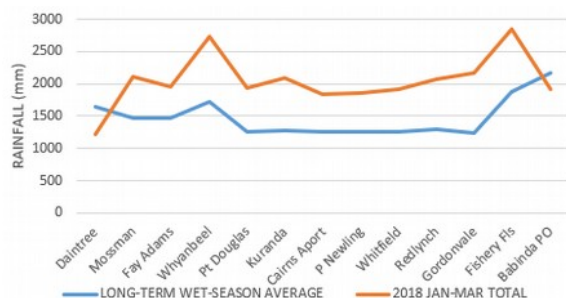


Figure 2. January to March total rainfall in 2018 compared with long-term (1943-2017) mean rainfalls for the same period.

Rainfall data were collected from 16 locations, four being private rainfall records (Cow Bay near Daintree, Mossman (2), and the Cairns suburbs Whitfield and Redlynch), and the remainder from Bureau of Meteorology data. The long-term rainfall means (1943-2017) are all from the nearest Bureau of Meteorology stations, with the exception of Redlynch where Ray Palmer has been collecting data since 1980. Results are presented in Figure 2.

Observations at Mossman (2) (Fay Adams pers. comm.); Kuranda (Fay Adams pers. comm.); Kamerunga (a Cairns suburb, Peter Newling pers. comm.); Redlynch (a Cairns suburb, Ray Palmer pers. comm.); and Whitfield (Cairns suburb)/Goomboora Park (Barry Muir) all indicate that fungal fruit bodies of all types were scarce to almost absent following the period of extreme rainfall. The actual falls recorded in each month at the six sites of fungi observation are presented in Table 1.

**Table 1.** Location, rainfall (mm) by month in 2018, total rainfall over the three-month period and long-term means

Location	Jan	Feb	Mar	2018 Total	Long-term means*
Cow Bay	585	306	751	1642	1652
Mossman (2)	299	415	1242	1956	1461
Kuranda	515	350	1216	2081	1285
Kamerunga	567	340	945	1852	1261
Whitfield	593	330	991	1914	1261
Redlynch	544	453	1069	2066	1293

\*Bureau of Meteorology data except for Redlynch

Cow Bay near Daintree had an average rainfall (five years of data) and produced the usual expected suite of species more or less in average abundance (Connie Kerr pers. comm.). There were several features which seemed to correspond with the lack of fruiting bodies in the areas with above-average

rainfall.

Firstly, at the start of the extreme wet period, fruit body production appeared to be normal or close to normal in both abundance and species diversity. However, towards the end of the extreme wet period, not only were many fungi pulverised by the heavy rainfalls, many simply stopped fruiting. We hypothesise that the species that normally grow on wood had simply used up the readily available resources because the moist growing period was simply too long, and breakdown of the cellulose in the wood and other food sources could not keep up.

Secondly, the fungi that grow on soil, apart from being pulverised or physically removed by water flow or soil erosion, may have been unable to cope with the waterlogged soil. After the extended rainfall a strong acid smell pervaded some areas of forest, and it is suspected that waterlogged soil had become sour and no longer suitable for the fungi to grow on. At Whitfield/Goomboora Park a sour smell dominated the soil when it was dug up and mean soil pH had dropped from about 6.5 to as low as pH 3.5 (strongly acid) in some locations. This odour persisted for about two weeks after the rains ceased, but gradually improved, although there were no new flushes of fungi. After 17 days without more than a few very light showers, there was another rainy period (31 mm over three days) and again the typical “first-flush” fungi such as *Psathyrella*, *Bolbitius*, *Phallus* and *Cyathus* appeared, but in small numbers. Soil pH had risen to about 6.0 (near-neutral) in the areas tested. This may indicate that the soils had experienced a period of re-oxygenation and perhaps bacterial and fungal breakdown in the soil, releasing nutrients which then allowed a new growth of fruiting bodies when rain again fell.

The third observation was that several species of fungi were recorded which had been scarce or absent (based on casual observation) in previous years. Some coral fungi appeared to be slightly more abundant than usual and *Cookeina sulcipes* and *C. tricholoma*, although common, seemed to be unusually common.

#### Acknowledgements and Sources

Thanks are extended to Fay Adams for rainfall data from Mossman (2) and observations at Kuranda; Connie Kerr for rainfall data from Cow Bay near Daintree; Barry Muir provided rainfall and observational data for Whitfield/Goomboora Park; Peter Newling for observations at Kamerunga; and Ray Palmer provided rainfall and observational data for Redlynch. Jennifer Muir edited the paper.

#### Reference

Muir, BG (2017). Climate and Fungi near Cairns. *Cairns Fungi Foragers No. 3 (June 2017): 1 – 2.*

## Another chapter in the blue *Mycena* saga

Patrick Leonard

In the autumn of 2015 we found a tiny blue *Mycena* growing on a log in an *Araucaria* plantation on the banks of the Tinaroo Dam in North Queensland (Photo at right, © Susie Webster). There was only a single very small specimen so it was not possible to do any microscopy on it. But there are very few blue *Mycena* species in the literature, and Cheryl Grgurinovic synonymized the three main ones in her monograph on the *Mycena* species of South-Eastern Australia. So, we decided that it was most likely to be *Mycena interrupta*, the only small blue *Mycena* with a basal disc present in the region.



*Mycena interrupta* from Motu falls, New Zealand.  
© FUNNZ 2013

trees in the Northern Hemisphere. The main exception is the absence of any records of *M. interrupta* in New Caledonia and Papua New Guinea. Both Dennis Desjardin and Egon Horak have collected and/or written up *Mycena* spp. from New Caledonia and PNG, though their collections are unlikely to have been exhaustive. However, it seems unlikely that the small blue fungus we had found was explained by the presence of a Gondwanan host, *Araucaria cunninghamii*.

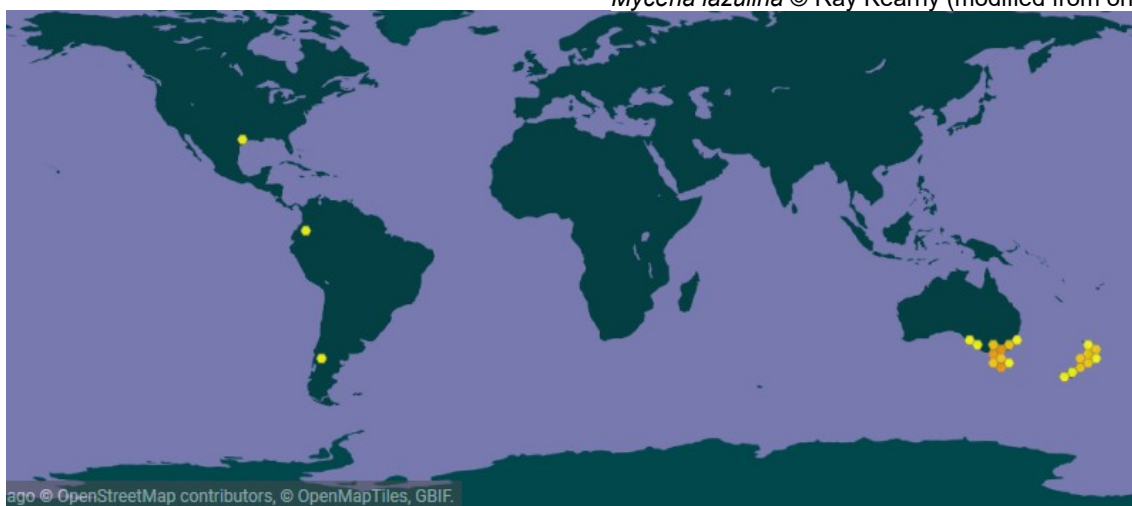
In 2018 David Noble published a picture of the newly described *Mycena lazulina* in the Sydney Fungal Studies Group's Newsletter. This fungus is



*Mycena lazulina* © Ray Kearny (modified from original)

In 2016 Tom May wrote an interesting article for the Queensland Mycologist entitled: What does the Atlas of Living Australia tell us about the distribution of *Mycena interrupta* in Queensland and South Australia? He demonstrated the power of the data now in the ALA database to allow us to forecast where we might expect to find a particular fungus based on information available about climatic and other conditions. That showed fairly conclusively that the Atherton Tablelands were unlikely to be a suitable location for *M. interrupta*.

I first came across *M. interrupta* in southern Argentina and Chile where it is found on logs in forests dominated by *Nothofagus* and *Araucaria*. If you compare the worldwide distribution of this fungus with the natural distributions of those two genera of trees then there is a good match. You have to ignore the records for plantations of the two



Worldwide distribution of *M. interrupta*. © GBIF 2018.



Worldwide distribution of *Nothofagus*. © GBIF 2018. (Northern hemisphere records are plantations).

described from Japan and so far only reported from New South Wales and Victoria in Australia. It is a very small blue fungus which would key out to *M. interrupta* in the key in Grgurinovic (2003), but sequencing has demonstrated that it is a distinct species. It has a very different distribution. It is not the tiny blue *Mycena* from North Queensland.

Many *Mycena* species in the Northern Hemisphere have a restricted host range. They only tend to grow on a particular substrate such as leaves or large logs and with a single genus of trees or sometimes only with a single species. So one might reasonably ask whether *M. interrupta* has an association with *Nothofagus* and/or *Araucaria*? It would seem not, as there are records of it occurring with *Eucalyptus* and *Pinus*.

### Conclusions:

As Tom May has demonstrated, good records that inform us about the substrate, host, habitat and climatic associations of fungi are important in advancing our understanding of fungal distributions. He has also demonstrated how big databases such as the ALA might be useful in helping us assess the likelihood that a fungal determination is correct. Fungal keys are vital to

good determinations but they are never perfect because by definition they cannot deal with fungi that are not yet described. To be a serious field mycologist one may have to deploy a range of methods and skills – comparing pictures on the internet seldom leads to valid determinations. So we are left with a small blue *Mycena* growing on an *Araucaria* waiting for a mycologist to chance upon it and give it a name so that we can begin the long process of building up a picture of what it is and what it does. Don't hold your breath.

### References:

- GBIF (2018) <https://www.gbif.org>
- Grgurinovic, C.H. (2003) *The Genus Mycena in South-Eastern Australia*. Fungal Diversity Press.
- May, T.W. (2016) What does the Atlas of Living Australia tell us about the distribution of *Mycena interrupta* in Queensland and South Australia. *Queensland Mycologist* **11(3)**: 5-9.
- Tonkin, J.E. & May, T.W. (1999). A preliminary bioclimatic analysis of the distribution of *Mycena interrupta*, *Fungimap Newsletter* **11**: 3-4.
- Webster, S. & Leonard, P. (2015) Cairns Foray, *Queensland Mycologist* **10(4)**: 10-13

## It's all in the name: some tips for naming fungi in the field

Alison Pouliot & Tom May

The desire to name organisms is human nature. Be it in everyday vernacular or scientific nomenclature, naming plays an important role in understanding the natural world.

There are three components to *naming* when it

comes to species. Firstly, the species must be delimited; that is, the variation within it is circumscribed, and the species separated from close relatives, using whatever characters are available. Secondly, a Linnaean binomial (genus+species) is applied to the species, as delimited. These two components are the bread and butter of taxonomists. The third component of naming is *identifying*, which means assigning a name to a specimen or observation. This is something we all do, not just taxonomists. We *identify* when we look

up to the sky and say 'wedgie' or when we observe a cluster of mushrooms and say 'ghost fungus'. Some identifications can be as rapid as a glance at the silhouette of a bird, or could take hours of careful inspection of fine details of the surfaces of a mushroom, or even the character of its spores under a compound microscope.

Few scientists are employed as taxonomists in Australia today. The *taxonomic impediment*, or dearth of taxonomists, especially mycological taxonomists, reflects the lack of recognition of the importance of naming species. However, if you're unlucky enough to ingest a poisonous mushroom, you'll be grateful that a taxonomic mycologist can identify the culprit and help determine the best course of action, depending on the toxin ingested. A taxonomist might well save your life! Indeed, accurate naming of species underpins all aspects of biological science, as each species has unique characteristics.

This article explores the third phase of naming — identification, in particular the importance of correct identification and how to deal with uncertainty in identification. Accurate identification of species has important implications for distribution and hence ecology and conservation.

## Recording fungi

Lists of animal, plant and fungus species have been recorded by naturalists in Australia at least since the first issue of *The Victorian Naturalist* in 1884. In recent decades, the general public has contributed to the understanding of the whereabouts of species through the collection of distribution records. Today, the ubiquity of the Internet, social media and online nature platforms enables contributors to place records in the public domain, allowing for mass data collection, and also ready visualisation of records such as through the Atlas of Living Australia (<https://www.ala.org.au/>).

The Fungimap project (<https://fungimap.org.au/>), founded in 1996, was the first fungus-mapping scheme in the Southern Hemisphere. Almost a thousand participants have contributed more than a hundred thousand fungus distribution records, making it one of Australia's largest citizen science projects. However, identifying fungi presents additional challenges relative to animals and plants. This is because fungi are characterised by relatively high species richness and a large number of rare or little-known species. Furthermore, they are generally ephemeral; characteristics can alter radically over a short period of time; character sets are often limited and so species can be very difficult, if not impossible, to distinguish from morphology alone. Moreover, fungal taxonomy is unstable and many decades behind that for animals and plants. This instability manifests in several ways, including

changes in both generic and species concepts, as well as discovery of novel species. Recent advances in molecular mycology are revealing a staggering diversity of fungus species.

Identifying a fungus to species level by macro-characteristics alone is not easy. Those who have stumbled across LBMs (little brown mushrooms) or members of the genus *Cortinarius* (with over 2000 species worldwide) know how difficult they are to identify. This is why Fungimap focuses on carefully selected 'target species' – those with conspicuous features recognisable in the field, with few or no look-a-like species. The choice of target species increases the likelihood of accurate identifications. It also increases the satisfaction for the identifier in being able to give a name to a specimen. At the same time, it is important to resist putting a name on something unless you are very sure of the accuracy of your identification, because inaccurate identifications have implications.

## The importance of accurate records for conservation

The accuracy of fungus records is important for mapping the distribution of fungi. This feeds into our understanding of ecology and allows for effective conservation and management. There are implications of applying the wrong name to a species, especially for rare species. It is better to 'under-record', that is, to leave a species at genus level, than assign it an incorrect species name. This approach ensures higher data quality.

So-called 'false positives' or 'type 1 errors' are errors in data reporting that falsely indicate the presence of a species due to a mis-identification. An example would be the incorrect recording of the wet-forest specialist *Vibrissea dura* from the mallee, due to confusion with a stalked puffball. 'False negatives' or 'type 2 errors' are the failure to identify a species that is present, perhaps because it is very similar to another common species that is already known from an area. Both types of errors have consequences for conservation research. False positives outside the known distribution can be picked up by expert reviewers (from inspection of maps) and can be corrected as long as there is supporting information such as a photo or specimen (see below). False negatives of rare or inconspicuous species can be especially difficult to detect. Errors in reporting fungi can bias analyses; for example, when creating species distribution models or estimating the rates of local extinctions or colonisation.

As most conservation hinges on the presence of rare species, it is critical that data about rarity are correct.

## Dealing with uncertainty in naming

There are some simple protocols for naming species where identifications are uncertain. If you can identify your observation to genus level but not to species level, it is best to describe it as 'Genus sp.', ('sp.' being shorthand for 'species'). For example, *Russula* sp. If your observation does not match well to the particular species known from an area, add a question mark between the genus and species names. For example, *Russula?* *marangania*. If there is a possibility that your observation might be a rare species, do include this information, but include it in the notes rather than make the identification formally. Some online citizen science portals (such as the ALA direct recording facility) use whatever name you supply without any checking at the time of the record submission. This can lead to misleading records appearing on maps.

If the species recorded is known to be a species complex, use the word 'group' following the genus and species name. For example: *Oudemansiella gigaspora* group. Being easy to identify, the *Oudemansiella gigaspora* group is a useful target 'species group', distinguished by the brownish pileus that is sticky when fresh, the rather widely spaced, white lamellae and the rooting stipe base. Until recently, Australian members of this group were lumped under the name of the European species

*Oudemansiella radicata* (sometimes placed in the genus *Xerula*). A taxonomic revision of *Oudemansiella* and related genera revealed that *O. radicata* is not present in Australia, but there are a number of closely related species that look rather similar in the field. *Oudemansiella gigaspora* was originally named *Hygrophorus gigasporus* by Cooke and Masee in 1887. Because this is the oldest name among the members of the group, we use *O. gigaspora*, as the basis for the 'group'.

If you see a particular species regularly that has something distinctive about it but you cannot identify it, make up a 'tag name' or 'field name'. This is a better option than assigning the Latin abbreviations 'aff.' (meaning 'similar to') or 'cf.' (meaning 'compare with') to a described species, particularly when that described species does not occur in Australia. Do not use tag names that look like species epithets (i.e. not in Latin). A short



*Oudemansiella gigaspora* group – a distinctive Fungimap target that is mapped as a group of species that are not readily distinguishable in the field. Image: Alison Pouliot

phrase is best, especially one that conjures up unique features that separate the species from others. For example, *Mycena* 'tiny blue lights', as used by the FNCV Fungi Group for a tiny bluish *Mycena* that is bioluminescent. Ideally, lodge a voucher collection (i.e. submit a dried fungus specimen) under that tag name in a reference collection such as a herbarium. This allows mycologists to name the species once revisions have been carried out. You'll need appropriate permits to make a collection, especially from nature reserves. Advice in Qld re collecting permits may be obtained from the QMS Website or by contacting the QMS Permit Holder on [info@qldfungi.org.au](mailto:info@qldfungi.org.au).

## Supporting your record

When submitting records of fungi to Fungimap, it is always useful to include a photograph, especially if it is the first time you have recorded a particular species. Photos that are submitted with records should show distinctive characters of the species. For example, for mushrooms, it is important to show the underside of the pileus (cap) so that the lamellae (gills) are visible, and provide a clear view of the base of the stipe. Also note features not evident from a photo, such as the texture of surfaces or odour.

In the case of a record being submitted for a rare species, or one that is found outside its usual distribution range, Fungimap will usually seek more information from the recorder if a photo is not provided or not adequate for identification. Given the ephemeral nature of many fungus sporing bodies (the visible reproductive part of the fungus such as mushrooms and puffballs), they might well have disappeared before Fungimap can respond. In this instance Fungimap encourages the recorder to look out for the species the following season and capture further photos.

Taxonomy is tricky business. Identifying fungi to species level takes time and practice. Start with the ones that are most conspicuous and easily recognisable. The more often you see the same species, the more familiar you will become with the extent of variation within that species. Equip yourself with a field guide (such as the guide to Fungimap target species, *Fungi Down Under*) and one of the local field guides (e.g. Australian Subtropical Fungi), and a hand lens to see some of the smaller details. You are quite likely to see at least a few of the Fungimap target species each time you visit the forest during the fungus season. Each fungus distribution record, even of common and widespread species, helps scientists understand species distribution and contributes to the conservation of biodiversity.

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# State of the World's Fungi Symposium, 13-14 September 2018, Royal Botanic Gardens, Kew, UK.

## Report by Alison Pouliot

What do dark taxa, quantum dot nanoparticles and hairy earth tongues have in common?

These tantalising subjects were all part of presentations or posters at the *State of the World's Fungi* symposium held at Kew Gardens, London from 13–14 September this year.

The symposium coincided with the release of the *State of the World's Fungi Report*, brought together by numerous authors and edited by Director of Science at Kew, Professor Kathy Willis. The report reviews the current state of fungal knowledge, conservation concerns and major issues affecting fungal diversity among other themes.

Over the years, I've greatly enjoyed visiting the world's only *Fungarium* to mine its vast specimen collection. On this occasion, as I approached the Jodrell Laboratory (in the shade of that magnificent euc) I was struck by the abundance of *Homo sapiens*. 263 specimens to be precise! Symposium participants had dispersed from 24 countries across five continents and 128 institutions, to gather for two intensive days of presentations and discussions around all things fungal. As one session chair reminded us, the opening day was also the 249th birthday of Alexander von Humboldt, the first person to describe nature as a web of life and to recognise human-induced climate change.



Participants at the State of the World's Fungi Symposium, 13–14 September 2018, Royal Botanic Gardens, Kew, UK. © Royal Botanic Gardens, Kew / Mark Winwood.

Kathy Willis opened the symposium and introduced the key themes, based around seven topical questions:

- Conservation of fungi: what, why, where and how?
- Does all plant life depend on fungi?
- And have you forgotten the lichens?
- Do fungi provide a greater ecosystem service or disservice?
- Fungal networking – who benefits?
- Panning for gold in the mould: where do we find commercial value in fungi?
- Exploring the dark taxa: when does a molecular signature become a species?

Having a particular interest in fungal conservation, I was excited that this was the theme of the opening session with four such experts as Anders Dahlberg, Greg Mueller, Giuliana Furci and Beatrice Senn-Irlet. Anders emphasised the importance of collaborations between authorities and landowners, scientists and citizen scientists in collecting, analysing and spreading fungal knowledge in facilitating nature conservation. He reminded us that in Nordic countries, fungi receive the same focus as plants and animals in conservation initiatives and assessments – something for which we must continue to fight in Australia.

Greg reviewed progress with the Global Fungal Red List Initiative, stressing the need to get Conservation Mycology recognised as a discipline of Conservation Biology. It was heartening that Greg acknowledged the international significance of Tom May's work with Fungimap and the recent co-authored paper (in press in *Conservation Biology*) led by Tom on Conservation Mycology.

Founder of Chile's Fundación Fungi, Giuliana Furci is an always-inspiring presenter and reiterated the Foundation's approach of going straight to the top and persistently lobbying politicians over many years until fungi were incorporated into Chile's Environmental Law. Giuliana made the point that we don't have time to wait for complete inventories of data, but considered that there is already enough to catalyse real change at a political level. Her Foundation's top-down approach stands out in conservation initiatives that more typically work the other way and has also been effective in creating jobs for mycologists.

Beatrice overviewed the current conservation situation in continental Europe and the challenges of meeting the 2030 Aichi Biodiversity Targets. She also spoke of the importance of next generation sequencing for monitoring conservation performance and the rise of new areas such as mycotourism.

There is not room in this brief report to describe all of the presentations but overall the quality of the research and presentations was absolutely exceptional. A recurring theme throughout the symposium was the significance of understanding fungi in the rapidly changing environments of today, in particular in predicting fungal responses to change. The importance of understanding symbioses was also a recurrent theme and the ever enthusiastic Martin Bidartondo opened the second session emphasising how new research is revealing a more distinctive and versatile fungal mutualist repertoire than expected. This followed with an entire session dedicated to those most famous of mutualists, the lichens. Speakers described new research and models being used to explore how distributions and symbioses can help characterise climate change and threats to biodiversity. This also emphasises the need to protect different areas of a species' range so as to maximise its diversity, allowing it the greatest chance to adapt to stresses and the overarching issue of climate change. However, it also exposes the limitations of slotting lichens into existing models, such as the criteria for evaluating extinction risk, when factors such as generation time are extremely difficult to determine.

The final hour of the first day was a dynamic whirlwind of sixty-seven poster presentations delivered in 45 second time-slots (and not one second more!). The presenters rose to the challenge (and the threat of being gonged off stage) distilling the essence of their research and often incorporating a wonderfully entertaining element of performance. Congratulations to poster prize winners, Tara O'Neill and Samantha Dawson.

The first session of the second day – Do fungi provide a greater ecosystem service or disservice? – had me perplexed. All four speakers gave excellent presentations of their fascinating and cutting edge research. However, I fail to comprehend how this sort of dichotomy suggested in the session title is even vaguely helpful. My concerns were echoed by the familiar voice of David Minter (president and founder of the International Society for Fungal Conservation) piping up from the back of the auditorium, who in his friendly but frank manner rhetorically asked: "Ecosystem disservices, what on earth are you talking about?". Fungal conservation has endlessly battled against this sort of scapegoating of fungi as the cause of environmental issues, rather than being a symptom of complex systemic problems, usually related to poor agricultural and forestry practices, especially the creation of monocultures. It seems to me that the misnomers of 'ecosystem services and disservices' only serve to perpetuate

fundamental misunderstanding about fungi and greatly hinder fungal conservation. Other than not making ecological sense, the notion of 'ecological disservice' is a disservice to fungi. Perhaps it's time to move beyond the good fungus – bad fungus binary.

One of the most visually sophisticated presentations of the symposium – combining an astonishing collection of stills and animations – was that of Toby Kiers. Toby examined the evolution of cooperation and dispelled the myth that complex systems of communication, transport and exchange between fungi and plants are harmonious, but rather, underlying the apparent cooperation are conflicts and much can be learnt from these tensions. The role of fungal–bacterial interactions, often under-recognised, was highlighted by the fascinating research of Paola Bonfante. It was also tremendous to see the focus given to the importance of endophytes, especially their role in conferring multiple stress tolerances (e.g. heat, cold, drought, salinity etc.).

The final session – Exploring the dark taxa: when does a molecular signature become a species – was one of the most compelling. Most fungi can be considered 'dark matter' because of the enormous gap between described and estimated species diversity (far greater than for animals and plants). The profound disconnect between species discovery and description exposed the challenges of finding a new way forward with taxonomy, given the vast number of taxa revealed in the 'omics era' and the race against time.

Overall it was a brilliant conference that ran like clockwork thanks to months of behind-the-scenes preparation and organisation. The excellent session



SOTWF Program cover with image of the luminous Australian fungus, *Omphalotus nidiformis*. Cover design © Royal Botanic Gardens, Kew. Cover image © Alison Pouliot.

chairs also deserve a special mention. It would have been nice to see more Australian or even austral representation or content, but at least we are glowingly represented on the Program cover!

*The State of the World's Fungi Report can be downloaded [here](#).*

*The State of the World's Fungi Symposium Program can be downloaded [here](#).*

## Some links related to the State of the World's Fungi report.

The secret life of fungi: Ten fascinating facts:

<https://www.bbc.com/news/science-environment-45486844>

New edible mushrooms among thousands of recently discovered fungi

<https://www.theguardian.com/environment/2018/sep/12/new-edible-mushrooms-among-thousands-of-recently-discovered-fungi>

Interview with Tom May, Late Night Live (ABC Radio National), 20 September 2018.

<http://www.abc.net.au/radionational/programs/latenightlive/state-of-the-worlds-fungi/10263526>

## Some Colourful Questions

### Barry Muir

A recent edition of *The Queensland Mycologist* (2017, v12:2), contained an interesting article by Wayne Boatwright about some Australian blue fungi. Wayne stated that blue fungi are amongst the most sought-after species, especially by photographers. I would like to pursue this idea of fungal colour a little further and raise a few questions which may keep mycologists awake at night.

Enormous variations in colour of fruiting bodies occur within genera, e.g. *Cortinarius* with caps of red, orange, yellow, green, blue, purple, grey or brown. Similar variation can even occur within a species, e.g. *Hygrocybe astatogala* which can be bright red, orange-yellow, yellowish-green, greyish-brown or black (Grgurinovic 1997). Are these colours subtle by-products of variations in environmental conditions in which the fungus grows, or is there an ecological advantage to the fungus in possessing a particular colour in different circumstances?

Changes in light intensity, direction, quality (direct or reflected), spectral composition (i.e. how much red, orange, yellow, green, blue or indigo is present), and the predictability of the Earth's day-night cycles carry vital information. Special pigments have evolved in fungi to sense these characteristics of light and to trigger changes in physiology, development, behaviour and awareness of light and dark (Heintzen 2012, Corrochano 2015, Herrera-Estrella & Horwitz 2007). Further, the colour may change with fruit body age, environmental stress such as exhaustion of the growing medium, or other factors (Hansen 2008). Some colours even wash out with rain!

Blue light has high energy and is absorbed best by red-orange-yellow pigments. Red-orange-yellow light is lower energy and is best absorbed by blue pigments. It is recognised (Corrochano *ibid.*, Heintzen *ibid.*, Schwerdtfeger & Linden 2003) that blue light is of particular significance to fungal senses. It is thus logical that pigments at the red, orange and yellow end of the spectrum are likely to

be the most common colours found in brightly coloured fungi. Blue fungi are not particularly common (only 37 out of 185 Australian taxa of agarics have blue/purple representatives (using May *et al.* 2013)). One would expect blue pigments to absorb the lower energy and thus less useful red-orange-yellow end of the light spectrum. In other words, there is a greater energy advantage to the fungus in being red than in being blue.

Certain fungal species can also detect ultraviolet (UV) light and green light (Herrera-Estrella & Horwitz 2007). UV light, in particular, can damage fungal DNA, and the yellow, orange and red pigments may be instrumental in protecting the fungal tissues from harmful UV rays (Isaac 1994). Fungi with green-pigmented fruit-bodies occur in only 30 out of 185 Australian taxa of Agarics (again using May *et al. ibid.*). The purpose for green pigments is unclear. They are not involved in photosynthesis as they are in green plants, so why have them at all, or are they simply combinations of blue and yellow pigments?

When variations in fruit-body colour are observed, do these actually reflect the light intensity, direction, directness or spectral composition of the environment in which the fungus is growing? All these factors can change in the course of a day or fruiting period. Is the colour of a particular specimen, within the normal colour range of that species, variable within a tight range according to environmental conditions? If so, does its colour indicate an "averaging" of environmental factors; or does it start out with a genetic "intention" to produce a certain colour, but full expression of that colour is not realised because environmental conditions do not allow it? Do internal processes stop progress of the full expression of colour because the optimum colour for its particular environment has been reached and there is no need to expend further energy making pigment?

Do the colours of a fruit-body have some more subtle purpose? Perhaps the colours are intended to attract invertebrates, birds or mammals, or some other creature that will disperse the spores of that fungus species. Maybe they are intended to camouflage the fungus, making it less obvious to

fungi-munchers until it is large enough to produce spores, at which time it may make use of that same creature to disperse its spores? Is it a warning to fungi-munchers that the fruit-body may contain toxins? Just because a fungus may be edible for humans does not make it edible to some animals (and vice-versa). Also bear in mind that many insects, birds and mammals have the ability to see colour and even to see ultraviolet (Parker 2005). With the right equipment it may be possible for us to determine if some fungi reflect light in the ultraviolet as well as the (human) visible spectrum. Maybe luminous fungi such as *Omphalotus nidiformis* (which, incidentally happens to be poisonous – at least to humans) emits light at a human visible frequency, but do they also emit light in UV frequencies? What about non-luminous fungi – do they emit or reflect UV light invisible to us? The more we learn, the less we know!

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### More fungi links

- Royal Botanic Gardens, Kew study: Plastic-eating mushrooms aid in combating growing waste crisis <http://www.freshplaza.com/article/9025866/Plastic-eating-mushrooms-aid-in-combating-growing-waste-crisis>
- What climate change means for fungi and food safety <https://www.eco-business.com/opinion/what-climate-change-means-for-fungi-and-food-safety/>