



FUNGI FORAGERS

No. 22, December 2020

OUR PURPOSE: TO RAISE AWARENESS AND INTEREST IN FUNGI OF THE CAIRNS REGION

This newsletter is not associated with any club or organisation and is emailed free of charge to anyone who may be interested. Anyone who wishes to contribute to the newsletter with observations, anecdotes, corrections, comments or photographs is welcome to do so. Although this “newsletter” is science-based we try not to make it too “scientific”. We recognise that there are school children, bush-walkers and others just interested in fungi, and we hope this leaflet will be a medium for furthering that interest. **The emphasis is on fungal biology and ecology** rather than identification.

Barry Muir, Editor Jenn Muir

Field meetings to find interesting species of fungi (not necessarily edible species) are known as 'forays', after the first such meeting organized by the Woolhope Naturalists' Field Club, Herefordshire, England, in 1868 and entitled "A foray among the funguses" [*sic*]. The Woolhope Club was an early member of the British Mycological Society founded in 1896. (Wikipedia).

STATUS OF CFF AND A CALL FOR ARTICLES

Firstly, as you may not have noticed, this edition of Cairns Fungi Foragers (CFF) did not come out in October as it was supposed to. Jenn and I decided to terminate the newsletter as we received virtually no feedback and considering the work involved, why should we produce a letter nobody reads? However, the wet season up here has not appeared on the scene yet, and the rainforest and everywhere else is as dry as chips despite the flooding and hail storms further south. Soon it will rain (we hope) and fungi will appear (we also hope), and the mushroom scroungers will come out of air conditioning and start collecting fungi to eat. It is on that probability we have decided to produce at least one more CFF with an article on the dangers of not properly knowing what you are collecting.

We have all been in Covid-19 lockdown to a greater or lesser extent for months. As a result, the responsible people have been sitting at home while the irresponsible Covidiot have been out partying. Surely, however, some of you responsible mycophiles have been undertaking safe trips out to the bush away from everyone else, or have been to local parks and gardens while applying social distancing rules, or have been poking around your own backyards and finding fungi. You may have been doing research online or just Internet surfing and have found all sorts of fascinating fungal facts.

That being so, how about an article, an observation, a photograph, an interesting fungi-related news article, an ANYTHING to let people know what you have been up to and what you have been observing about fungal ecology. There must be SOMEONE out there who would like to contribute to this newsletter other than us. If no responses are forthcoming, we're considering closing this newsletter down very soon.



FUNGI CHEMISTRY - POISONOUS MUSHROOMS

Emergency: If you suspect you, or someone you know, has been poisoned by eating toxic fungi, call the Poisons Information Centre on 13 11 26 or go immediately to the Emergency Department of the nearest hospital, *taking some of the fungus with you.*

There have been several articles in previous Cairns Fungi Forager newsletters that have mentioned or discussed poisonous mushrooms, yet still the edibility of local species is one of the commonest questions presented to me. Some people want to know which local species are edible, and some show me pictures or even show me the fungus and want to know if they can eat it. One showed me pictures after he had eaten it! A Cairns local recently told me that his father had shown him which species were edible when he was a boy and he had been collecting and eating them ever since: yet this same person could not tell the difference between a *Russula* and an *Amanita* that I was holding at the time. Talk about a charmed life!

Bear in mind the fact that it is illegal in Australia to remove or collect any fungus from any public land, for any purpose, without a written permit. As has been discussed many times, a great number of Australia's fungi



The Death Cap – *Amanita phalloides* (Internet image)

are unique; Australia's rate of habitat destruction is one of the highest in the world; and fungal species are being lost at an enormous rate. The last thing we, fungi, or the environment, need is over-collecting. Several species of Australian fungi are edible and you will find articles, cookbooks and websites that tell you where, when and what species to collect but, of course, they cannot guarantee that the species you collect are the ones they discuss or illustrate, even if they are correct, which they may not be.

The safest thing is to buy your mushrooms from a reputable supplier. The big market chain stores have good quality control. However, in 2014 a young woman in Canberra sued one of the chain stores, claiming mushrooms bought from the supermarket contained traces of Death Cap mushroom (*Amanita phalloides*). After eating the mushrooms in a curry, she became critically ill and survived only after a liver transplant and subsequent bowel surgery. The company rejected her claim and she was unsuccessful in her lawsuit, but clearly some doubt must remain. Besides, if the mushrooms were contaminated it was not the store's fault – they would be trusting their suppliers and presuming that some despicable person hadn't adulterated the mushroom stocks the way some idiots have put needles in strawberries.

Eight people were hospitalized in early 2019 in New South Wales due to wild mushroom poisoning. Almost 40 calls were made to the NSW Poisons Information Centre in one week on one occasion, and in 2018 in NSW, 70 people were admitted to hospital. Australian poisons information centres receive almost 900 calls about possible mushroom poisoning in any 12-month period, with about a third of those being referred to a hospital or for medical treatment. These risks also extend to herbal, including fungus-based, medicines: researchers at the University of Adelaide found in 2014 that almost 60% of "reputable" herbal products surveyed had ingredients that did not match what was on the label.

I know there are several small suppliers in Tropical North Queensland that sell mushrooms from stalls on market days. Some of these are probably OK because they buy spawn (spores) from reputable suppliers and grow their own, but in poor years there is always the chance they will supplement their home-grown mushrooms with wild-collected fungi, or the odd toxic-species spore gets in with the edible species through no fault of their own. Even the growth substrate they are using may not be safe and there may be no quality control.

Mushroom poisoning occurs mostly among four groups of individuals: young children who ingest mushrooms inadvertently; wild-mushroom foragers (probably collecting illegally); individuals attempting suicide or homicide; and individuals looking for a hallucinatory high. Emergency Department physicians have found that interest in eating mushrooms has risen dramatically in recent years as part of the back-to-nature and organic food movement. Numbers have also increased as people "go bush" during the Covid-19 lockdowns. With

stress and depression on the increase, eating certain mushrooms for their hallucinogenic components is increasing mushroom poisonings.

I sometimes hear people say that mushroom poisoning in Europe is rare because people have a long history of mushroom collecting and therefore know what they are collecting. Despite this vote of confidence, one hospital in Turkey, for example, recorded 294 cases of poisoning, including three deaths, in just seven years. Over 6% of the poisonings were from cultivated mushrooms, not wild ones. People born overseas, especially in Asian countries, should be aware that some of Australia's deadly mushrooms can look like edible mushrooms that they may have gathered in their home countries. Every year, one thousand cases of mushroom poisoning occur in France, the home of the truffle and other well-known fungi.

Amanita muscaria – the Fly Agaric
(Internet image)



Wild mushrooms from commercial sources may be contaminated by toxic look-alikes which are collected together with edible mushrooms through either ignorance or negligence. Field drying the wild harvest before sale to processing and packaging operations makes effective culling even more difficult because the appearance of the dried product is changed. This is especially worth considering if you purchase “medicinal” fungus products, because many are collected in third-world countries by peasants who are paid by weight, and thus adulterate their collections with unrecognisable material. The fungi are then dried and powdered, and the chances of identification are zero without DNA analyses. Small-scale suppliers may employ children, or amateur mushroom pickers, who are paid by the kilogram for their wild harvest: a practice that discourages selective harvesting and culling for elimination of undesirable species, which in turn, encourages fraud. There are also many instances where laboratory-produced synthetic medicines have been added to “natural” medicines to ensure the purchaser gets the desired effect and buys some more (the addition of Viagra to powdered rhinoceros horn, and Valium to camomile tea are well-known examples).

As an aside, it is worth noting here the common symptoms of poisoning, just to assure you that this is not to be taken lightly. The toxic look-alike mushrooms often contain substances which cause gastrointestinal pain, violent vomiting, and diarrhoea. After an apparent clinical improvement, more serious symptoms of liver, kidney and intestinal damage occur, including: jaundice; abnormally low blood-sugar (hypoglycaemia); and kidney failure. After severe headaches, mental confusion, coma, high temperatures and convulsions, death can occur in up to 90% of the poisoning cases depending on what fungus is involved...not fun!



The onset of symptoms depends on the species consumed; the state of maturity of the fungus and whether it is contaminated with some other natural but undetectable fungus; the season when it is collected; the location in which it was growing; whether it was growing on wood or soil, and what species of wood; whether the soil was contaminated; the age, body size and fitness of the consumer; individual people's tolerance to the toxin; allergies; the quantity and frequency of consumption; how the fungus was prepared; and associated consumption of alcohol, medications, and even foods eaten with it. So it is very hard to predict who will say “yum”, who will simply feel a bit off-colour, and who will die...fungal Russian roulette.

A *Podostroma* so toxic even handling it can be dangerous (Internet image)

The so-called recreational “magic mushrooms” are definitely toxic. The poisonous compounds in these fungi can cause gastrointestinal disturbances, seizures, dizziness, loss of coordination, and deep sleep with vivid dreams. After waking, victims may experience periods of elation; hyperactivity and sound and sight distortions; profuse sweating; nausea; vomiting; excessive salivation; and nasal and eye discharge. Severe cases result in lowering of blood pressure and pulse rate; shock; and death due to lung or heart complications. Magic is not the word – a quick way to meet your Maker is more likely.

Studies in Spain have found high levels of metals, including lead, in chanterelles, a common edible fungus in Europe. The studies also found thorium and uranium accumulated mostly in *Hypholoma* and *Gymnopilus* despite being species that live on fallen tree trunks and are isolated from the mineral substances of the soil. The scientists found no significant differences in the metal levels when comparing mushrooms collected from different substrates, habitats and locations.

The possible explanation is that mushrooms that form mycorrhizae are especially adapted to absorb chemical elements from the mineral particles of the soil and give them to the plant. This is their contribution to symbiosis, and, the more effective they are in providing nutritional elements to the plant, the closer their connection to it, and the more sugars from photosynthesis they can access, which is what the fungi are ultimately looking for. Mycorrhizal mushrooms carry out an indiscriminate acid attack on the mineral particles of the soil and absorb elements in quantities relative to the mineral composition of the soil. In some contaminated soils, or those with peculiar mineral characteristics (such as mine wastes), the mushrooms collected can reach such high concentrations of toxic elements that their consumption would be inadvisable.

In the case of fungi that grow on wood, the hypothesis is that when decay fungi grow on the wood they selectively absorb the toxins which the plant absorbed while it was alive. Further, the distribution of toxins in the fungus fruit body are not equal: the highest levels are observed in the spore-forming part, but not in spores; lower contents in the rest of the cap; and the lowest in the stipe.



A harmless-looking but very toxic hallucinogenic fungus (Internet image)

Certain fungi are lauded as medicinal species and in 2014 alone, it was estimated that the worldwide market value of medicinal mushrooms was US\$18 billion and growing at an enormous rate - mushrooming in fact! Today, China is responsible for over 85% of the world's medicinal mushroom production. For a long time, there has

been considerable concern over all health foods, nutritional supplements, and pharmaceutical ingredients that originate from China due to their high levels of soil contamination, industrial pollution, and toxic waterways. While there may be some truth to these concerns, it is also important to recognise that there are still many select areas in China that are extremely clean and far from industrial pollution. That may be so, but collection by untrained people, fraud, and poor quality-control may still be an issue.

It is unclear why mushrooms are seen as being so potent as medicines, but it is thought to be mainly related to their startlingly rapid growth; the resemblance of some to certain human body organs; and unproven traditions. If the fungi are not grown in clean soils, they tend to accumulate the heavy metals and other nasties that are in those contaminated soils. Too much mercury in the human body can cause brain and kidney damage, and loss of cognition; lead has been linked to bone, heart, and behavioural disorders; arsenic is a known cancer agent and effectively blocks the body's detoxification system; while cadmium has been linked to heart disease, and skin and kidney disorders.

Even *Agaricus bisporus*, the commonest supermarket mushroom in Australia, is known to absorb heavy metals such as copper, cadmium, lead, zinc, manganese, iron, chromium and nickel. When responsibly cultivated, *A. bisporus* absorbs less, although this mushroom is reported to be very susceptible to increasing content of mercury, and to a lesser extent, cadmium: it accumulates both these metals and lead in its fruiting

bodies. Metal levels reported in wild-growing *A. bisporus* are considerably higher than in cultivated fruiting bodies. The probable explanation is not only in different substrate composition and contamination, but also in different age of mycelium, which may exist for several years in nature, while only for several months in cultivated environments. The use of mushroom waste as garden fertilizer and mulch, together with heavy-metal-containing fertilisers such as chicken manure and superphosphate on vegetable gardens, is a cause for concern as *A. bisporus* from mushroom waste in these circumstances effectively become “wild” populations.

Have a look at the web site <https://fungimap.org.au/about-fungi/edible-poisonous-fungi/> There are certainly several edible wild mushrooms in Australia, and recipe books on how to prepare them, BUT identifying them absolutely correctly is a tedious process requiring a microscope and a great deal of expertise.

There are numerous myths about how to distinguish a poisonous mushroom from an edible one:

- if the cap skin peels readily then the fungus is not poisonous - **wrong**;
- you can always eat a fungus if slugs, snails or other animals have eaten it - **wrong**;
- only fungi growing under trees are poisonous – **wrong**;
- a poisonous fungus will blacken a silver spoon or coin - **wrong**;
- fungi that taste good are not poisonous - **wrong**.

There is **absolutely no easy way** of distinguishing edible mushrooms from poisonous mushrooms and in more than 95% of mushroom poisoning cases, poisoning occurs as a result of misidentification of the mushroom by an amateur mushroom hunter, often the people who consider themselves “experts” on edibility. If a professional mycologist takes hours with a microscope to identify a fungus, an amateur identification is obviously unreliable. Although most ingested mushrooms are either non-toxic or only gut irritants, resulting in mild to moderate toxic effects, you may just be allergic to them, so I recommend you don't take the chance.



Picture from Omphalina Jan 31, 2012, Vol. 3 (1)



DID YOU KNOW?

The common budding yeast, *Saccharomyces cerevisiae*, has been used to make bread and beer for thousands of years, but did you know that this yeast has 23% of its genes identical to those in humans? Although yeast and humans diverged from a common ancestor about a billion years ago, this suggests a strong conservation of gene function between yeast and humans. (Liu et al., *Biomed Rep.* 2017 Aug; 7(2): 153–158. doi: [10.3892/br.2017.941](https://doi.org/10.3892/br.2017.941))



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