LAND FOR WILDLIFE
CENTRAL AUSTRALIA
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GARDEN FOR WILDLIFE

Macrofungi Keeping Things 'Fun'

A Guide to Identifying Macrofungi in Central Australia

Fungi Classification

Fungi are neither plant nor animal, but are rather classified in their own kingdom. While fungi are often mistaken for plants, they lack chlorophyll, the essential component of plants that is responsible for the absorption of light to provide energy for photosynthesis. Therefore fungi do not manufacture their own energy, but rather secrete digestive enzymes and absorb the dissolved molecules. They are also differentiated from other organisms by the presence of chitin in their cell walls.

Land for Wildlife director, Bill Low, holding an unidentified pileate fungus, possibly Agaricus langei. Image: Land for Wildlife

Within the Fungi kingdom, there are phyletic divisions based on characteristics of reproductive structures, which are constantly being reassigned with advances in science. Currently, there are seven major phyla that are suggested and these include:

- **Microsporidia** (unicellular parasites of animals and protists)
- **Chytridiomycota** (chytrids, aquatic and the only fungi with active motility)
- **Blastocladiomycota** (saprotrophs that feed on decomposing organic matter; parasites of all eukaryotic groups)
- **Neocallimastigomycota** (anaerobic organisms, living in the digestive system of larger herbivorous mammals / terrestrial and aquatic environments enriched in cellulose)
- **Glomeromycota** (form arbuscular mycorrhizae as mutualist symbiosis for increased nutrient supply, bread molds)
- **Ascomycota** (spores in a sac-like structure known as sac fungi, including morels and truffles, yeasts)
- **Basidiomycota** (club fungi, including mushrooms)

Fungi Functionality

Fungi perform an essential role in the function of healthy ecosystems, decomposing organic matter and playing a role in nutrient cycling and exchange. Species from the Ascomycota and Basidiomycota are used as a source of food, can contain organic compounds that produce strong colours and therefore can be used for dyeing textiles, while other species can be used as fire starters (tinder fungi). Smaller fungi such as yeasts can be used in bread and fermented beverages or foods, molds have been used for the production of antibiotics, while other fungi can be used as biological pesticides (rust) and in filtration technologies. They also contribute greatly to Australia's biodiversity, with an estimated 2.2 million to 3.8 million species worldwide.

Macrofungi

It is the latter two of the phyla that is the focus of this fact sheet, containing species that many people will recognise as macrofungi (on the flipside, the majority of the world's fungi evade being seen until they form dense growths). Some examples of macrofungi fruiting bodies include mushrooms, toadstools, puffballs, truffles and earthstars.

Macrofungi are made up of a mycelium, which is the feeding and growing body of the fungus. The mycelium is in turn composed of microscopic cobweb-like threads called hyphae that are rarely visible to the naked eye. However, they also produce a large spore-bearing fruiting body which is conspicuous and often recognisable. The fruiting bodies are used by the fungi to reproduce and are therefore analogous to the flowers and fruits on plants.

Identifying a macrofungus requires a basic understanding of their structure. Macrofungi generally have gills, which produce spores, the colour of which can be used to help classify the species. When the cap is placed on a sheet of paper overnight, the spores fall off as a fine powder and provide an impression of the gill shape, which can also be used in identification. Juices that appear when breaking a fruiting body, bruises, odour, taste (not recommended as some can be poisonous or carry allergens), habitat and season can also be used to identify a macrofungus.

Ascomycota largely include the cup fungi, and then within the Basidiomycota, there seems to be differences that lead to morphological groupings (pileate, pleurotoid, polypore, jelly, corticioid, gasteroid and secotioid fungi). These are vaguely separated and described here, though they do not always affect phylogenetic relationships and are therefore arbitrary groupings.

Macrofungi Identification

Cup Fungi

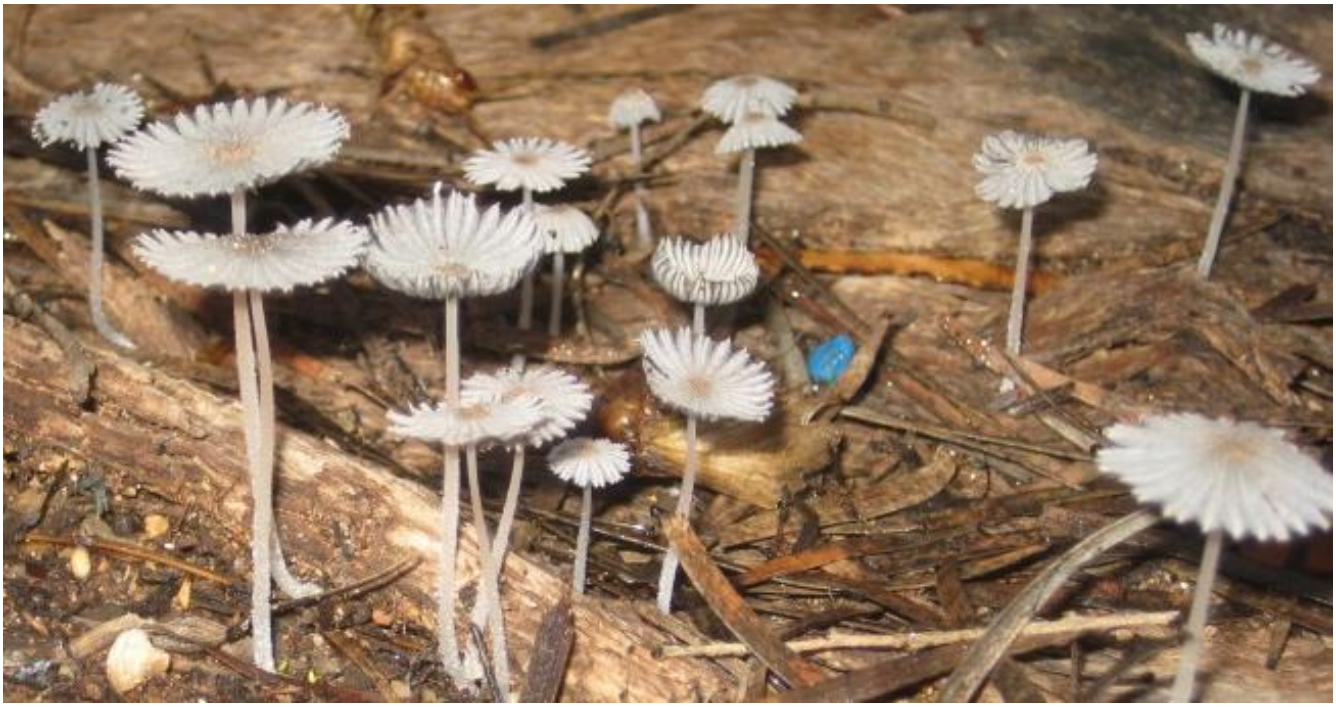
Cup fungi sit within the Ascomycota, and includes hypogeous (occurring or living below the surface) fungi (AKA Truffles) and epigeous cup fungi. None of these are particularly common in central Australia according to the ALA.

Desert Truffle (*Elderia arenivaga*, prev. *Choiromyces aboriginus*)

This is a truffle-like fungus found in dry parts of Australia, cracking the soil as it pushes up from beneath, and these cracks are used to find it. They are roughly spherical in shape, growing to 7 cm diameter. While they are a traditional food (with a soft consistency and tasking like bland cheese) and source of water, they are now rarely seen.

Pileate Form

Generally, mushrooms have a fruiting body characterized by the presence of a cap (pileus) that is clearly differentiated from the stalk (stipe) and has gills (lamellae) on the underside. However, the term mushroom has been used for a range of groupings listed below. For example, a stalk is generally absent in the polypores (form shelf-like brackets) and puffballs (have a supporting base) as well as others. Therefore, here I refer to the typical capped fungus that is supported on a stalk and has free/exposed gills for dispersal of spores. There are many species present in central Australia, with one of the most commonly reported to ALA being the False Parasol (*Chlorophyllum molybdites*).



An unidentified pileate fungi, possibly Parasola plicatilis. Image: Land for Wildlife

False Parasol (*Chlorophyllum molybdites*)

This is a widespread mushroom that is highly poisonous and produces severe gastrointestinal symptoms of vomiting and diarrhoea.

Pleurotoid Fungi and Polypores

Pleurotoid fungi are those with gills and laterally-attached fruiting bodies, and are commonly referred to as oyster mushrooms. Laterally-attached fungi with pores rather than gills on the underside are referred to as polypores, or bracket fungi, and their woody fruiting bodies are called conks. They are both typically wood-decay fungi and therefore most inhabit tree trunks or branches consuming the wood and therefore they play a very significant role in nutrient cycling and carbon dioxide production of ecosystems. Some species, such as the Hairy Trumpet (*Panus fasciatus*) has a stem and so therefore can be confused with that of a pileate form.

Scarlet Bracket Fungus (*Pycnosporus coccineus*)

This species is saprophytic, a white-rot decomposer fungus. The fruiting bodies of this polypore genus look like bright reddish-orange brackets and are widespread on dead wood due to their saprophytic nature. The upper surface is hard but the under-surface is porous. Despite being poisonous if swallowed, the fungus is used for medicinal purposes by some Indigenous groups, either chewed out (like a teething ring) or applied to the mouths of young children suffering from skin complaints. The fungus also emits an irritant smoke when burned.

Scarlet Bracket Fungus (Pycnosporus coccineus). Image: C. Heenan

Jelly Fungi

Jelly fungi are so named because their foliose and irregularly branched fruiting body has the consistency of jelly, or is rubbery and gelatinous. They harden and shrivel when dried and return to their original form when wet. While some are edible, they are unpleasant to taste and have an earthy flavour.

Corticioid Fungi

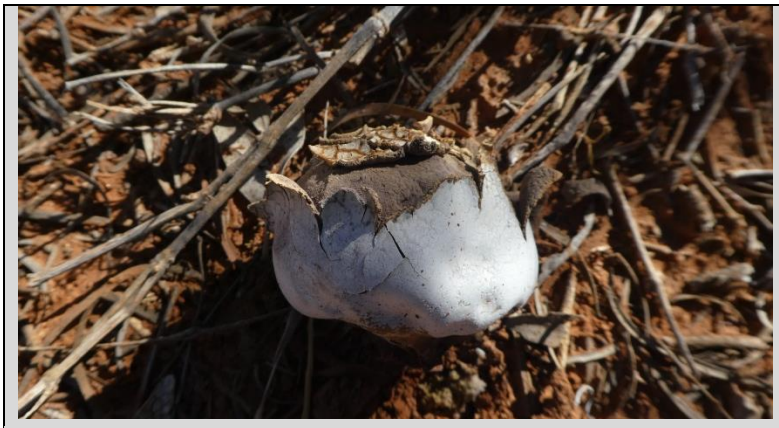
The corticioid fungi, also known as crust fungi and patch fungi, are a group of fungi having effused, smooth fruiting bodies that are formed on the undersides of dead tree trunks or branches. They are not overly common in central Australia; however there are roughly eight species that have been reported on the ALA.

Gasteroid Fungi

The gasteroid fungi are a group of fungi that produce spores inside their fruit bodies rather than on an outer surface. Species include puffballs, earthstars and stinkhorns. These sub-groups are expanded upon below.

Puffball

True puffballs do not have a visible stalk or stem. The distinguishing feature of all puffballs is that they do not have an open cap with spore-bearing gills. Instead, spores are produced internally, in a spheroidal fruiting body called a gasterothecium. As the spores mature, they form a mass called a gleba. Eventually, it develops an aperture, or bursts, and the spores escape. This grouping includes the genera *Abstoma*, *Bovista*, *Calvatia*, *Disciseda, Lycoperdon* and others.



Unidentified Puffball. Image: C. Heenan

Dead Man's Foot, Dyeball (*Pisolithus arhizus* syn. *Pisolithus tinctorius*)

The Puffball has a fruiting body that is light brown, has scaly skin and is round. It is often found at the base of trees or shrubs. It produces copious amounts of powdery spores that can be used as a strong yellow/orange dye for textiles when mature. When it is immature, it will have a tarry consistency and can be used on wounds. It is rarely used as a food resource, but it is eaten (raw or cooked) when young and soft as an emergency food.

Earthstar

Earthstars are 1-2 cm in diameter and height. As the Earthstars mature, the outer layer of the fruiting body splits into segments which turn outward creating a star-like pattern. The little bellows (endoperidium) that are propped up on the star shaped rays (exoperidium) release spores via the hole in the centre when rain drops, or wind-blown litter strikes the bellows and puffs out the spores. There are six or so species in Central Australia, with the most commonly reported to ALA being the Tiny Earthstar (*Geastrum minimum*).

Earthstar. Image: Land for Wildlife

Stinkhorn (Phallus sp.) with a netted veil that sheds off with age. Image: B. Gilfedder

Stinkhorn

Stinkhorns are known for their foul-smelling, sticky spore masses, or gleba. Spore-producing tissues break down to form a slime that houses the spores. This slime has a rotting meat (carrion) smell that is attractive to various flies, which then feed on the mass and secondarily transport spores on their feet to other locations. Once the fungi have begun producing the odorous slime, they are toxic and should be avoided. Some dogs can be attracted to the rotting meat odour and consumption of the fungus can result in sickness (or worse). The fruiting bodies themselves begin their development as oval or round structures known as eggs, but morph into a range of shapes.

Stinkhorn (*Itajahya hornseyi* syn. *Itajahya galericulata*)

Summer rains in central Australia in 2017 brought up some unusual fungi, including this fragrant specimen. The fungus popped up overnight and by the afternoon, it possessed a strange foetid smell. Read more about this Stinkhorn observation on the Land for Wildlife blog Stinkhorn Bringing in the Crowds and view additional Stinkhorn images in the January 2017 Newsletter.

Stinkhorn (Itajahya sp.). Image: C. Heenan

Birds Nest

Birds nest fungi have small fruiting bodies that resemble egg-filled birds' nests. They feed on decomposing organic matter and so are often seen on decaying wood and in soils enriched with wood chips or bark mulch. Their spores develop internally, and the ‘splash cups’ project spores when they are hit by rain.

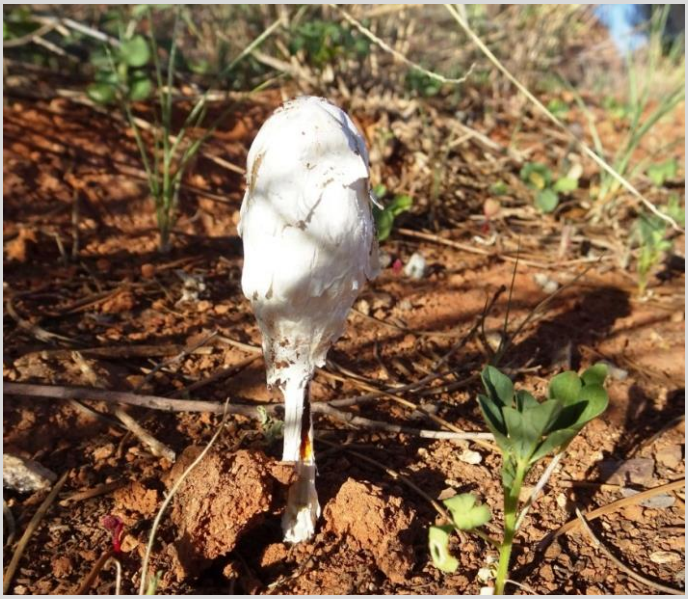
Birds nest fungi. Image: T. Seager

Secotioid Fungi

Secotioid fungi are an intermediate growth form between mushroom fungi and closed bag-shaped fungi. They often lack the vertical orientation needed to allow the spores to be dispersed by wind, and the spores are prevented from being dispersed (e.g. when the gills are completely enclosed). The most common of the grouping is the Stalked Puffball (*Podaxis pistillaris*), though there are several other species of ‘stalked puffball’ in central Australia.

Stalked Puffball (*Podaxis pistillaris*)

Despite the common name, this species is not related to other Puffballs. It has a 10 cm tall stem and a shaggy cap, which houses a mass of purple-black spores. Often found on sandy soils, it has various traditional uses including decoration of the body, darkening grey facial hair, and fly repellent.



Young Stalked Puffball. Image: C. Heenan

Old Stalked Puffball with browned cap. Image: C. Heenan

Note: See the June 2009 and April 2010 newsletter articles for more on fungi.

On a final note, something I discovered in the process of preparing this fact sheet, was that there are very few records of fungi submitted to the ALA. If you see a fungus, take a photo, consider taking a sample to the Alice Springs Herbarium (they will forward it to the Darwin collection), get it identified and submit a sighting on the Atlas of Living Australia!

References

- Atlas of Living Australia (2019). Atlas of Living Australia. https://www.ala.org.au/
- Latz, P.K. (1995). Bushfires and Bushtucker: Aboriginal Plant Use in Central Australia. IAD Press, Alice Springs, NT.

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Based on the article that appeared in the Land for Wildlife Newsletter – March 2019 (LINK)