

The Value of Fungi

They are neither plants nor animals, and there are about 10,000 different species of them in Australia. They are macrofungi - the fungi that you can see with an unaided eye. This Note describes various types of macrofungi and the ecological roles that they play.

The Fungi Kingdom is roughly divided into two categories: macrofungi and microfungi. Microfungi tend to be minute and are hard to see with the naked eye with common examples including yeasts, penicillin, moulds, plant rusts and mildew.

All fungi are vital to the health and functioning of our world and yet so little is known about them. Only about 25% of Australian macrofungal species have even been documented. Macrofungi are fungi that you will see in bushland or on your garden mulch and are classified and defined by their fruiting bodies - the mushrooms and toadstools that we see above ground.

Macrofungi do not have roots, leaves, flowers or chlorophyll for photosynthesis and therefore need to obtain their own food from other organisms. Some fungi are parasitic and eventually kill their host, while other species live in partnership with their host, such as

mycorrhizal fungi that assist eucalypts and wattles to grow.

Fungi that we see are fruiting bodies of the actual fungus below the surface. The fungus itself consists of microscopic threads called hyphae. A network of **hyphae** is called a **mycelium** which resembles a tangled mass of tiny white threads that wrap in and around the material on which the fungus is growing. The fungus would look like a loose mass of cotton wool if it could be separated from its substrate. Fungi have cell walls made of a type of chitin (related to crab shells) and do not contain cellulose like plants.

Fungal ecology

Fungi play an essential role in Australian bushland ecology. They have three main ecological roles:

- 1. Mycorrhizal associations.** Mycorrhizal fungi live on and around the roots of some plant species especially eucalypts and wattles. Mycorrhizal fungi assist in the plant to uptake essential minerals and nutrients, such as nitrogen, which ensures healthy plant function.
- 2. Recycling.** Fungi that help breakdown and recycle dead plant and animal material (e.g. leaf litter, dead wood and animal dung) are called saprophytic. As saprophytic fungi breakdown dead material, this process releases essential nutrients and moisture into the soil. Without this activity, fallen logs, branches and leaves would congest our forests and many soils would lose their productivity.
- 3. Providing food.** Fungi provide critical food resources for many of our native mammals, birds, reptiles and invertebrates. Some mammals dig out and eat underground puffball-like fungi (commonly, but incorrectly, called 'truffles'. Australia does not have any native species of the highly-prized European truffle, *Tuber sp.*). Fungi eating mammals then disperse fungal spores via their faeces. In some cases, fungal spores are more viable once they have passed through a mammal's gut. Fungi eating mammals include rodents (some *Rattus*, *Pseudomys* and *Melomys* spp.), bandicoots, wallabies (i.e. Swamp Wallaby and Red-necked Pademelon) and some possums.



The foul-smelling slime (shown as brown patches) produced by this Craypot Stinkhorn (*Colus hirudinosus*) contain fungal spores which are dispersed by flies that are attracted to the odour.

Mycorrhizal fungi

Many species of macrofungi form mutually beneficial relationships with plants. Mycorrhizal fungi assist in providing nutrients and access to water that otherwise may be unavailable to the plants. Such fungi are essential given Australia's nutrient poor soils. Mycorrhizal fungi may also protect tree roots against pathogens and insect attacks. Trees commonly found to have mycorrhizal fungi are those in the Myrtaceae family (eucalypts, paperbarks and bottlebrushes), acacias, casuarinas and Antarctic Beech (*Nothofagus moorei*).



*The Curry Punk Fungi has a distinct curry-like odour.
Photo by Keith McCosh.*

Fungi also have very interesting relationships with insects. Some beetles are fungal specialists and have highly specialised symbiotic relationships. A number of beetles and flies lay their eggs in fungi, which then become food for the larvae. Other insects eat decaying fungi, while some eat the hyphae found under logs and bark. Some male flies (*Heleomyzidae* sp.) defend mushrooms and attract female flies to their mushroom to mate. Given that there is so little known about the ecology of macrofungi in Australia, there are likely to be other equally important ecological roles that are still unknown.

Fungal research

It is a difficult business researching fungi as fruiting bodies can appear and disappear rapidly (some have a life span of three hours). Precise knowledge of Australian macrofungi (both species diversity and ecology) remains extremely limited. There are probably about 10-15,000 macrofungal species in South East Queensland, of which perhaps 3-5,000 thousand have been scientifically described. Even for those species already known, very limited information is held on their ecology, distribution and abundance. Landholders and naturalists are vitally important to Australian mycology (the study of fungi) for providing distribution and ecological data about fungi.

Get involved in fungal research and conservation

The Fungimap project is an opportunity for Land for Wildlife members and other landholders to be involved in research and conservation of Australian fungi. It's an Australia-wide scheme that aims to stimulate and support the study and conservation of Australian macrofungi. Hundreds of volunteers and community members are working across Australia to collect, store, analyse and disseminate information about fungi. One of the main activities of Fungimap is the mapping of 105 readily recognisable target species of fungi. Most of the target species are reasonably common as this gives recorders a good chance of seeing at least some of the target species. More than 20,000 Fungimap records have been received so far and data has shown that some target species are more widespread than previously thought. Fungimap has an excellent website, which profiles all the target species and provides copies of previous newsletters at www.rbg.vic.gov.au/fungimap. For more information on submitting records or to join Fungimap, email fungimap@rbg.vic.gov.au or phone (03) 9252 2374.



Fungi profile: Earth Star fungi

Earth Star fungi (*Geastrum* spp.) require rain for spore dispersal. Raindrops hit the outer star shaped structure (called an endoperidium) which acts like a bellows forcing the spores out the top of the stoma (the middle round ball). Large colonies of these fungi can give spectacular displays of ejected spores floating in the air above them during light rain.



Earth Star fungi require raindrops to land on the star shaped structure to trigger the release of spores. Photo by Jutta Godwin.

Fungi profile: Ghost Fungus

The Ghost Fungus (*Omphalotus nidiformis*) is commonly found on dead logs, decaying stumps and at the base of living plants, such as *Eucalyptus* sp., *Leptospermum* sp., *Banksia* sp., *Grevillea* sp and also exotic pines. It produces a spectacular display of luminous light at night and is one of two well-known luminous species of Australian fungi. It is not known why fungi produce light. Giant Land Snails are attracted to large colonies of Ghost Fungi, eating them voraciously overnight. Perhaps the snails are attracted to the light and disperse fungal spores in return. More research is required to answer these questions. Whilst similar in appearance to the edible (but non-luminescent) Oyster Mushroom, the Ghost Fungus is poisonous to humans causing severe vomiting within an hour of ingestion.



Ghost Fungus glowing at night (left) and during the day (right). Photographs by Sandy Craig.

Fungi profile: Red Starfish fungus

The Red Starfish fungus (*Aseroe rubra*) is a member of the Stinkhorn Fungi group. This group of fungi always have a foetid smelling, slimy spore mass. *Aseroe rubra* is found commonly in south-eastern Australia. This fungus is like a large, sea anemone with outstretched red tentacles and rotten-smelling brown-green slime in the centre. The slime contains fungal spores that are dispersed by flies and other animals attracted by the smell. Some dogs are attracted to the rotting meat odour, and several have died as a result of eating Stinkhorn Fungi.

The immature fruiting body of the Red Starfish fungus emerges from the ground looking like a white gelatinous egg. It then opens up to display the bright red arms and the rotten spore mass. Colours vary from red to pink, yellow, orange and even white. They occur either solitary or in large numbers and are generally found in grasslands and woodlands with rich soils and deep litter. They also occur in urban areas in compost, garden mulch and eucalypt woodchips.

The Red Starfish fungus can appear in garden mulch or bushland areas.

Photo by Jutta Godwin.



How to encourage fungi

The south-eastern corner of Queensland is remarkably rich in fungal species. The easiest way to maintain macrofungal populations is to ensure that large habitat areas remain intact without major human impact. Macrofungi are tied to the habitat and if the habitat is maintained in a healthy state, the macrofungal biodiversity will also be retained. The community has an essential role to play in preserving and collecting data on macrofungi. Mapping fungi distributions and collecting herbarium quality specimens are important actions.

What you can do

- ✓ Maintain natural areas in good condition.
- ✓ Retain understorey vegetation for Swamp Wallabies and other fungi-eating animals.
- ✓ Discover what fungi occur in your area.
- ✓ Record observations of fungi on your property.
- ✓ Observe the changes in fungi with seasonal and climatic conditions.
- ✓ Join the Fungimap Project.

References and further reading

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Grey P&E (2005) *Fungi Down Under: the Fungimap Guide to Australian Fungi*. Fungimap.

Young AM (2005) *A Field Guide to the Fungi of Australia*. University of New South Wales Press.

Australian National Botanic Gardens website, www.anbg.gov.au/fungi/index.html



Jelly fungi (Auricularia species) are gelatinous in texture and are usually found on dead wood in subtropical forests.



The fruiting body of the Golden Curtain Crust (Stereum ostrea), a leather fungus, lives on dead wood and assists the decomposition process.



A fairly common fungus, Orange Fan (Anthracophyllum archeri), is found on dead branches and logs in wet forests. All three species shown above are decomposer (saprotrophic) fungi.

Land for Wildlife is a voluntary program that encourages and assists landholders to provide habitat for wildlife on their properties. For more information about Land for Wildlife South East Queensland, or to download *Land for Wildlife Notes* free of charge, visit www.lfwseq.com.au
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