Tropical Topics

An interpretive newsletter for the tourism industry

Fungi

No. 72 March 2002

Notes from the Editor

The Wet brings mould. Blighting our ceilings, covering our leather shoes with fuzz, penetrating our binoculars and cameras and taking up residence between our toes, it is not a welcome aspect of life in the tropics.

On the other hand, it is a time of year when bright and startling shapes leap suddenly from the ground and from rotten logs to surprise and delight us. Mushrooms, toadstools, mould, slime, mildew, rusts, smut and truffles – all are fungi, infiltrating every nook and cranny of every type of environment.

Of the estimated 250 000 species of fungi in Australia only about 5-10 percent have been named. This is partly a reflection on how little work has been done and partly because the vast majority are microfungi which are just too small to be noticed. About 10 000 are regarded as macrofungi, with visible fruiting bodies. This *Tropical Topics* deals with this group.

I would like to thank Ceri Pearce, Australian Tropical Mycology Research Centre, for her valuable help with this issue.

Invisible recyclers

If the rubbish which we put outside our houses for collection was never picked up it would eventually fill the street, gradually making access impossible. Similarly, without fungi, natural rubbish such as leaves, twigs and logs would pile up on the forest floor, forming an impenetrable barrier reaching right to the canopy.

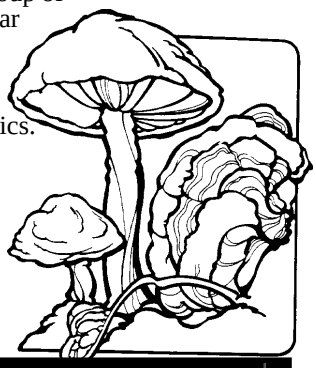
Largely invisible, fungi do a tremendous job as recycling agents. Breaking down dead plant material, they not only keep the forest floor clean but also free up the nutrients, making them available to the living. It has been estimated that fungi are responsible for the release of 85 percent of the carbon, with bacteria and animals breaking down the rest. Without this recycling service, those nutrients would be locked up in ever increasing piles of natural rubbish, soil fertility would steadily decline and plant growth would suffer. It has been suggested that without fungi, life on earth as we know it would be virtually destroyed within 50 or 60 years.

Generally, all we see of a fungus is the fruiting body. The rest of the organism – the equivalent of the trunk and branches – is hidden from view. A vast network of extremely fine, hair-like filaments thread their way through soil, wood and leaf litter, breaking it down and feeding on the nutrients released.

The contribution of fungi does not stop with their recycling efforts. Many species form close symbiotic relationships with living plants, thus enhancing the growth and survival of both. Indeed, the vast majority of Australian plants have been shown to benefit from important fungal liaisons. (See Marvellous mycorrhizae, p2).

Fungal fruiting bodies are also an important food source for various animals; over 30 Australian mammal species are known to eat them and some, such as bettongs and potoroos eat little else. We humans also eat fungi. High in B group vitamins, potassium and fibre, mushrooms are one of the rare natural non-animal sources of vitamin B12, so are important to vegetarians. In addition, yeast – another fungus – is used to make beer, wine and many breads. Fungi are used in some cheeses as well as in the manufacture of soy sauce and tofu. Fungi also give us important drugs including penicillin and other compounds (see page 7).

Naturally, the fungi which rot our constructions, spoil our clothes and food, attack our crops and cause ill health are unwelcome. However, the benefits of this diverse but largely invisible group of organisms far outweigh their negative characteristics.



The nutrient-gathering filaments (the 'roots') of a fungi are known as hyphae. These tiny tubes are usually much thinner than a cobweb and are often invisible. The mass of hyphae is known as the mycelium.

WET TROPICS MANAGEMENT AUTHORITY

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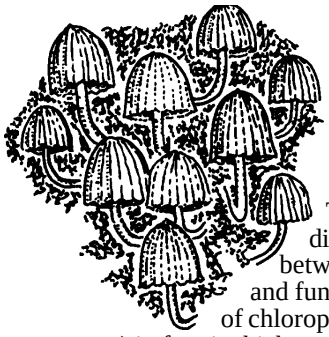
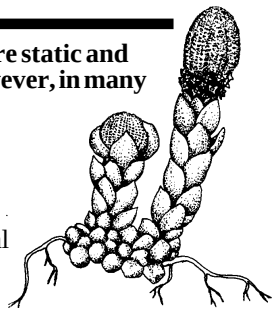


Fungi – in a kingdom of their own

Living things are classified in kingdoms. For a long time, because they are static and generally resemble plants, fungi were included in the plant kingdom. However, in many ways they also resemble animals.

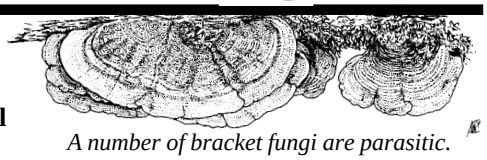
The main difference between plants and fungi is the lack of chlorophyll (green matter) in fungi which means that they cannot create their own food from sunlight through photosynthesis*. Instead, like animals, they must obtain nourishment from other organisms. In addition, the cell walls of many fungi are composed of chitin, an animal product found in insect shells. Although plants use starch to store energy, fungi, like animals, store it as glycogen. On the other hand, fungi reproduce by producing spores, which are not unlike the spores (seeds) of primitive plants. Finally, fungi are distinct from many plants and animals in that they release enzymes to externally digest their food, subsequently reabsorbing the products, including the nutrients.



*It is worth mentioning that some plants, notably our local *Balanophora fungosa* (right), also lack chlorophyll so must live as parasites on the roots of other plants. They are, nonetheless, plants. It is quite likely that their ancestors had chlorophyll but then lost it as it became redundant.

Different lifestyles

The majority of fungi, known as saprophytes, make their living by breaking down dead plant and animal material, including dung. They produce enzymes which soften the tissues and speed up the process of decomposition. Others, however, feed on living organisms either as parasites, which are often harmful to the hosts, or in symbiotic relationships in which both parties benefit. Parasitic fungi are in the minority, but nevertheless cause considerable damage in forest plantations and fruit orchards.



A number of bracket fungi are parasitic.

Marvellous mycorrhizae

Certain fungi form close associations with particular plants. The 'root systems' of the fungi – the hyphae – penetrate the root systems of the plant. The two organisms then join forces to exploit the local environment in the most efficient way. The fungus feeds on carbohydrates produced by the plant through the process of photosynthesis. In return, it acts as an extension of the plant's root system, its hyphae spreading further, and into tinier spaces, than the plant's roots are able to. They collect vital resources such as water, trace elements and, notably, phosphorus which are fed back into the host plant. The relationship is not unlike that of corals and the algal cells (zooxanthellae) which reside in their tissues, each partner using its particular talents for the common good.

These symbiotic fungi may also protect the host plants from fungal diseases. They may do this by attacking invading fungi or simply by leaving no room for them to move in. In any case, a plant which is well fed, as those with mycorrhizae inevitably are, is better able to resist disease.

Mycorrhizal fungi play an extremely important role in the ecosystem, particularly in the nutrient-poor soils of Australia; they are thought to form associations with up to 90 percent of all Australian plants. (Trees in the Proteaceae family are an exception.) In fact, some plants cannot live without them – orchid seeds will not germinate unless infected with the correct fungus and even some adult orchid plants, which lack green matter, are completely dependent on them. (Horticulturalists use fungi, isolated from stem tissue of mature plants, when preparing the germination medium for propagated orchids.)

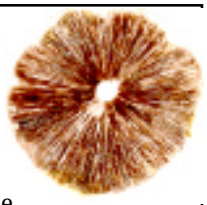
Much research into mycorrhizal fungi has been conducted by experts concerned with plantation forestry, revegetation and agriculture. Now that the importance of these fungi has been recognised they are being deliberately introduced. Imported pines grew badly before the correct fungi were also imported and, similarly, mycorrhizal fungi are exported to eucalypt plantations around the world. Some mycorrhizal fungi produce underground fruiting bodies but others, notably in the Russula, Cortinarius, Lactarius and Boletaceae groups, fruit above ground.

More details in Facts and stats, p6.

Vegetable caterpillars,

Cordyceps spp., are rare macrofungi which parasitise living animals. They target certain moth and beetle larvae which live beneath the ground. The caterpillars emerge at night to feed on the surface and encounter the spores of the fungi which are either eaten or become attached to the caterpillar's skin. The fungus then begins to grow inside the body of the unfortunate host, gradually filling it with mycelium. The fruiting body emerges from the head of the larvae, pushing up on a stalk, up to a metre long, to reach the surface. The forest floor where these fungi and their hosts are abundant may be studded with the elongated, cigar or club-shaped fruiting bodies, up to 12cm long.

Spores

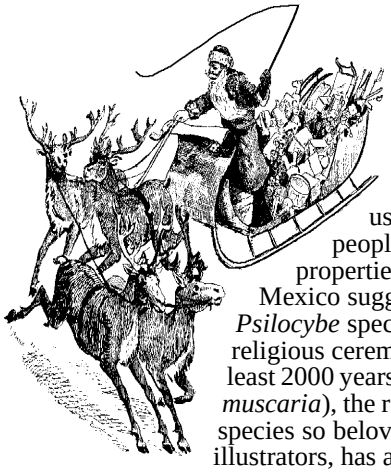


Spore print

Spores are produced in vast numbers – a field mushroom may release spores at the rate of 200 million an hour, adding up to billions during its short life. Puffballs are even more prolific; it has been estimated that giant puffballs produce 15 trillion spores from each fruiting body.

Most are distributed by wind, but some are carried by animals. They may stick to the feet of insects, such as fungus gnats, or they may be consumed and distributed in droppings. Flies feed on the spore-saturated slime of some fruiting bodies and truffles are designed to be consumed by bettongs and other carriers. Dung fungi simply spread their spores on to nearby pasture to be accidentally consumed by browsing animals and deposited, conveniently, in a pile of dung where they grow, produce fruiting bodies and begin the cycle again. While the heat and enzymes in the guts of animals will kill the spores of many fungi, those designed for dispersal in this way are unaffected – and may even have their germination chances increased by the journey.

Extremely small, with very little in the way of food reserves to sustain them, spores die quickly and very very few ever survive. However, being so small and light, they can travel huge distances and thus colonise vast areas – which makes it difficult to distinguish between endemic Australian species and those which have hitched a ride here on introduced plants.



Fungi and people

Edible fungi have been artificially cultivated in China and Japan for several thousand years. Apart from using them as food sources, people have exploited the chemical properties of many fungi. Carvings in Mexico suggest that hallucinogenic *Psilocybe* species were being used in religious ceremonies by the Mayan people at least 2000 years ago. Fly agaric (*Amanita muscaria*), the red-capped, white-speckled species so beloved of children's book illustrators, has a long tradition of use in northern Europe. Shamans, (priests) in Lapland used to eat this fungus which – after they had wakened from the coma it induced – gave them superhuman strength. The active ingredient in the fungus allowed the shamans to make enormous leaps with little effort. The fungus has the same effect on reindeer, who eat them at every opportunity. This led to the myth of flying reindeer pulling the sleigh of a shaman, dressed in the colours of the fungus, red and white – the origin of the Santa legend.

Fungi are particularly feared due to the poisonous qualities of some mushrooms/toadstools – but it is only fair to point out that many plants are also poisonous. For example, all parts of oleander, which is grown in many gardens, are extremely toxic. In fact, 90 percent of all deaths from fungus poisoning, world-wide, are caused by a single species, the death cap (*Amanita phalloides*); one third of a cap is enough to kill an adult. Fortunately this species is rare in Australia, although a man in Melbourne was fatally poisoned in 1996. Severe to moderate poisoning is caused by a number of other species. Some are poisonous only when eaten raw, others when eaten in combination with alcohol and yet others may be eaten safely by some people but cause allergic reactions in others. Chitin in the fungal wall can cause indigestion, especially if large amounts are eaten. There are no easy methods for identifying poisonous fungi, apart from careful study and experience. Indeed, the supermarket is the safest place to find edible mushrooms.

Ergot is a fungus which infects edible grasses, particularly rye. It is a powerful poison which affects the central nervous system causing spasms, paranoia and hallucinations as well as stillbirths and a weakening of the immune system. It is possible that the symptoms have been interpreted both as 'bewitching' and religious ecstasy at various times. Like many poisons, ergot also has pharmaceutical potential especially for the treatment of Parkinson's disease. LSD is derived from ergot.

Dry rot (*Serpula lacrimans*) is a notorious fungus which feeds on structural timber. It needs wet conditions to become established, but then may spread to dry wood.

Commercial uses

For many years now, industrial chemicals such as acetic, citric and oxalic acids have been commercially produced using fungi. More recently fungi have been used to produce enzymes such as cellulases, lipases, pectinases (jam and fruit preservatives), rennet and proteases (for breadmaking). Some of these enzymes are also used in biological washing powders.

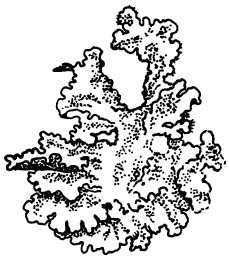
Relatively new drugs derived from fungi include Cycloporin A, which has revolutionised transplant surgery and is used to prevent organ rejection, and Lovastatin, a cholesterol lowering drug. The total market value of drugs derived from fungi now exceeds US$20 billion a year.

Acknowledgements to Ceri Pearce.

Aboriginal uses

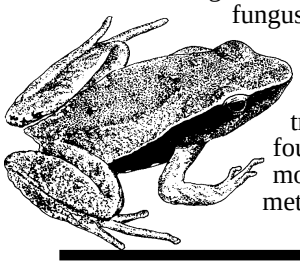
A number of fungi have been eaten by indigenous people in Australia, and some used for medicinal purposes, as dressings for sores or, smoked or infused, as remedies for sore throats and coughs. A scarlet bracket fungi from desert areas was chewed to cure sore mouths and given to teething babies – but is poisonous if swallowed. Liquid from some fungi has been used as eye drops. The spores of puffballs are a traditional source of coloured powder rubbed on the body for decoration and also serve as baby powder. Dried bracket fungi make good, portable kindling for fires.

Lichens are a combination of algae and fungi. The alga uses its green stuff (chlorophyll) to create food from sunlight but has no roots. The fungus provides the 'roots', in the form of hyphae, which collect water and minerals to contribute to the partnership. Each partner depends on the other. Together they make a lichen.



Frog fungi (not toadstools)

A fungus, *Batrachochytrium dendrobatidus*, more commonly known as Chytrid fungus, is being blamed for contributing to the deaths of frogs. It is widespread in Australian frogs, as well as in cane toads. The spores of the fungus grow inside the outer layers of the skin, causing it to thicken, and eventually lead to the frog's death. The fungal spores are easily transmitted in water and have been found in the mouths of tadpoles. It moves into their skin after they have metamorphosed into frogs.

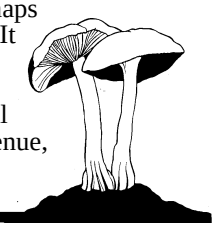


FUNGIMAP

This is a joint initiative of the Field Naturalists Club of Victoria and the Royal Botanic Gardens Melbourne. It is a scheme to map the distribution of 100 species of Australian fungi using information sent in by a network of volunteers across Australia. Photos of most of these species, with information and mapped records can be found on the web site: http://calcite.apana.org.au/fungimap You can also read the newsletters and find out more about fungi on the site.

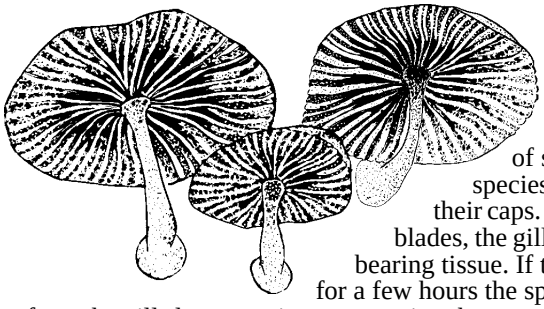
Remarkably little is known about the distributions of Australian fungi. By collecting records, the organisers of FUNGIMAP aim to work out the major patterns of distribution, habitat and substrate preferences and factors determining their limits or boundaries. They are also interested in the timing of, and factors affecting fruiting, as well as species surviving in remnant vegetation, particularly in urban areas, and the effects of pollution and disturbance.

FUNGIMAP has produced a CD-ROM, designed for both experts and beginners. It contains more than 700 colour pictures of most of the 100 target species, maps and key features to help with identification. It costs $15 plus $3 postage (in Australia). Cheques to 'Field Naturalists Club of Victoria' should be sent to: Fungimap, Royal Botanic Gardens Melbourne, Birdwood Avenue, SOUTH YARRA, VIC 3141. Queries can be emailed to fungimap@rbg.vic.gov.au



Fungal fruits

The fruiting bodies are usually all we ever see of the fungi around us. They come in a range of varied and wonderful shapes.

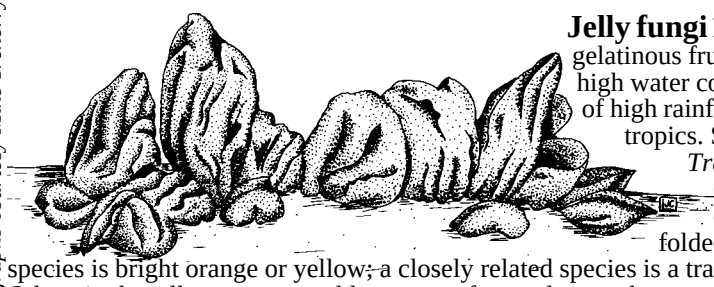


Agaric fungi are those species which are most commonly called mushrooms or toadstools. Although the fruiting bodies appear in all sorts of shapes, sizes and colours, agaric species all have gills on the undersides of their caps. Growing in more or less parallel blades, the gills are covered with fertile spore-bearing tissue. If they are placed on paper for a few hours the spores which drop down from the gills leave a print representing the pattern of the gills; the colour of the spores and the pattern they make can help in identification of species. The young fruiting bodies are often covered by an external skin known as the veil. This bursts open but remnants sometimes remain – these are the white bits on the red cap of the fly agaric (*Amanita muscaria*) and the ring, below the cap, on many *Amanita* species. Some agarics, such as the cultivated mushroom, have a stalk in the middle of the cap but others have a stalk to the side and grow as brackets on living or dead wood. Some produce single fruiting bodies, others grow in dense clusters.

Spore print of agaric fungus

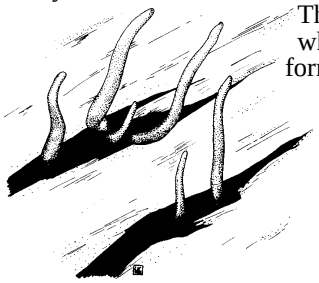
Polypore fungi have pores in the place of gills. These pores are, in fact, the open ends of numerous tightly-packed tubes which contain the spores. Boletus fungi are polypores. They are fleshy fungi, related to agarics, and have central stems. They tend to produce quite solid, stout fruiting bodies – one specimen, found in Victoria, weighed 29kg. Other polypore fungi are more woody. Many of them grow as bracket fungi, lacking stems and attached to living and dead wood. The fruiting bodies of these types tend to be long-lasting, and may indeed display growth rings which represent years.

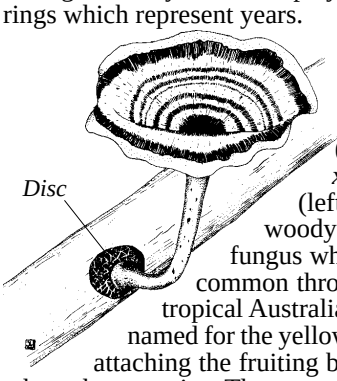
Spore print of polypore fungus



Coral, cup and bridal veil photographs courtesy Mike Trenerry

Jelly fungi have flabby, moist, gelatinous fruiting bodies with a high water content and like areas of high rainfall, such as the wet tropics. Some, such as *Tremella mesenterica* (left) have a convoluted multi-folded surface. This species is bright orange or yellow; a closely related species is a translucent white. Others in the jelly group resemble groups of tentacles, or clusters of worms, poking out from within the wood (below). Yet others look like ears or brackets. Jelly fungi are usually found on wood and are often parasitic on other fungi, particularly bracket fungi. They tend to shrivel up in dry weather but unlike agarics, which never recover, jelly fungi can regain their original form when rehydrated.



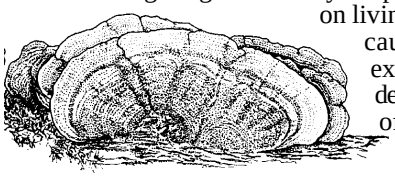


Yellow-foot fungus (*Microporus xanthopus*) (left) is a woody, polypore fungus which is common throughout tropical Australia. It is named for the yellow disc attaching the fruiting body to branches or twigs. The top, which is slightly funnel-shaped, is attractively patterned with concentric circles of varying shades of brown. Underneath are very fine pores.

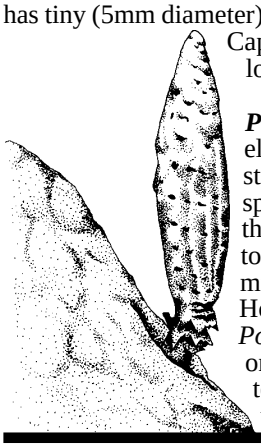
Coral fungi sometimes create dense, complex, branching clumps of growth which resemble corals, or cauliflowers. Some species, however, are much less elaborate, the fruiting bodies appearing as sparse, unbranched spikes. Spores are produced on most of the surface, apart from the stems. Most coral fungi appear on the ground but some grow on wood. In spite of their fragile appearance, these fungi tend to be firm and rubbery.

Spine fungi have spines or teeth in the place of gills or pores. Some spine fungi have 'mushroom' shaped caps while others form crusts on the lower sides of logs or branches, the long spines hanging down like mini-stalactites.

Many **bracket fungi** have pores. Bracket fungi are sometimes very tough and long-lasting. Whereas the shape of agaric fungi depends on their cells being inflated with water, bracket fungi tend to be constructed of thick fibres. Some have been used as blotting paper to dry wet ink, with layers being sliced off as they became stained to expose a fresh, white surface. Dried specimens make good tinder for lighting fires. Many are parasitic on living trees, causing extensive destruction of wood.



Puffballs are common ball-shaped fungi which darken with age and eventually split open to release huge numbers of wind dispersed spores. Related species include earth stars, which have an outer layer of tissue that splits to produce a star-shaped pattern around the central ball. The bird's nest fungi (*Nidula* spp) is also part of this group. It has tiny (5mm diameter) fruiting bodies which occur in groups, usually on dead wood. Caps fall off the little capsules to reveal packages of spores which look like 'eggs' in the nest. Falling raindrops disperse the spores.



Podaxis carcinomalis (left) is in the puffball group. The pale, elongated fruiting bodies of this fungus can sometimes be seen sticking out of termite mounds. As they dry out they split, the spores dispersing in the wind. Eventually they wither away until they look like black roots. Termites in Africa and Asia are known to cultivate fungus gardens within their mounds, where the fungal mycelium breaks plant material down into digestible forms. However, scientists are not aware of any relationship between *Podaxis carcinomalis* and termites. Since this fungus also grows on the ground, it doesn't seem to rely on mound-building termites, so its appearance on the mounds may be incidental to the activities of the occupants.

Cup fungi often produce fruiting bodies in the form of discs which are frequently curved to form a concave, cup- or saucer-shaped surface. It is from this upper surface that the spores are produced. Some, less regular forms, look like orange peel, some are cushion-shaped and others, such as the vegetable caterpillars (see page 2), are cigar shaped. The edible morel is part of this group.

Stinkhorns make their presence known! Egg-like sacs appearing on the ground burst open to release a variety of foul-smelling, bizarrely-shaped fruiting bodies. The bridal veil fungus (*Dictyophora* sp) (below) is fairly common, often appearing in rainforests and from wood chip mulch in gardens. A long white stalk up to 16cm high is topped with a wrinkled orange to brownish cap below which hangs a delicate white or orange lacy 'veil'. The spores are contained in a brown slime on the cap which smells like dead animals or faeces and thus attracts swarms of flies.

They feed on the slime and spread the spores in their droppings. Stinkhorns come in many forms and can look like red 'seastars', anemones or latticed baskets (see below).

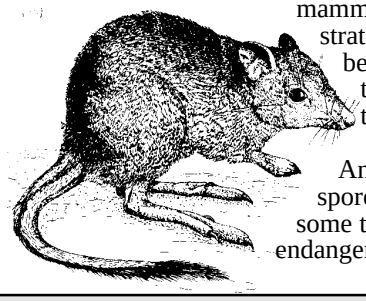
Truffles

Strictly speaking, the term truffle refers to the genus *Tuber*, which includes the European gourmet truffles. However, the term is often used in Australia for all those fungi which produce underground fruiting bodies. Just because they fruit in the same way does not mean that these fungi are related. Many are more closely related to fungi with above-ground fruiting bodies. Indeed, the fruiting bodies of some underground fruiting species resemble distorted button mushrooms with stalk and gills enclosed within a cap which never expands. Others are ball-like in form with the spores completely enclosed – rather like puffballs. Some are found just under the leaf litter, while others are deeply buried in the soil.

Wet Tropics truffles

Truffle photographs courtesy CRC Rainforest

Truffle-like fungi are a very important food source for a number of animals. Thirty-seven native Australian mammals have been recorded eating truffles. Bettongs and potoroos are particularly dependent on them but they form an important part of the diet of a variety of other animals, including a number of rodents, bandicoots and wallabies, notably the swamp wallaby. Truffles are not generally a good source of nutrients for mammals but studies of bettongs show they have developed a strategy for using them. Special bacteria in one part of the bettong's stomach consume the fungi. These bacteria and their by-products are then digested by another part of the stomach, providing a balanced diet.



Animals which eat truffles are important dispersers of their spores, which are deposited in their droppings. However some truffle eaters, such as the northern bettong (above), are endangered. If these animals become extinct it is likely that their food source will also disappear because without dispersers the fruiting bodies would remain buried in the ground. Similarly, there are concerns that attempts to reintroduce the animals into former habitat may fail if their food source has suffered a decline in their absence. In addition, since truffle-like fungi also tend to be mycorrhizal (see page 2), plants in the area are also likely to suffer if the dispersers of the fungi which make such an important contribution to their growth disappear. Fungi play a vital role in so many webs of dependence.

Invisible giants

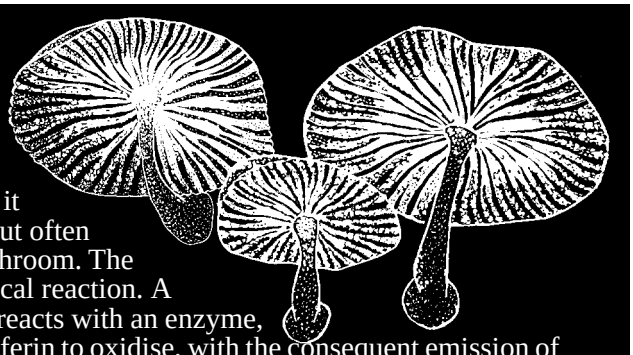
In order to measure the size and spread of individual fungal organisms, researchers sampled the DNA of fruiting bodies of the same species. By plotting the positions of all those with the same DNA – and therefore produced by the same 'parent' – they have discovered that it is not unusual for some individual fungi to cover areas as large as tennis courts.

Indeed, researchers in America are claiming the title 'largest living organism' for an individual fungus (*Armillaria bulbosa*) which they have measured. Growing in a forest in Michigan, it has been shown to spread over more than 15 hectares (more than 600m across) and has an estimated mass of about 100 000 kg. It is also thought to be at least 1500 years old. There are even claims that a rival contender, a specimen of *Armillaria ostoyae* in Washington State, covers an area of 600 hectares.

Fairy rings are formed by fungal species which grow out radially, underground, from a central point producing fruiting bodies at the outer edges and dying in the middle.Grass at the edge tends to die off, in a circular pattern, possibly due to toxins released by the fungus or possibly because it prevents the grass from absorbing water. However, as the mycelium dies off, the grass within the circle is nourished by the fungal remains, stimulating a healthy green colour. Some fairy rings may be several hundred years old.

This bright red stinkhorn, ***Colus hirudinosus*** (right), is considered rare, with records in southern Australia. However, it turned up two years ago on mulch in this editor's garden in Cairns where it fruited abundantly and spectacularly. It has not been seen there again since.

Glow-in-the-dark fungi



It is not unusual, when walking through a forest at night, to see an eerie glow coming from the base of a tree. Sometimes it turns out to be an insect, but often it is a bioluminescent mushroom. The light is created by a chemical reaction. A substance called luciferin reacts with an enzyme, luciferase, causing the luciferin to oxidise, with the consequent emission of light. Fireflies, glow-worms and a number of marine organisms, such as fish, use bioluminescence to attract prey or mates. The function in fungi is unknown. It has been suggested that it attracts insects which then disperse the spores. It is also possible that the production of light is incidental – although this is unlikely since it is an energy-expensive process.

One of the best-known bioluminescent fungi in Australia is *Pleurotus nidiformis* (below), a large, irregular-shaped fungus with little or no stem which grows, often in dense clusters, at the base of living or dead eucalypts. However, it seems that species of *Pleurotus* in the tropics do not glow. Instead, we have *Mycena chlorophanos* (above) with smaller, daintier fruiting bodies, also growing in clusters. Not only the fruiting body but also the mycelium of this species glows.

Questions & Answers

Q Is it true, or a myth, that earthworms can regenerate when they are cut in two?

A Steve Van Dyck, Senior Curator of Vertebrates at the Queensland Museum, wrote the following notes on regeneration as part of an article on earthworms in *Nature Australia* Vol 26 No 5:
If cut in two (by predator, spade or through autotomy*), many species will regrow missing part. Regeneration of back end takes place more readily than front end, with regrown tail often having paler and more narrow segments. Head regenerates are less commonly encountered as worm lies coiled and dormant in soil until mouth regrows. It is theoretically possible to get two worms when an individual is cut in half. They may also occasionally grow a head where the tail should be and vice versa. Survival of such freaks is unlikely.

*Autotomy is when an animal deliberately casts off part of its body, for example when a gecko drops its tail.

Q Eating a number of fruits of finger cherry (*Rhodomyrtus macrocarpa*) is most likely to result in permanent blindness in humans. Do these fruits have the same effect on other vertebrates which might eat them?

A This rainforest plant, which grows as far south as the Herbert River and also in New Guinea, produces fleshy elongated fruits which turn from green to bright red and then dull red as they ripen. There were several reports in the early twentieth century of people, particularly children, who became permanently blind after eating the fruits. In 1915, warning pamphlets were sent to all Queensland schools and few cases have been reported since then. Opinions vary as to whether it is unripe or ripe fruits which cause the problems. It has also been suggested that an infecting fungus, *Gloeosporium periculosum*, may be to blame. In all cases, however, the victims had eaten a large number of fruits in a short time. More recently, a child who had eaten green fruits – and rubbed his eyes – was affected although other children in the group, who had eaten ripe fruits, were unaffected.

The poison remains elusive. An isolated extract was found to be toxic to mice but there was no evidence that it caused blindness. The common plant toxin, saponin, has also been found but, again, this is not linked with blindness. Doubt remains as to whether the fruits are actually toxic or not.

There is a 1921 report from Malanda that two calves, which had nibbled finger cherry leaves, became paralysed, one later dying while the other became blind. Later a goat was reported to have become blind six weeks after being fed with the fruits. However, it is unlikely that birds would be affected. They have different systems, with different enzymes, to us and can eat a number of fruits which would poison humans. Similarly, there are likely to be some mammals (perhaps native ones) which might well be able to eat the fruits without ill-effects. There are few fruits which are not eaten by something. After all, they are designed to be eaten so the seeds can be distributed.

Acknowledgements: Poisonous Plants of Australia by Selwyn L. Everist

Tourist talk

ENGLISH	GERMAN	JAPANESE	
fungus	Pilz (Schimmel)	kabi	カビ
mushroom/ toadstool	Pilz	kinoko	きのこ
truffle	Trüffel	torifu	トリフ
to recycle	wiederverwenden	saisei riyo suru	再生利用する
to break down	zersetzen	fuhai saseru	腐敗させる
roots	Wurzeln	ne	根
stink	Gestank	akushuu	悪臭
luminescent	leuchten	hakkou	発光
poisonous	giftig	dokuno	毒の
symbiotic	symbiotisch	kyosei	共生

Facts and stats
on fungi

There are at least ten times as many fungi as vascular plants.

In Australia, there are only 32 mycologists – experts in fungi – trying to identify an estimated 250 000 species of fungi. This compares with, for example, a total of 25 botanists just working on about 600 eucalypt species.

Fungi do not fossilise well, but fossil plants as much as 400 million years old show signs of fungal growth. These primitive plants, *Rhynia*, had no roots, so it is thought that mycorrhizal fungi were assisting with water and nutrient absorption even before the development of plant roots.

There are many hundreds of truffle-like fungi species in Australia – more than anywhere else in the world.

The vegetarian meat substitute Quorn (which is very popular in the UK) is made with fungi.

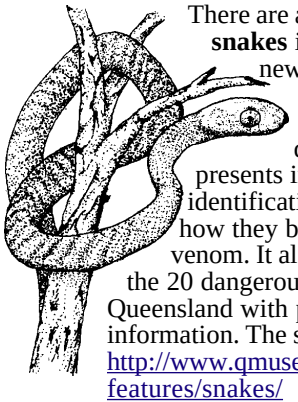
One hundred marine fungi have been identified in mangroves and on fish and crustaceans – however many more remain to be discovered.

There are seven currently recognized types of **mycorrhizae**. The most common and widespread of these, in terms of distribution and number of associated plants, are the arbuscular mycorrhizas and ectomycorrhizas. With arbuscular mycorrhizas, the fungal hyphae grow deep inside the plant root, and produce microscopic spores in the soil. With ectomycorrhizas, the fungi form a thick hyphal sheath around the root, and hyphae grow between the outer root cells within the root. Ectomycorrhizal fungi include many of the above-ground fruiting mushrooms and puffballs, and the below-ground fruiting 'truffles'.

Research suggests that rainforest plants usually form arbuscular mycorrhizas, whereas eucalypts are predominantly ectomycorrhizal, but sometimes form arbuscular mycorrhizas. Whilst ectomycorrhizas generally increase eucalypt growth, it is less clear whether arbuscular mycorrhizas also benefit eucalypt growth. Experiments have shown both increases and decreases in the growth of eucalypt seedlings due to arbuscular mycorrhizal fungi.

For more information on mycorrhizal fungi, see the website: http://www.ffp.csiro.au/research/mycorrhiza/

Out and about



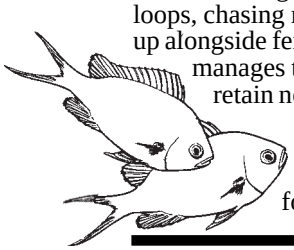
There are about 120 species of **snakes** in Queensland. A new part of the Queensland Museum website is dedicated to them. It presents information on identification, what they eat, how they breed, bites and venom. It also features a list of the 20 dangerous snakes of Queensland with photos and detailed information. The site can be found at: http://www.qmuseum.qld.gov.au/features/snakes/

Not surprisingly, considering the extremely hot temperatures we have been experiencing this summer in north Queensland, the **corals are bleaching**. Water temperatures have been particularly high, with the lack of cloud cover exacerbating the situation.

The Great Barrier Reef Marine Park Authority is keen to build up a picture of the extent of the bleaching and is providing an up-to-date summary on its website. You can find it at: http://www.gbrmpa.gov.au/corp_site/bleaching/index.html

Included are maps of ocean temperatures and of bleaching sites. You can also find an on-line reporting form. GBRMPA would appreciate all reports of bleaching so they can build up as accurate a picture as possible.

The warm water conditions are encouraging **fish to spawn**. Look out for blue-green chromis performing in broad daylight. The males are very active, becoming greener than usual and swimming above the coral in rapid loops, chasing rivals and shimmying up alongside fertile females. If one manages to attract a female (they retain normal colours) he waits as she passes over the rock, laying her eggs as she goes, and then follows to add his sperm.



Plants of the Tropics, Rainforest to Heath
An Identification Guide
By Betsy Jackes, including **Bryophytes** by Andi Cairns
This is a thorough and extensive guide to the identification of plants in the rainforest in the Paluma and Cairns areas, as well as the dry heath-like areas to the west. It has just been published and is currently available from James Cook University bookshops.

The Third International Canopy Crane Conference will be held at the Cairns International Hotel, 23-28 June. The Conference theme is: Science, Policy and Utilisation. This is a joint venture between the Queensland Government and the Smithsonian Institute.

Canopy cranes allow scientists to reach the top of the forest, where many of the critical ecological processes are taking place, rather than being confined to the forest floor. The Daintree is the site of the only canopy crane in the southern hemisphere. Situated near Cape Tribulation, it is fifty metres high and spans over one hectare of lowland tropical rainforest in one of the most ecologically diverse areas of the Wet Tropics.

Find out more about the conference and register at: www.premiers.qld.gov.au/about/science/canopyconference

If you find **sick, injured or orphaned wildlife** please call a wildlife care group as soon as possible. Carers are spread around north Queensland. Even if you are not in Cairns or Townsville, give them a call and they will tell you who is nearest to you.

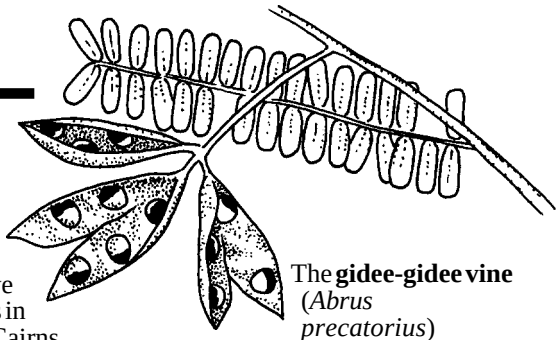
- Townsville:

North Queensland Wildlife Group
Ph: 0414 717 374
Independent Wildlife Carers
Ph: 0412 123 783

- Cairns:

Far North Queensland Wildlife Rescue Association
Ph: 4053 4467 (24 hours).

Injured, stranded or dead **marine** wildlife should be reported to: 1300 360 898.



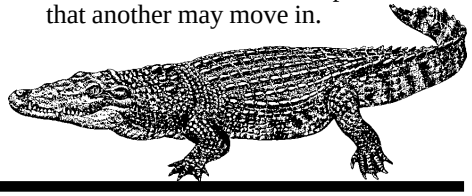
The **gidee-gidee vine** (*Abrus precatorius*) produces seeds during the first half of the year. Also known as crab's eye and jequirity bean, it grows in dry vine thickets and open forests, and is found in similar habitats throughout the warmer parts of the world. It is a slender, inconspicuous climber which is without leaves during the Dry. However, it quickly sprouts light green pinnate leaves and pinkish pea-flowers after rain. The flowers are followed by flat, brown pods, about 5cm long, which split to reveal extremely attractive, bright red seeds tipped with black.

These seeds contain a powerful poison, abrin. Chewing one seed is enough to kill an adult. However, the seedcoat is extremely hard and must be ruptured for the poison to escape. In spite of their extreme toxicity, the attractive seeds are widely used in necklaces, decorations and rosaries – *precatorius* comes from the Latin word, *preca*, meaning prayer. Their uniform size has also led to them being used in a practical way as reliable units of weight. Unfortunately, they are extremely attractive to children so it is important that they are made aware of the dangers.

Acknowledgements: Australian Rainforest Plants V by Nan and Hugh Nicholson.

2002 is the International Year of Ecotourism. A major event will be the **Ecotourism Association of Australia International Conference** to be held in Cairns 21-25 October. For more information look at the website: http://www.ecotourism.org.au/conf2002

Please be croc-wise – and please make visitors aware that they must be very cautious in areas where crocs are likely to be present. Even if a croc is not visible does not mean there are none around. Similarly, if one has been removed from an area, it is possible that another may move in.



Bookshelf

A Field Companion to Australian Fungi
Bruce Fuhrer
Field Naturalists Club of Victoria (1993)

Common Australian Fungi
Tony Young
University of NSW Press (2000)

Mushrooms & Toadstools of Australia
C.J. Shepherd and C.J. Totterdell
Inakata Press (1988)

Fungi of southern Australia
Neale L.Bougher and Katrina Syme
University of Western Australia Press (1998)
This book has an excellent introduction.

A Field Guide to Fungi of South-eastern Australia
Ross Macdonald and John Westerman
Nelson (1979)

Fungi of Australia
Volume 1B
Introduction – Fungi in the Environment
CSIRO (1996)
A collection of fairly academic papers.

Using Rainforest Research
CRC Rainforest leaflets
Getting the jump on frog disease!!
May 2001
Trial by fire: Survival of the northern bettong
January 2000
Root establishment strategies of rainforest seedlings
January 2000

Ecos 98 January-March 1999
The role of fungi in Australian ecosystems
Alastair Sarre

Landscope Vol 7 no 4 1992
Fungi – winter wildflowers
Gerhard Saueracker

Ecos 103 April-June 2000
Fungal awakenings
Wendy Pyper

GEO Vol 22 No 4 Dec 2000- Feb. 2001
Fascinating fungi
John Cooper

Australian Natural History Vol 24 No 7Summer 1993/94 pp10-11
Largest living organism

Wildlife Research, 2001, 28, pp 643-645
Mycophagy by the swamp wallaby (*Wallabia bicolour*)
A.W Claridge, J.M. Trappe and D.L. Claridge

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Please report **sick, injured or orphaned wildlife** as soon as possible.
Cairns: 4053 4467 Townsville: 0414 717 374 or 0412 123 783
These wildlife care groups can direct you to your nearest carer.

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