Fungi

Text and photos by Gerhard Saueracker

Western Australia's springtime wildflower display is world-renowned, but its more subtle winter equivalent is relatively unknown.
Fungi have a beauty of form, if not of colour, that while not as widely appreciated as wildflowers, has a distinction all its own.

Winter Wildflowers

Many of us wait for spring, when the bush comes alive again with the colours of wildflowers, but the quiet winter months can display an equally wonderful, though far more subtle, array of beauty.

The features of the winter rain-washed forests are less obvious than those of the spring. Fungi, with their interesting shapes, textures and colours, are at their best when the weather is at its worst. However, even in the depths of winter there is an occasional clear, crisp day when feeble sunlight breaks through, and this is the time to pay an invigorating visit to the forests in search of the winter wildflowers.

A likely place to look for fungi is on fallen trees. Standing out like a beacon on the dark wood of a rotting eucalypt, the bright yellow to orange colours of the jelly fungus are a vivid exception to the usually pale fungi. This convoluted, gelatinous fungus is found not only on fallen timber; it may also sprout from the erect stems of dead saplings.

On a sapling, jelly fungus is likely to be the only fungus present. On a giant log there may be an entire community of fungi, many belonging to a group called agarics, more commonly known as mushrooms and toadstools.

The agarics of rotting wood are tiny structures with conical or rounded caps, often delicately fluted, perched on elegantly thin stems. They make quite a contrast to the ponderous logs from which they sprout.

Like the stouter field mushroom, which makes a brief appearance in the paddocks, the agarics of rotting wood are short-lived. Their transient nature is partly due to their makeshift construction: agarics maintain their shape by inflating their cells with water. Warm or dry weather speeds up the loss

Previous Page Main:
A sawn eucalypt log reveals the white mycelium of invading fungus. *Inset: Gymnopilus penetrans* is frequently found on dead wood, particularly on fallen banksia. The loosely attached bark can be peeled away to reveal the fungal mycelium.

Left:
The brilliant hue of the jelly fungus makes it our most obvious fungus. It grows on dead wood, from standing saplings to massive fallen logs.

Top left:
The bright underside of the scarlet bracket fungus reveals the pores that characterise so many of the bracket fungi.

Top right:
This group of pretty grey bonnets was growing on a living tree, but the cleft in the bark indicates that they may be colonising dead wood in an old wound.

This leathery non-pored bracket fungus projects from decaying logs as a small ledge banded in shades of yellow, orange and brown. It has a hairy upper surface, a characteristic reflected in its scientific name - *hirsutum* - meaning hairy.

of water from such fungi and hastens their demise. The jelly fungus also shrivels in warm weather, but unlike the agarics it can resume its shape when rehydrated by rain.

Although we usually imagine the umbrella-shaped agarics sprouting straight up out of the ground, they may sprout from any surface of a log, even the underside. No matter what angle the fungus starts at, the stem curves around to the vertical and the cap on the end remains horizontal. This allows the spores found in the gills - the radiating vertical plates on the underside of the cap - to be released and to fall away under gravity without being trapped.

Also found on logs are the bracket fungi. Easily recognisable, they grow as horizontal semicircular plates. They are constructed of thick-walled fibres, or fibrils, reinforced by other branched fibrils which bind the structure together and give it a tough, leathery consistency. As they do not owe their shape to moisture-swollen cells, they are not dried out by warm weather, and their remains may be found throughout the year. However, they lack the delicate forms of the winter fungi.

The underside of most bracket fungi is covered with pores instead of gills, hence the alternative name 'polypores'. The pores serve the same function as gills: the release of spores.

Although the bracket fungus grows horizontally to release spores, it is possible to find it in a vertical position. This is because the fungus remains in place even after the tree it is growing on has toppled over. A bracket which was horizontal on a standing tree becomes vertical when the tree falls. Any new brackets and additional growth will be horizontal, allowing us to differentiate between the two types of bracket fungi: beneficial and parasitic.

The beneficial bracket fungi break down dead wood, so they are only likely to grow after a tree has fallen. They will be the horizontally growing fungi. On the other hand, the parasitic bracket fungi, which grow on living trees and contribute to their death, will become vertical when the tree has fallen over and will cease to grow.

FUNGAL FRUIT

The bracket and jelly fungi, mushrooms and toadstools all disperse spores. These spores are the equivalent of fruit which carries seed. But if they are the fruit, where is the tree? The business end of wood-attacking fungi is inside the log. Fine fibrils, each composed of a single strand of elongated fungal cells, grow through the wood, digesting it as they go. When conditions are right, a mass of cells grows to the surface, and there forms the familiar mushroom, toadstool or bracket. On banksia limbs, the loosely attached bark can be peeled away to reveal the furry white fungal mass running along inside the bark until it finds a gap and sprouts into the open. This fruiting body can broadcast spores a lot further afield than the fungus itself can grow.

Fungi are not only found on logs. The principal food of many is dead plant matter, which is distributed thinly over the forest floor. Logs are essentially large concentrations of such matter, inhabited by concentrations of fungi. Soils of the bush also support fungi, but these fungi are more isolated than those of the logs, and finding them requires a more careful search.

The coral fungus, the most obvious of the forest floor fungi, is bright yellow, like the jelly fungus. It looks as if it would be more at home under water. Nevertheless it is quite common in the jarrah forests of the Darling Scarp.

Other fungi are less common or perhaps just less obvious. Brown fungi blend in well with the leaf litter of the forest floor. Particularly hard to see is one species with a rounded cap which mimics the gumnuts of the marri trees under which it grows.

These beautiful little cup fungi were well disguised amongst the orange gravel of the Darling Scarp.

MYCORRHIZA

Top:
This fungus in the 'split-gill' group was found growing on a dead eucalypt sapling. Though it has the gills of a mushroom, it has the shape of a bracket fungus, to which it is related.

Coincidentally camouflaged, the rounded cap of this toadstool makes it almost invisible amongst the gum nuts beneath a marri tree. Although it appears to have sprouted from the ground, this fungus has probably risen from some buried wood, as it belongs to a group known to grow on wood.

Fungi can be essential to the growth and survival of many trees and plants. This symbiotic relationship is known as mycorrhiza.

Fungi and roots form two basic types of mycorrhizal association. In one (known as vesicular-arbuscular mycorrhiza) the fungi extend from the soil right into the cells of the roots, but the fruiting bodies of such fungi are underground and microscopic. In the other (known as ectomycorrhiza) the fungi form sheaths around the outside of certain roots; fungi which do penetrate the root run between the host cells. These are found in eucalypts and form fruiting bodies above the ground where they may be seen by the amateur observer.

Such associations of fungi and roots are common, and certainly not confined to eucalypts. Indeed, they occurred before eucalypts - or even flowering plants - evolved, in such primitive plant groups as ferns and cycads (the zamia palm of the west, and the burrawang of eastern Australia) which now grow in the forest understorey shaded by the eucalypts.

Even before plants had roots, mycorrhizal fungi probably aided water and nutrient absorption, as their presence has been shown in the 400-million-year-old fossil stems of a delicate, rootless, leafless ancestral plant called *Rhynia*. But to the modern eucalypt, growing in the ancient, leached soils of Australia, any ploy to extract more nutrients is important, and all species of eucalypts whose roots have been examined show evidence of symbiosis with fungi.

Co-operation of plant and mycorrhizal fungi, however, is not sufficient to explain the growth of tall, productive eucalypt forests on soils which elsewhere in the world could barely support tree growth. After all, introduced pines have mycorrhiza, but grow poorly on soils which supported vigorous eucalypt forests.

The answer probably lies in the extensive root system and fine roots which enable eucalypts to fully use available nutrients and find sufficient water in an often dry land. This may also be a factor in the susceptibility of eucalypts to fungal diseases.

SYMBIOSIS IN THE FOREST

But fungi are more than winter decorations. Just as the wildflowers of spring herald a new generation, the fungi are signs of new growth. For even as they decompose logs and leaf litter, they recycle nutrients which plants of the forest need if they are to grow. Further around the cycle, when the plants are taking up these nutrients, fungi are involved again. Some fungi grow in and around plant roots where, together, the roots and fungi form a structure called a mycorrhiza. Mycorrhizal fungi facilitate the uptake of essential nutrients by plants, a vital role in our nutrient-poor soils (see 'In Search Of the Perfect Pine', *LANDSCOPE*, Autumn 1992). In the floors of Western Australian forests, these fungi are more important than those feeding on dead plant matter; indeed all eucalypts whose roots have been examined show evidence of mycorrhiza. In exchange for the nutrients, the trees provide the fungi with energy in the form of sugars, so both partners benefit. Some of these fungi grow up to the forest floor and form a fruit, most commonly of umbrella-like form.

Unlike the masses of springtime wildflowers, fungi are seldom visible from the window of a tourist coach. However, for the visitor who is willing to get out into the forest, they are an attraction whose delicate features rival the wildflowers' colours during a season when few plants are in bloom.

Gerhard Saueracker is a well-known photographer. His photographs have appeared in *LANDSCOPE* and diving magazines. Photographing the fungi of WA has led him to research them further. Gerhard works in medical research and can be contacted after hours on (09) 367 1194.

You don't have to go far from Perth to enjoy the peace and quiet of the bush. The forest is right on our doorstep. See page 10.

The increase of births in captivity for cockatoos seemed promising, but was it related to the upsurge in 'birdnapping' in the wild? To Catch a Thief *explains how forensic experts unravelled the mystery. See page 28.*

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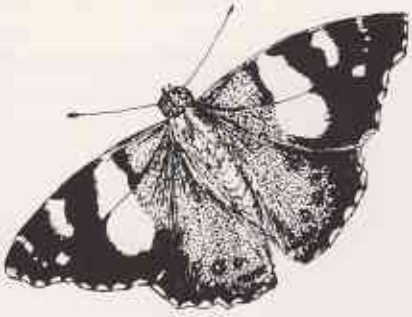

Painted ladies, northern admirals, southern admirals and Western Australian skippers - not the stuff of a sailor's dream, but all members of the butterfly family. See page 23.

Our native animals are prey to introduced species. While baiting gives them a fighting chance, scientists are looking for more long-term, humane solutions. See page 16.

The bilby has many names, including ninu and dalgyte. Ninu Magic *tells the story of this shy animal and its remarkable survival skills. See page 43.*

FEATURES

REGULARS

COVER

The red-tailed black cockatoo (Calyptorhynchus magnificus) *is one of several cockatoos native to Western Australia. These spectacular birds nest in tree hollows and can be found in the woodlands and grasslands of the south-west of Western Australia.*

Illustration by Philippa Nikulinsky.

Managing Editor: Ron Kawalilak
Editor: David Gough
Contributing Editors: Verna Costello, Helenka Johnson, Tanyia Maxted, Carolyn Thomson
Scientific and technical advice: Andrew Burbidge, Roger Underwood
Design and production: Sue Marais, Stacey Strickland
Finished art: Gooitzen van der Meer
Advertising: Estelle de San Miguel ☎ (09) 389 8644 Fax: 389 8296
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