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FOREST MYCOLOGY

in

WESTERN AUSTRALIA

by L. N. Weston  
and edited by  
D. W. R. Stewart.

FOREST MYCOLOGY IN W.A.

(from Weston, 1958).

Species	Fungi		
	Parasitic	Saprophytic	Parasitic and saprophytic
Jarrah	<i>Polyporus portentosus</i> " <i>pelles</i> " <i>gilvus</i> <i>Poria mollusca</i>	<i>Corticophora cerebella</i> (rare) <i>Stemphilium</i> <i>Polyporus tumulosus</i>	<i>Polyporus australiensis</i>
Karri	<i>Polyporus portentosus</i>	<i>Corticophora cerebella</i> (rare) <i>Stemphilium</i> <i>Trametes lilacino-gilva</i> <i>Polyporus mylittae</i> <i>Lentinus doctyloides</i>	<i>Polyporus australiensis</i>
Wandoo	<i>Polyporus portentosus</i> <i>Fomes rimosus &amp; robusta</i>	M	<i>Polyporus australiensis</i>
Blackbutt	<i>Polyporus portentosus</i>	<i>Merulius lachrymans</i> <i>Trametes lilacino-gilva</i>	
Marri	<i>Polyporus portentosus</i>		<i>Armillaria mellea</i>
Tuart			<i>Polyporus australiensis</i>
Peppermint	<i>Pleurotus ostreatus</i>		

FOREST MYCOLOGY IN WESTERN AUSTRALIA.

NOTES ON FUNGI AFFECTING WESTERN AUSTRALIAN  
TIMBERS.

by L. N. Weston.

Edited by D. W. R. Stewart

1. INTRODUCTION.

These notes were prepared by Mr. L. N. Weston, former Chief Timber Inspector of the Forests Department of Western Australia, as the basis of a lecture to junior officers of the field staff. There is of course, still a great deal to be learnt about the many "rots" that affect our trees and timber, and our knowledge at present is meagre. It is hoped that these notes, written by one with a life-time's practical experience in the forests of Western Australia and presented in simple language, will form a useful reference for foresters, timber men, and laymen generally.

Technical terms have been avoided almost entirely. A few which have necessarily been used, and which are not common in everyday conversation are as follows:-

Fungus (Plural - fungi)

A low form of plant life which draws its nourishment from other plants or waste material, and has itself no chlorophyll.

Fungal.

Relating to fungus or fungi.

Hypa (Plural - Hyphae)

Fine fungal threads. The simple or branched filaments of the mycelium.

Mycelium.

Strands or cords or mats of fungal hyphae.

Mycology.

The study of fungi (from the Greek "Myketos", a fungus).

Parasitic.

Growing on living material.

Saprophytic.

Growing on dead organic matter.

Sclerotium.

A resting body or mass of fungal hyphae.

Sporophore

A fungal fruiting body.

Spore

A germ or seed of a non flowering plant.

2. FUNGI AND FUNGAL ATTACK.

Certain fungi have the capacity to attack, live on, and destroy wood. Those attacking living tissue are called parasitic, and those attacking dead wood are saprophytic.

Fungal attack, with the resulting breakdown of wood texture, is conspicuous in all our hardwood forests. There is a tremendous waste of timber, due to the development of rot in the living tree, caused by one or other of the fungi.

Most of the fungi present, attack the mature "heart-wood", causing either a "cubical" rot (so called because the decayed wood breaks into cube-like formations), or "straw" rot (in which case the decayed wood resembles old straw, both in colour and texture.)

Cubical rot is the more common, and because it bears a strong resemblance to the so called "dry rot" of the old world, a great deal of confusion existed, and still exists. The false impression became current, that the cubical rot in our jarrah trees would continue to develop after the timber was cut and put into use.

Early contracts contained provisos that jarrah should be 'free from all rot'. Contractors had little difficulty in obtaining plentiful supplies of timber free from rot, so had no hesitation in accepting such contracts.

3. RESEARCH AND INVESTIGATION.

Practically nothing was known 20 years ago of the identity of life history of the fungi in our forests. Mr. S.L. Kessell, when Conservator of Forests, arranged to subsidise a student, (Mr. N. Tamblin) at the eastern Australian University, to study our forest fungi, working under the guidance of Dr. Armstrong, an eminent botanist on the University staff.

Mycology, the study of fungi, is a branch of botany, and provides a vast field for research.

This Department was concerned chiefly with the fungi which caused decay in our forest trees, and in our timber when put into use. Hamblyn concentrated on this field of study from 1935 to 1939. He then transferred to the Division of Forest Products, C.S.I.R.O. in Melbourne, and Dr. Armstrong returned to England about the same time.

This Department co-operated in many ways, such as in directing attention to immediate problems, supplying specimens, etc.

Hamblyn's studies soon yielded valuable information, which eventually enabled this Department to revise and modify the specifications or grading rules for jarrah, yarri, tingle and wandoo.

It was essential that we should know the identity and life history of the fungi occurring in Western Australia because of the varying habits of the different species. They may be considered under two main headings -

A. Parasitic.

Some fungi will attack the living or growing cells of a tree. These are truly parasitic.

Others will attack only the mature wood inside the sap. Mechanically, these, although occurring in the living tree, are not truly parasitic, as the heartwood cells are not living cells.

For convenience, we refer in the Forests Department to any fungal attack in a living tree as being Primary and that term has been accepted in our Grading Rules by the Standards Association of Australia.

B. Saprophytic.

This term is used to describe any fungal attack on dead wood or other dead material.

For convenience again, we refer to these as Secondary. Unfortunately, some fungi are both parasitic and saprophytic, that is to say, primary and secondary. The

outstanding example of this is the *Polyporus Australiensis*, which can be seen fruiting freely on living trees and dead logs and stumps.

4. RESULTS OF RESEARCH.

Tamblyn's investigations gave us the following information -

1. Most of the fungi which attacked our trees were identified.
2. Those which attack our trees are mostly primary.
3. One fungus in particular, *Polyporus Australiensis*, which attacks karrri, marri, tuart and sometimes wandoo and other trees, is both primary and secondary.
4. With the exception of *P. Australiensis*, the various primary fungi die sooner or later after the timber is milled and dried.
5. The fungi which may seriously affect jarrah and other timbers when in or on the ground in Western Australia are mainly saprophytic species, and are not primary rots which have extended after the cutting of the tree.

5. FURTHER INVESTIGATION.

Tamblyn is now in charge of the Timber Preservation section of the Division of Forest Products of the C.S.I.R.O. The Forests Department maintains close contact with that and other sections of the D.F.P. and continues to send specimens for identification and for laboratory tests.

Tamblyn and other members of his staff periodically visit Western Australia and inspect various timber tests in operation.

There is still a great deal to be learnt in the study of wood rots and other timber defects in Western Australia and in preservation of timbers from such decay.

6. NAMING OF FUNGI.

The genera and species of fungi are decided chiefly by characteristics apparent in the fruiting bodies or sporophores. (This of course excludes the 'fungi imperfecti' which do not have sporophores).

General agreement has not been reached by mycologists as to which are the most important characteristics, and as a result there is a good deal of confusion. No doubt that will be corrected in time. For our purpose, it is sufficient to say that many of the fungi are well known, and their habits are familiar to us.

Certain names are accepted for them, and even if these are changed later by the mycologists, we will still know the fungi to which the new names are given.

7. DESCRIPTION OF VARIOUS ROT-CAUSING FUNGI.

These will now be considered under the main headings -

- A. Primary Rots.
- B. Secondary Rots.
- C. Rots which are primary and secondary.
- D. Other fungi.

A. PRIMARY ROTS.

- 1. Polyporus portentosus (syn. P. cucalyptorum) -  
'Column rot' or 'Heart rot'.

This fungus causes the 'heart rot' or 'column rot' which is the commonest and most important in our main jarrah forest, where it does a tremendous amount of damage in the bole of the living tree.

It will attack most Eucalypts, and has been known to attack other genera, such as Casuarina.

It causes a brown, cubical rot, usually associated with a good deal of mycelium, often in sheets.

This mycelium consists of a mass of fungal hyphae or threads. These fine threads, with the aid of a digestive ferment, penetrate sound wood, enter air pockets, and break down cell structure. It

will attack the bole or limbs of a tree, and may sometimes be found in the larger roots. When a log is opened up and the rot exposed, it is usually found that there is some little discolouration of the wood outside the conspicuous cubical rot.

This extension is apparently due to the action of the fungal threads in their progress, and it may later become apparent as decayed wood. Further penetration then ceases and the fungus dies, excepting in rare cases where moisture conditions are favourable, and further development of the rot may then occur.

It is possible that in such a case, the discolouration or incipient decay may have been more extensive than usual. The fruiting body (or sporophore or punk) is conspicuous in our jarrah forests in winter. It usually emerges from a knot or knot hole or other blemish in the bole of the tree, in the form of a whitish bracket about 6 to 12 inches across, and 5 or 6 inches thick.

As its name implies, it has numerous small holes or pores, and these are found on the underside. They contain the spores or seeds, which are fine as fine dust. They blow about in the air, and a few of them find knot holes or other blemishes on other trees, where spores can germinate, and the fungal hyphae can enter the heartwood, and so continue the life cycle.

This process of distribution applies to many fungi.

2. Polyporus pelles. 'Pocket Rot'.

Pelles means the skin of a beast, and the top of a fresh sporophore of this fungus resembles a rather furry skin.



It is a bracket sporophore, russet to dark brown in colour, and in our jarrah forest it is usually about 3 or 4 inches across, and an inch or more in thickness. Like the sporophore of the column rot, it has many pores on the lower side.

This fungus is responsible for the "pocket rot" which is common in jarrah, particularly in the eastern belt of the forest.

The rot is brown and cubical, somewhat like column rot, but the cubes are often smaller, and the sheets of white mycelium are absent, though there may be small quantities of mycelium present, (generally a sparse downy white growth). It is called "pocket rot" because it occurs in pockets anywhere in the mature wood of the tree, in apparent isolation from other pockets. It probably gains access from broken limbs, or the wounds left where fire-induced epicormic shoots break off.

The life history is very similar to that of column rot.

3. Polyporus gilvus syn. *Momes gilvus*, possibly syn. *Momes lineator scaber* - 'white pocket rot'.

This fungus is known to attack jarrah, marri, sheoak and other trees. It causes a whitish rot, which usually has a good deal of white mycelium in it.

The decay and mycelium may be rather streaky, or take the appearance of a honeycomb. Brownish tufts of mycelium are commonly found in it.

The sporophore is a rough, irregular and knobby bracket, usually 3 to 6 inches across, and half as thick. They are persistent in the manner common to others of the *Momes* genus, and there may be 3 or 4 superimposed upon each other.

*Polyporus gilvus* is not so common as column or pocket rot, and there is less information available regarding its life history. It may be mainly saprophytic.

4. *Poria mollusca* - 'Tarrah straw rot'.

So far, fruiting bodies of this species have not been found or reported in the forest. However, when bred in a laboratory, flat pored surfaces are formed on a culture dish, and an examination of these indicates that the responsible fungus is *Poria mollusca*. The name "straw rot" has been used because the decayed wood bears a resemblance to old straw both in texture and colour.

Very often, there is a zone of yellowish wood extending from the decayed wood, indicating that it has reached a stage of incipient decay. However, in ground tests, it is found that this yellowish zone decays only very slowly unless already in an advanced stage. Normally, the decay then stops, and it is not considered seriously as a saprophyte. The rot is often found in association with pinholes, which seems to indicate that the borers are responsible for much of the spread of the rot.

5. *Fomes* - 'Straw Rot and Honeycomb Rot'.

*Fomes rimosus* and *Fomes robusta* are found on wandoo, jam, casuarina and other trees. The sporophores of these are very similar and require a specialist to distinguish one from the other.

They are hard, woody, hoof shaped brackets, brownish in colour, and about 2 to 4 inches across.

They are persistent, and it is common to find several superimposed one upon another.

*Fomes rimosus* is fairly common on wandoo, where it forms a white honeycomb rot in the bole or limbs.

It dies after the timber is dead and drying out.

('Rimose' means the surface marked by a network of intersecting cracks).

A Fomes as yet unidentified which has a smaller sporophore apparently causes the common yellowish straw rot in wandoo.

The sporophores usually emerge on the upper limbs and as the name implies, the rot resembles old straw.

This rot also dies soon after the timber is partly dried.

6. Pleurotus estreatus - 'Straw Rot in Peppermint'.

When the peppermint tree matures, it is almost invariably attacked by this fungus, which causes a straw rot. It grows quickly in the bole of the tree, and often results in the tree breaking at a fork or in some of the bigger limbs.

Limited observations indicate that the rot dies when the timber dries. The sporophore emerges from any blemish in the bole, in the form of a yellowish bracket, from 4 to 14 inches across and  $\frac{1}{2}$  to 1 inch thick.

Decay soon sets into the sporophore, which then gives forth a powerful and objectionable smell.

The underside of the sporophore is gilled, and the fruit is rather soft.

B. SECONDARY ROTS.

1. Coniophora cerebella - 'Dry rot'.

This is one of the so-called "dry rots" because although it requires a plentiful supply of water in order to function, it produces long and branching threads of mycelium, which can carry water some distance. Thus, with the aid of the water carried along its threads, the fungus can attack dry timber at some distance from the ground.

In England, Europe, America and other places, it sometimes causes considerable damage in buildings.

It is rare in Western Australia, excepting in old timber stacks where moist conditions have favoured its development.

So far as is known, it is a secondary rot, but could invade dead wood in the butt of a living tree, or contaminate some fungus already established in a tree.

The fungus rarely fruits, so identification is not easy.

The rot is brown cubical in Western Australia and is fairly common in some of the Eastern States, where it is said to cause jarrah to disintegrate rather rapidly if conditions favour its development.

Sometimes the brown mycelial threads can be found on the ground at an old damp timber stack. They bear a superficial resemblance to spider web, and if the stack is opened up, they can at times be found running up between the pieces of timber.

This fungus is very serious in any place where conditions permit it to operate, particularly in a building.

It <sup>long</sup> was confused with the cubical rots of our living trees, and even now, many people think that the "dry rot" is a continuation of our primary rots. It is highly undesirable that any of our primary rots should be referred to as "dry rot", because that implies that it functions similarly to the *Coniophora cerebella*, and so frightens buyers unnecessarily.

If a common term is necessary for the dry looking brown rot in our trees, the term "cubical rot" is very suitable.

2. Merulius lachrymans - 'Dry Rot'.

This is another of the so-called dry rots, since like *Coniophora cerebella*, it can convey water to a dry piece of timber and then attack it. It occurs in the Eastern States where it is said that the mycelial threads or cords may become nearly an inch thick. It has not been recorded in Western Australia, although according to Aplin it was identified at Dwellingup in 1951.

3. Stomphiliium - 'Wet Rot' or 'Ground Level Rot'.

The term "wet rot" has not been generally adopted, but is likely to be, unless a more suitable name is selected. This is the fungus which attacks our jarrah and other timbers at or near ground level. It is commonly found softening the face of the wood in contact with the ground. It works in slowly from the outside, and if it has developed to some little depth and the wood is exposed to the dry air to permit it to dry out, it forms a thin cubical rot, somewhat resembling that caused by *Polyporus pelles*. Like *Polyporus pelles*, the rot does not exhibit much mycelium, and many people imagine that it is a continuation of that primary rot. However, *Stomphiliium* is a secondary rot, though it may invade some other decay in a living tree.

It does not produce a sporophore, but grows its spores directly on the wood. It is therefore known as one of the "Fungi imperfecti" and is very hard to identify. There may be more than one species of *Stomphiliium* operating in Western Australia but identification has not been completed.

4. Trametes lilacino-gilva.

This secondary fungus or saprophyte occurs over a good deal of Australia, and attacks dead wood of many species. It is severe on karri, but may be found on marri, yarri, banksia, etc. It produces a brown coloured cubical rot. The sporophore is a thin leathery pored bracket, 1 to 4 inches across and  $\frac{1}{2}$  inch or so in thickness, pale brownish on top and lilac coloured beneath. The flesh is also lilac coloured, and after the colour fades from the surface, it can still be seen for some time in the flesh. Usually associated with a good deal of whitish mycelium.

5. Polyporus tumulosus - 'Log Rot'.

This commonly attacks large jarrah logs, causing a brown cubical rot. The fungus develops a large mass of mycelium underground, which is called a false sclerotium. It may wrap up stones and gravel until it weighs perhaps half a hundredweight.

Eventually, usually after a bushfire, mushroom type sporophores rise from the mycelium mass, and these may be up to 6 inches in diameter. Unlike mushrooms, they are pored underneath instead of gilled.

6. Polyporus mylittae - 'Blackfellow's Bread.'

This fungus is somewhat like P. tumulosus in its habits. It forms a true sclerotium up to 50 lbs. or so in weight, which, when cut, resembles tapioca pudding. Reputedly eaten by natives, it is tough and tasteless, but the natives may have found some satisfactory method of treatment to make it palatable. Blackfellow's bread fungi have been found in various parts of Australia. In eastern Australia they have been found with stems attached to the underside of karri logs.

It is not certain to what extent they are capable of causing decay. In the laboratory it has been found possible to cut a sclerotium into segments and grow a sporophore from each.

Pored beneath.

7. Lentinus dactyloides.

This interesting fungus is only known as a secondary fungus or saprophyte. It occurs in the dry inland of Australia and has been known to attack Karri sleepers in South Australia. It is doubtful if it is really important, because the dry conditions usually prevailing where it occurs would not be conducive to the rapid development of any rot.

It is interesting in that the rot seems to develop in the inside of the sleepers, whilst branching cords of pale mycelium develop on the surface.

These lie flat on the wood for a time, but eventually lift from the wood and become brownish in colour. Their ends then grow down into the ground and form a sclerotium, or mycelial mass. This is quite firm and resembles a man's hand or fist in shape, about 6 or 7 inches long. From this small body gilled sporophores arise and are said to be about 1½ inches across and usually dusty and inconspicuous.

8. Trametes cinnabarina syn. Polystictus cinnabarinus.  
'White Cap Rot'.

This secondary fungus is very common on dead wood, particularly on sapwood. The sporophore is a thin leathery bracket as a rule, but may appear as a flat surface attached to the top of pine stumps. Pored.

The sporophore is scarlet underneath, but when on a pine stump, it is at times scarlet all over.

In such a case, too, it may measure a foot across, but is usually less than half as wide, and about 1 inch thick.

It is not very destructive in Eucalypts, apart from on the dead sapwood.

On a pine log, it soon penetrates the wood, which will show a pink colouring many inches deep.

If conditions remain favourable, the pine log is soon destroyed with a form of straw rot.

9. Polystictus versicolor.

Somewhat similar in habit to *Polystictus cinnabarinus*. Sporophore is a thin leathery bracket, sometimes fan-shaped. They may be 1 to 6 inches across, and from 1/16 to 1/4 inch thick. Pored beneath. They are marked with "beautiful concentric zones of various colours". The brackets are sometimes massed one above another.

C. PRIMARY AND SECONDARY ROTTS.

1. Polydorus Australiensis - 'Karri cubical rot'.

This fungus attacks karri, marri, tuart, wandoo, yellow tingle and some other Eucalypts.

The sporophores, which have a strong musty smell, can be found during many months of the year, sometimes on the bole of a tree, but more often on old logs or stumps. They are usually from five to fifteen inches across, and 5 to 6 inches thick, in bracket form.

Commonly, they are bright orange on the underside, with an orange coloured pigment inside, which has on occasion, been used fairly successfully as a dye. In the spring, the colouring is less vivid than in autumn and the fruits are smaller.



The fungus attacks both dead wood and the mature wood of the living tree. It is severe on karri timber in contact with the ground, but works very slowly on tuart and wandoo. It produces a brown cubical rot, with a white mycelium.

2. Armillaria mellea - 'Root Rot'.

This parasitical fungus is commonly associated with marri, with which it may even live in symbiotic relationship. The fungal threads attack the living cells of many plants, including citrus trees, apple and stone fruit trees, tree lucerne, Victorian ti-tree, and pine seedlings.

The fruiting bodies arise in groups like small slender mushrooms. They are gilled, and because of their colouring are known as "honey fungus".

D. OTHER IMPORTANT FOREST FUNGI.

1. Sporotrichus destructor - 'Red Flowering Gum Canker'

This is another parasitic fungus, which attacks the living cells of the marri and red flowering gum. It penetrates the bark and sap, then works around the limb inside the bark, at the same time causing the bark to open up for a few inches along the grain, exposing some whitish mycelium which usually becomes stained with sap or gum.

It is fairly common on marri, and kills the limbs attacked, but the attack is rarely severe enough to kill the tree.

From the marri, the attack spreads to the red flowering gum, and in King's Park and other places many flowering gums have been killed by it. It is therefore very risky to plant many red-flowering gums in close proximity to marri trees which may be affected. Like the saprophytic fungus, the *Strophilium*, this is one of the fungi imperfecti, so it does not produce a sporophore.

2. Plcurotus lampas - 'Luminous fungus'.

This fungus is probably of little economic importance, but its sporophore has the power to give some light. It is not a strong light but when fresh and put in a dark room, it emits a soft radiance.

The sporophore is gilled, with the stem near one side. It may be 5 to 6 inches across. Whitish on top. Usually found near the base of a tree, sometimes in groups. It is occasionally found at Ludlow, and is saprophytic.

3. Pistulina hepatica - 'Liver fungus'.

This fungus is also probably of little economic importance. It is found on jarrah, and is said to occur also on oak in England.

The sporophore has a superficial resemblance to Polyporus pellics, usually 5 to 6 inches wide and 2 inches thick in Western Australia. It is brownish to liver-coloured, with a reddish flesh, has a reddish juice, and is edible.

It is often associated with 'pencilled jarrah', the 'pencilling' being caused by the fungus, and appearing as an excess of kino in the medullary rays. Apparently, it is not responsible for decay, directly at least.

4. Pencilling.

In yarri, we also find trees which show pencilling, but this is sometimes associated with some other fungus which causes a rot. Samples from Palgarup siding were sent to the D.F.P.

(C.S.I.R.O.) but have not yet been identified.

Mr. Lamblyn is keen to get samples of pencilling in other timber species, with or without rot.

5. GENERAL.

There are other fungi in our forest, some parasitic and some saprophytic. They are not so numerous or

important as most of those listed so far as is known.

It is necessary to follow up the research which has been initiated. If anything is an enemy of our forests or of our timber, we should learn all that we can about it, so that if possible we can combat it, either in whole or in part.

8. ROTS AS THEY AFFECT TIMBER GRADING.

Under Forests Department Grading Rules, rot was not acceptable prior to 1948. Then with our increased knowledge when it became apparent that the three commonest rots in jarrah trees, (*Polyporus eucalyptorum*, *P. pelles*, and *Poria mollusca*) ceased to extend soon after the timber was cut, it became reasonable to accept limited amounts of these primary rots in timber for most purposes.

It was still necessary to ensure -

- (a) That the cavity caused by the decay and incipient decay was not large enough to impair the serviceability of the timber.
- (b) That the decay did not come within the section of timber most likely to fail because of its presence.
- (c) That the presence of the decay would not cause the loss of timber orders.

Subject to adequate control over these points, Grading rules were amended in 1948 to allow the acceptance of "minor pockets of primary rot" in most classes of jarrah timber.

A similar arrangement was later made to cover yarri, and tingle. Wandoo is attacked chiefly by *Pomes*, and this rot also dies soon after cutting. Wandoo is used chiefly in local trade where its great durability is appreciated, so something more than "minor pockets" are accepted.

Greater care is taken in karri, because it is commonly attacked by *Polyporus Australiensis*, and this often continues to extend when the timber is put into use.

Apart from air and warmth, all fungi require a good deal of water, and are therefore of far less economic importance in the dry inland parts of Australia than they are in the higher rainfall areas.

9. SUMMARY.

The following table lists the rots attacking commercial timber species classified in groups, and related to the species which are affected by them -

	<u>Parasitic A</u> <u>(Primary)</u>	<u>Saprophytic B</u> <u>(Secondary)</u>	<u>Both parasitic</u> <u>and saprophytic</u>
Jarrah	1, 2, 3, 4	1 rare 3, 5	1
Karri	1	1 rare 3, 4, 6, 7	1
Wandoo	1, 5		1
Blackbutt	1	2, 4	
Marri	1		2
Tuart			1
Cas.			
Marri			