

FLORA

THE question seems simple and the answer is often short. Foe! After all, mistletoes are parasites and parasites are inherently bad, like tapeworms or ticks - aren't they? Nowadays, justice requires us to examine the evidence before finding them 'guilty'. So let's do so.

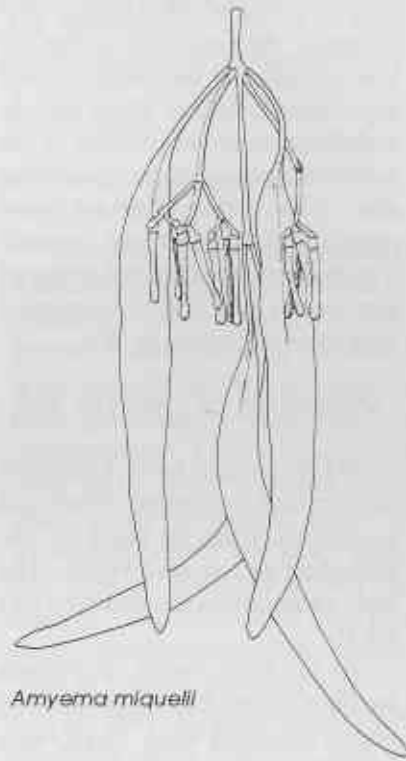
Parasitic plants

There are two levels of parasitism among plants. Real parasites obtain all their water, minerals and nutrient from their hosts. They have no chlorophyll and so they cannot make their own sugars and starch. *Rafflesia*, the world's largest flower, is an example. It lives entirely within the stem of a rainforest vine until a bud bursts through the host's bark, swells to cabbage-size, opens into a flower almost a metre wide, and eventually sheds seeds and falls off. Nevertheless it seems that the hosts are not debilitated by their free-loaders.

Mistletoes are hemiparasites. They take water and minerals from their hosts but they have green leaves in which they photosynthesise their own nutrients. They may even contribute carbohydrates to their hosts. There are many hemiparasites, but we are oblivious to most of them because they grow from the ground where, unseen, their roots tap into those of their hosts. Quandong and sandalwood are examples. They both belong to a family (Santalaceae) that is closely related to the mistletoes (Loranthaceae). It may come as a surprise that the WA Christmas tree is a real mistletoe - a primitive one that taps into the roots, not the branches, of its hosts. All our other mistletoes grow on their host's branches. *[There is another family of mistletoes (Viscaceae) but its members are rare in WA. This article is concerned with the mistletoes that are familiar to most Western Australians.]*

MISTLETOE:
FRIEND OR FOE?

by A.N. Start



Mistletoes are an ancient group of plants. They existed on the great continent, Gondwana, before it broke up to become Antarctica, Africa, India, South America and, of course, Australia. However, most Australian mistletoes are derived from stock that was on the African and Indian plates. Their ancestors reached Australia via the rainforests of the Indonesian archipelago. Within Australia, the immigrants evolved into new species and spread across tropical latitudes and down the east coast. Thus a few species have entered south eastern WA from south eastern Australia, but most came across the top end to the Kimberley, from where they have successfully colonised the arid zone. Once again, the WA Christmas tree is an exception; its ancestors have always been on the Australian plate.

As one might expect from this history, in WA the greatest diversity

occurs in the Kimberley (20 species in 5 genera) and decreases to the south. (Pilbara, 14 species in 3 genera, south west 6 species in 2 genera, excluding the WA Christmas tree.) All but one of our south west mistletoes are widespread in Australia.

Mistletoes and fire

For forest plants, there is an obvious advantage to living in the tree-tops. They don't have to compete for light. However, it leaves them with a problem. How do they 'plant' their seeds on the branches of another tree? Easy! They have fleshy fruits with a sticky coating around the seeds. Mistletoe birds swallow them and deposit the seeds onto a branch where they stick firm. But as the mistletoes adapt to dry climates, they are exposed to bush fires. As we all know, the plants of our fire-prone bush have means by which they survive fire. Eucalypts can reshoot from dormant buds under the bark, or from mallee roots. Banksias keep their seeds in large cones until a fire has passed, wattles have hard-coated seeds (often stored underground by ants) and orchids have tubers safely insulated in the soil - and so on.

Mistletoes (at least in the south west) can do none of these things. A fire that scorches the canopy of a wandoo woodland will kill all the mistletoes on the trees. They will have to recolonise the burnt area from elsewhere, and they depend on birds for transport. This can be a slow process; there is no incentive for mistletoe birds to visit places where there are no mistletoe berries to feed on! It is even slower for mistletoes that grow on hosts such as acacias, because the hosts are often killed. The mistletoes then have to wait for a new generation of hosts to mature before the process of recolonisation can even begin.

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Mistletoes and conservation

All our mistletoes are indigenous flora. No doubt, before European settlement, they would have occurred in a balanced relationship with their hosts. This is still the case over much of the State. However, it has changed:

- where clearing has eliminated them from large areas.. This mostly applies to the south west where remnant populations persist on roadsides, along rivers, in paddocks and some uncleared sites, including small and large conservation reserves
- where fire appears to have eliminated them from huge areas of spinifex grasslands (and perhaps tropical savannas)
- where lack of fire means the loss of one of the processes that assured balance in nature.

The huge fires that nowadays affect hummock grasslands and the Kimberley's savanna woodlands have just about eliminated mistletoes from vast areas, and in the south west mistletoes are among the species that will probably disappear from small patches of bush, including nature reserves,

because at some time fire is inevitable. If the next patch of bush is too far away (about 20 mins flying time for a mistletoe bird, if it doesn't stop en route), they will never manage to return. Loss of mistletoes leads to a loss of other things. For example, they provide nectar for honeyeaters and the mistletoe bird depends on their fruit. Many insects, including the larvae of some of our most brilliant butterflies, eat nothing else. Nevertheless there are many populations in relatively fire-safe situations and so I am not aware of any species that may be threatened with total extinction in WA.

Mistletoes as pests in WA

Many people have expressed concern because they see mistletoes as serious pests in parts of the wheatbelt and around Perth. The table summarises the situation as I see it.

As the table shows, mistletoes are only perceived as a problem or pest in the south west. In all cases (excepton prickly bark in kwongan, see below) the problem occurs in highly disturbed sites where natural processes have been curtailed; typically road verges, paddocks and remnant vegetation. These sites also tend to be highly visible, often

giving casual observers the impression that the problem may be more widespread than it really is.

To be sure, there are places where the problem is real and serious. However, there is a psychological element too. "They are parasites - like tapeworms and fleas - and therefore inherently bad and must be eliminated!" I have encountered this message amongst teachers, conservation groups and farmers alike. It was the motive for a boy-scout project to eliminate mistletoes from marri trees in a Perth suburb. They got good coverage in the local newspaper too!

While such perceptions may be a little off the mark, they are very real to those conservation-minded people who hold them. We need to encourage people to care for remnant bush. Therefore we, as a community, need to provide education and solutions. Neither is easy. Where they are in balance with nature, we must respect mistletoes as members of the natural flora that play a significant support role for animals, and even the plants that are pollinated by, or have their own seeds dispersed by, those animals. Nature's relationships are a complex web and breaking one strand can have unpredictable and disastrous ramifications.

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Mistletoe	Affected hosts	Location	Situation
<i>Amyema miquellii</i>	wandoo	western wheatbelt, York to Mt Barker	patchy, usually road verges and paddocks
<i>A. miquellii</i>	marri	Gosnells / Martin	paddocks and remnant vegetation
<i>A. miquellii</i>	prickly bark	Geraldton sandplain south from Eneabba	patchy in kwongan (heaths) including many conservation reserves
<i>Amyema preissii</i>	jam wattle	northern and western wheatbelt, notably Toodyay-York and Mullewa-Northampton areas	patchy, usually road verges and remnant vegetation
<i>A. preissii</i>	acaclas from the Eastern States	Perth, notably the hills and adjacent suburbs	gardens and 'escapes'
<i>Amyema fitzgeraldii</i>	various acaclas, notably jam wattle	northern wheatbelt, Mullewa, Northampton	patchy, usually road verges and remnant vegetation

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The real problem in remnant bush

It seems that mistletoes can be the final cause of death for some hosts. Eastern States wattles that have been imported for their ornamental values, e.g. *Acacia baileyana* and *A. podalyrifolia* are very susceptible to crippling infestations, especially in Perth's hills suburbs. This may not be a bad thing, as both these wattles have the potential to become weeds. However, there seem to be two indigenous hosts that experience problems more frequently than most. They are jam, *Acacia acuminata*, and wandoo, *Eucalyptus wandoo*.

Jam wattle

Like many other acacias, jam is a relatively short-lived tree. Old stands can become senescent and eventually collapse. Fire is probably important for regeneration. Pest-level mistletoe infestations are common on jam that is growing in road reserves and other remnant vegetation. No doubt the mistletoes hasten the demise of some of them. However, two pertinent factors contribute to the problem:

- many of the trees are already old, senescent or in poor health because of their situation
- the fire regimes that would have played a part in jam regeneration and mistletoe control have changed.

The mistletoes are not the underlying problem. The jam will die from one cause or another and a lot *is* dying from other causes. Unless it regenerates, it will disappear from those remnant communities, with or without mistletoes. Removing the mistletoes will not solve the problem of jam disappearing from the road verges or other remnants.

To address this problem, we need to seek methods to regenerate and manage jam in remnant vegetation, particularly road verges. The

judicious use of fire may be the most effective tool to develop, because fire probably did the job before we altered things. The issue of mistletoes would take care of itself. However, managing the dense exotic grasses that usually dominate the understorey now will be a difficult problem. I suspect they are a factor in suppressing jam regeneration.

Wandoo

Wandoo differs from jam in that it lives longer, survives hot fires by producing epicormic shoots from dormant buds that lay sheltered below the bark, and is less reliant on seed germination after fire for regeneration. I have never seen sites where a lot of trees carry debilitating mistletoe loads in woodlands where fire scars show that fires occasionally scorch the canopy. The absence of fires that are hot enough to scorch the canopy once in a while probably explains why excessive infestations can build up along road reserves and in remnant bush.

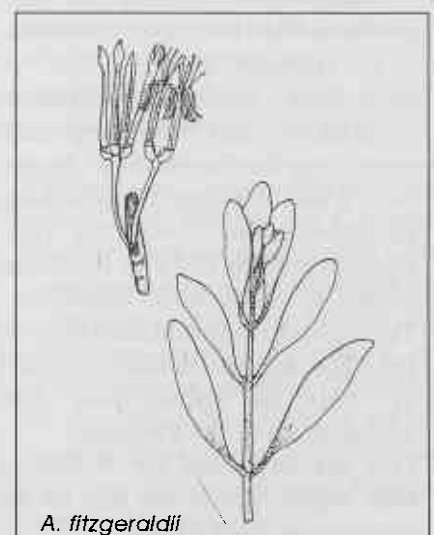
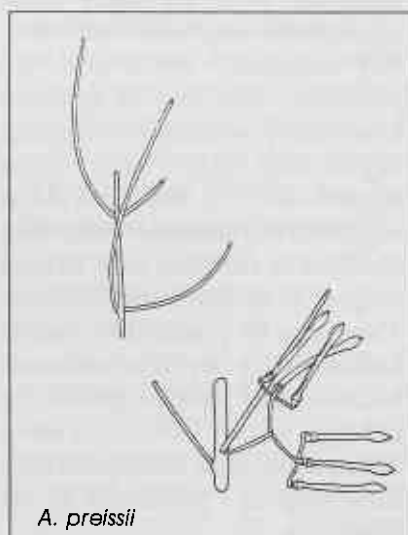
Even so, mistletoe infestations at pest level is usually patchy. In a wandoo-lined road reserve, there may be sections of a few hundred meters every few kilometres in which infestations are excessive. Some trees will be so heavily infested that their health is affected

or, in extreme cases, they have died. But, look carefully and you will see that there are 'clean' trees among them. The phenomenon can be seen on Albany and Brookton Highways. I suspect that the mistletoes are exploiting trees that are less healthy in the first place.

It may now be difficult to introduce fire that is sufficiently hot to scorch tree canopies in narrow road reserves except on days when the adjacent landholders would NOT want anyone lighting up! However, it may be possible to remove the mistletoes with tree pruning equipment. This mistletoe has a simple haustorium (join to its host) that terminates its host branch. Cutting off the mistletoe kills it.

Prickly bark

In the table, I have listed *Amyema miquelii* as a serious pest of prickly bark (*Eucalyptus todtiana*, sometimes called blackbutt) in kwongan communities north of Perth. In many of the national parks and nature reserves south from Eneabba, prickly bark occurs as a sparse overstorey to the kwongan and it is often infested by mistletoes to a debilitating level. I have observed dead trees with many mistletoe scars that suggest the mistletoe killed them. Fire is often rare in these communities. However, I have observed areas that have been



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burned. The fire has killed all the mistletoes (their haustorial scars are obvious) and the trees all regenerate canopies from epicormic shoots. The new canopies are dense and healthy, in strong contrast to those that were not burned and still have mistletoes.

It appears that, if fire is permanently excluded, mistletoes could more or less eliminate prickly barks from the community. In any case, it would be worth establishing an experiment involving fire, physical pruning and a no-treatment control to examine the hypothesis. The experiment would shed light on fire frequency and mistletoe control as well as appropriate fire management in the kwongan.

[Are the any Land for Wildlifers who would like to try this on an appropriate site? - Ed.]

Other possibilities

I have emphasised the role of fire as a problem and a solution because I think it is probably the most important single factor. However, there are many other processes that may have contributed. For example, mistletoes are palatable. The loss of possums from many patches of remnant vegetation may have been significant. It has also been suggested that mistletoe birds, when confined to corridors such as road verges, exacerbate the problem. These may be contributory factors but I doubt that they are prime causes because they don't explain the patchy nature of excessive infestations, or the selection of only some trees in a population by the mistletoes.

The verdict

Guilty? I think a jury would have to conclude that mistletoes are intrinsically 'good citizens' in our bush. Nevertheless, the prosecution has good evidence that there are places and times when they are rather anti-social! However, the defence must point out that there are mitigating circumstances; people have created the conditions under which the mistletoes become pests. Making amends is up to us.

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Pics from 'Flora of Australia' Vol 22