lerps bugs and gum-leaves

BY JANET FARR

IN THE EARLY 1980'S, FLAT-TOPPED YATE TREES THROUGHOUT THE LOWER GREAT SOUTHERN STARTED TO LOOK AS THOUGH SCORCHED BY FIRE - YET NO FIRE HAD TAKEN PLACE...

The fire-scorched appearance of flat-topped yates (*Eucalyptus occidentalis*) was first officially recorded in June 1982 between Gnowangerup and Borden. Since then, damage has been observed throughout the entire range of flat-topped yate in the south-west of Western Australia. This tree species is now suffering severe crown decline and, in some instances, death. The cause? An insect commonly, though erroneously, referred to as a lerp.

Flat-topped yate, or swamp yate, is distributed throughout the Lower Great Southern in swamps and creek-lines, mainly as remnant stands of vegetation. Before European settlement these trees must have been a significant feature of the landscape; the town Jerramungup was named from an Aboriginal word meaning 'place of the flat-topped yate'. The timber from this species is extremely hard and was valued as a material for making strong, reliable cart-wheels. Today, its value is environmental. Flat-topped yate is salt-tolerant, and in farming areas is considered important in reducing salt encroachment. In fact its importance is not limited to Western Australia: the flat-topped yate has found its way to countries such as Lebanon, Israel and Portugal.

WHAT IS A LERP?

The word *lerp*, which is Aboriginal, does not refer to an insect. It refers to the protective covering under which the insect, a psyllid, lives. Lerps are as diverse as the individual species that build them, but generally come in two forms: those with a high wax content and those with a high sugar content. Sugary lerps were eaten by Aborigines as a kind of confectionery.

The psyllid itself belongs to the order Hemiptera ('true bugs'). It is a sap sucker feeding from plants, much like an aphid or a mealy bug. Some psyllid species are free-living; the lerp-building species belong to the sub-family Spondyliaspidinae, and the lerps they construct are often used to differentiate between species.

The psyllid which affects flat-topped yate was at first identified from a lerp case as *Cardiaspina brunnea*, originally collected in NSW in 1923 on the grey ironbark (*Eucalyptus paniculata*). This suggested that the insect may have been introduced to Western Australia, which would explain the sudden occurrence of an insect which until 1980 was not known in this State. However, the host tree of *C. brunnea* belonged to a different group of eucalypts from that of the Western Australian host tree. Species within the insect genus *Cardiaspina* are known to have a fairly limited host range, restricting their food plants to eucalypts which are closely related. So this insect did not seem to fit the current knowledge on its genus. Also the only specimen of the NSW species as described in 1923 was a lerp case. Therefore, it was not known what the actual insect looked like.

It has now been verified that the psyllid affecting flat-topped yate is not *C. brunnea*,

Waxy lerp.
Photo - Peter Skinner

Facing page:

Left:
Lerp-infected leaf.
Photo - Ian Duncan

Inset:
Landscape showing healthy yate.
Photo - Ian Duncan

Above:
Landscape showing unhealthy yate.
Photo - Ian Duncan

Right:
Distribution of the flat-topped yate in south Western Australia.

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but a new species now called *Cardiaspina jerramungae*. This means it is very likely to be indigenous to the outbreak area.

The new psyllid species builds a distinctive waxy, shell-like lerp, patterned with dark bands. There are two main hosts, the flat-topped yate and the coastal moort *(E. platypus* var. *heterophylla*). Eggs are laid, preferably on mature leaves, and attached to the leaves by stalks. After hatching, the young nymph crawls over the leaf surface until a suitable feeding site is found. The insect then inserts its long needle-like mouth parts into the leaf and starts to feed and then starts to build its characteristic lerp case, which is a simple disc built up through five nymphal stages. The finished structure looks like an inverted basket in the shape of a sea shell.

During feeding, the leaf tissue around the feeding site changes from green through yellow, purple-green, purple-red, and red, to brown, when the leaf tissue dies. The red and purple colours reflect the plant's response to the psyllid's saliva and are due to chemicals such as tannins around the feeding site. Some scientists believe that such chemicals are the plant's counter-attack against its insect feeders. Severe outbreaks of this insect can result in most of the leaves in a tree crown turning purple-red - hence the scorched appearance of flat-topped yate.

Like other species of *Cardiaspina*, this insect has three generations a year. The long winter generation extends from May to December and is followed by the shorter summer and autumn generations (December-February and February-May respectively). It is the generations' timings and the insect's preference for mature leaves which contribute to its nature as a 'cyclic outbreaker'.

Most species of lerp-building psyllids exist in relatively low numbers within their natural habitat, sometimes so low that they can be very hard to find, which may be why the insect was relatively

1 Psyllid eggs. Size, less than 0.5mm.
Photo - Janet Farr

2 First stage lerp and nymph.
Photo - Peter Skinner

3 Approaching second stage. Nymph has extended lerp with finger-like projections.
Photo - Peter Skinner

4 Showing nymph with wing buds and lerp approaching final form.
Photo - Peter Skinner

5 Fourth stage nymph and lerp (inverted).
Photo - Peter Skinner

6 Adult female psyllid. Length from head to wing tip 3mm.
Photo - Janet Farr

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unknown until now. Outbreaking psyllid species exhibit a cycle of rapid build-up in numbers followed by a rapid decline. This decline is often due to depletion of preferred food resources, the psyllids having literally eaten themselves out of house and home. During this decline psyllids may exist in moderately high numbers in isolated areas or on isolated trees, often on the fringes of the old outbreak. Such trees are termed 'out of phase'. Detection of resistant trees can therefore be difficult, as undamaged trees could be out of phase with the current outbreak.

OUTBREAK CAUSES

Two main theories have been developed to explain psyllid outbreaks. One is that they are stimulated by waterlogging of food plants followed by drought, the stress leading to an increase in nutrients in the food; this in turn increases the survival rate of young nymphs. The second is that a number of factors may contribute to high psyllid numbers, including drought in the previous growing season, good levels of soil moisture for growth of the food plant in the present season, favourable autumn and winter temperatures, a low level of flowering on food plants, an abundance of leaves of the preferred age class, low levels of leaf damage by other insects, and inefficient natural control. Neither of these theories may be entirely satisfactory; leaves of the right age class having the preferred chemical components should

also be considered.

What has caused the outbreak in the Lower Great Southern is also a matter for debate. It seems that the life of a natural flat-topped yate stand is cyclic, relying on flooding and retraction of flood levels in successive years to ensure seed germination, survival and establishment. Many remnant yate stands are comprised of a high proportion of mature trees with very little age and species diversity, and it is the mature trees that are dying. Psyllids seem initially to outbreak on mature trees, moving on to young trees only after the older ones have been defoliated. Species and age diversity coupled with land management history (mainly in terms of stock access) may be major factors in the decline of remnant vegetation. Therefore fencing is considered one of the primary means of conserving the species.

CAUSE OR SYMPTOM?

Such insect outbreaks may be more a symptom than a cause. Trees stressed by environmental factors such as weather extremes (e.g. drought and flooding), increased salinity and nutrient imbalances, some of which are a result of agricultural development, increase the trees' susceptibility to insect attack. This in turn induces further tree decline.

Research by The Department of Conservation and Land Management (CALM) into this problem began in 1988. With the co-operation of farmers within the region, mainly through liaison with Land Conservation District Committees and the Jerramungup Department of Agriculture, psyllid population levels and the impact of this insect on the tree have been monitored. A parasitic wasp which mummifies psyllid nymphs, and a predator, the striated pardalote, have been seen to cause significant decline in a psyllid population near Cranbrook. This is an isolated case, however, and in general parasites have little influence on psyllid populations in outbreak.

Farmer participation plays an important part in collecting data. A simple trapping method enables researchers to compare differences in psyllid populations throughout the outbreak region. Traps are erected in remnant yate stands during flight seasons. These traps are tended at weekly intervals by the farmer on whose property the trap is located. Experiments have shown that yellow is the colour that most attracts adult psyllids.

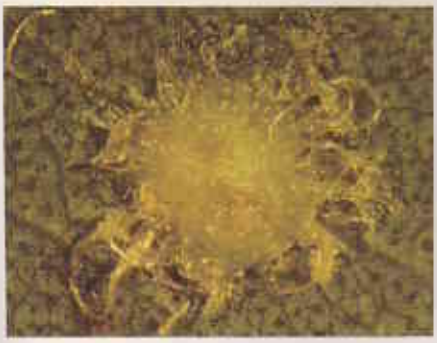
By studying the psyllid and its host within both farmland and national parks, research is aiming at conserving remnant flat-topped yate by either controlling the psyllid populations or promoting stand regeneration. With greater understanding of the interaction of the flat-topped yate with its environment, it is hoped that Jerramungup will remain the 'place of the flat-topped yates'. ⊡

Right:
Leaves of the flat-topped yate showing colour change.
Photo - Janet Farr

Below right:
Psyllid nymph mummified by wasp parasitoid. The body of the parasitoid can be seen as a white blob inside the nymph's skin.
Photo - Peter Skinner

Below:
Adult wasp parasitoid.
Photo - Peter Skinner

Below left:
A sugary lerp.
Photo - Janet Farr



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LANDSCOPE

VOLUME EIGHT NO. 1 SPRING ISSUE 1992

Small and shy and quite unlike their exotic, urban cousins, high climbing rodents live throughout the Kimberley. *See page 10.*

Once it was a traditional battleground for Aboriginal people. Today the competition is between sailboarders while families of picnickers look on. *See page 23.*

The various groups of Aboriginal people around the Swan River lived in harmony with the seasons. *See page 28.*

His name is connected with plants and places around Australia. He was interested in everything from Aboriginal customs to the size of trees. Read about A Man of Science *on page 16.*

Learn about the incredible variety of orchids in the Stirling Range. *See page 36.*

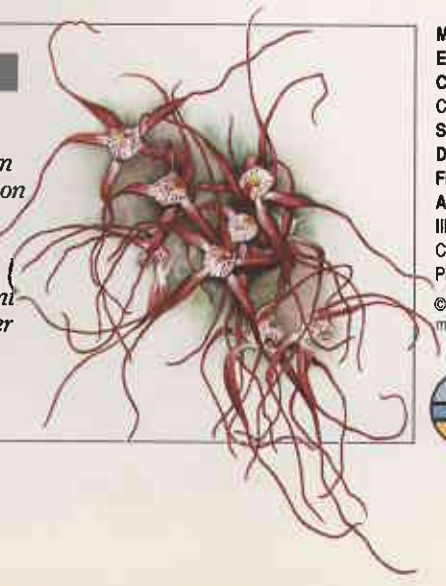
FEATURES

REGULARS

SPECIALS

COVER

*The many coloured orchid (*Caledonia polychroma *) is well named. Aside from the rich pinks there are clumps of lemon yellow and pure white. The orchid is found in the low areas of the Stirling Range, preferring wandoo and sheoak woodlands. While most years its vibrant flowers can be seen, it flowers best after fire. The illustration is by Phillipa Nikulinsky.*



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