Out on a Limb

Ian Abbott

Thousands of insect species live in W.A. forests but two of them are of particular concern to forest managers. Principal Research Scientist for CALM, **Dr Ian Abbott**, discusses the impact these insects are having on our jarrah forest and why they are the subject of intensive research.

There are about 15 000 native insect species living in South-West eucalypt forests. Some live in the soil and litter, while some eat wood. Others are parasites living off other insects and a large number feed on plant foliage. Two of these herbivorous species - jarrah leafminer (*Perthida glyphopa*) and gum-leaf skeletonizer (*Uraba lugens*) - are abundant enough to worry forest managers.

Jarrah leafminer, which lives only in the South-West, did not cause concern until the 1960s when it began to brown jarrah tree crowns in forest east of Manjimup every year. In 1962, the Forests Department asked CSIRO's Division of Entomology to initiate research into the leafminer explosion and control measures. This research finished in 1988.

In the summer of 1982/83, gum-leaf skeletonizer caused widespread browning of jarrah tree crowns in the Manjimup region and the Forests Department immediately started research.

S. Curry

Jarrah leafminer damage to foliage (top).

Adult moth of gum-leaf skeletonizer (above).

Today, pest populations of these two insect species can be found in half the jarrah forest. Most of the affected stands lie south of Collie. Leafminer affects about 400 000 ha and skeletonizer 120 000 ha.

Detailed studies around Manjimup indicate that operations in the forest such as logging or prescribed spring burning are unlikely to have caused the outbreaks. Since the 1960s, most winters have been mild, with below average rainfall, and it is possible these changes triggered the development and spread of the outbreaks. If this is so, the predicted Greenhouse effect may aggravate problems with pest insects over the next few decades. However, the 1988 winter - one of the coldest and wettest for many years - reduced the numbers of leafminer and skeletonizer.

Damage to jarrah crowns

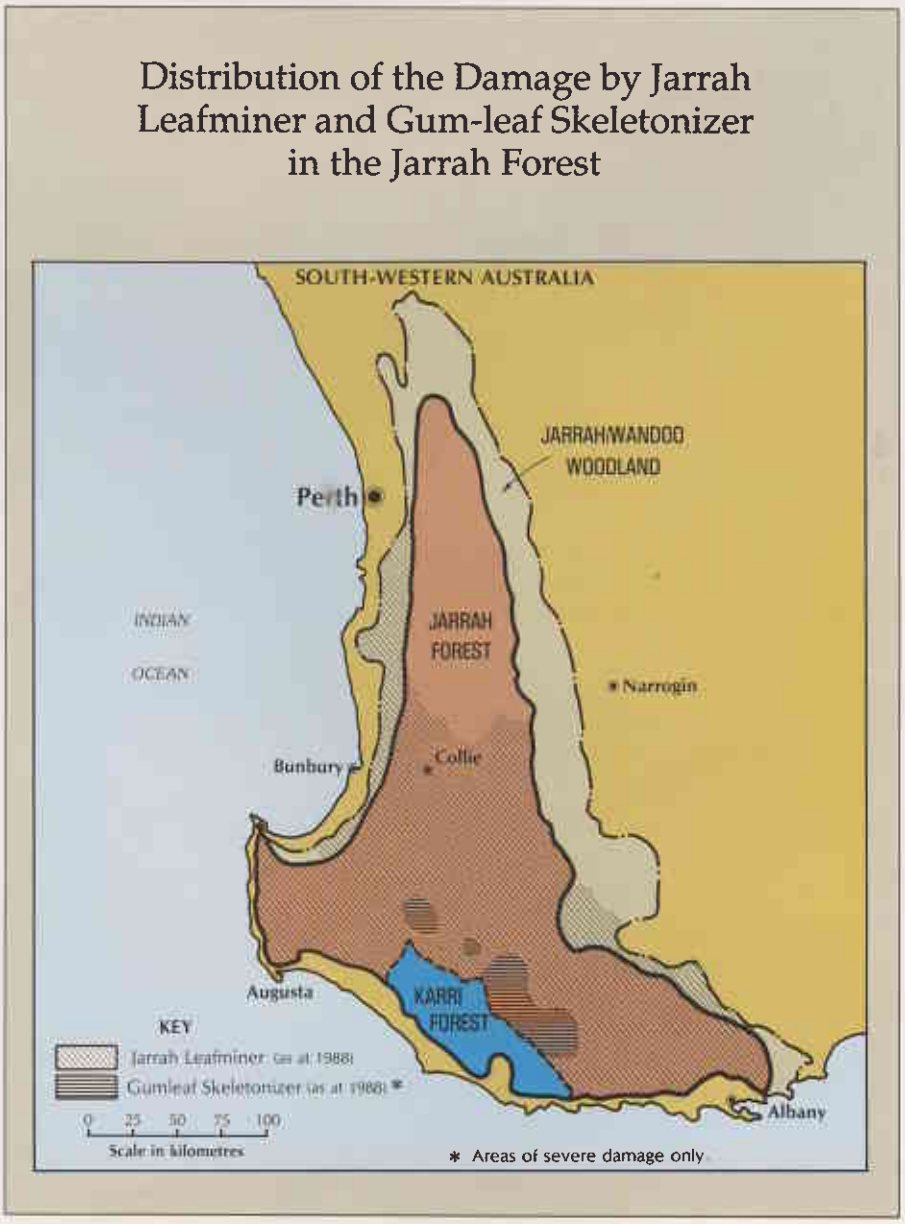
When the caterpillars of both species feed, they reduce the green material of jarrah leaves. In severely affected stands, more than 60 per cent of all foliage turns brown and is unable to photosynthesize. Consequently, foliage becomes less dense and dies back from the branch tips, permanently damaging the jarrah crowns.

Jarrah growth is cut by 50-70 per cent as a result. It is estimated that leafminer infestation causes the loss of about 120 000 cubic metres of wood growth each year, while about 50 000 cubic metres is lost to skeletonizer.

Fortunately, skeletonizer outbreaks so far have not reduced the variety and number of other invertebrates living in jarrah crowns. The impact of leafminer on other invertebrates is still being studied.

K. Low

Gum-leaf skeletonizer caterpillar feeding on jarrah leaves (above).



CONTROL OPTIONS

The ravages of jarrah leafminer

Leafminer

- Single Autumn Fire - the aim is to disrupt the life cycle, as such a fire should reduce the number of suitable egg-laying sites for at least a year.
- Fertilizer - the aim is to promote the vigour of jarrah. However, fertilizer usually increases the density of crown leaves, providing more sites for egg-laying.
- Parasitoids - this has been thoroughly investigated by CSIRO's Division of Entomology at Floreat Park. Local parasitoid species (small wasps) cannot effectively control leafminer when in outbreak.
- Insecticide - an insecticide specific to leafminer would be essential. Any other insecticide could have adverse environmental consequences, including contamination of birds and mammals feeding on affected insects and extensive killing of non-target species.

  Non-specific insecticide, however, could pollute streams and would eventually result in the evolution of an immune system by the pest insects, so proving counter-productive.
- Breeding of resistant trees - CSIRO research has found that 25 per cent of jarrah in the southern jarrah forest are resistant to feeding by leafminer larvae. The aim is to gradually convert stands to contain a higher proportion of resistant jarrah.

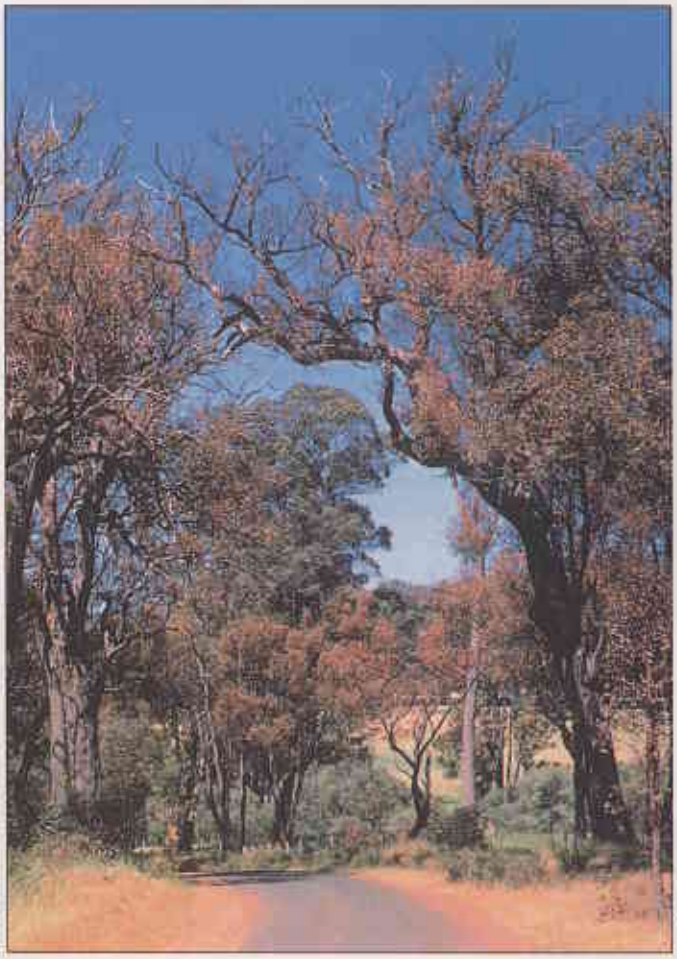
Gum-leaf skeletonizer damage.

Skeletonizer

- Pupation behaviour - the preferred site of pupation is not yet known. Clearly, if most pupae were present in leaf litter or on lower tree trunks, then low-intensity fire could be used to kill the pupae. However, if pupae were mainly in the crowns, then higher-intensity fires would be needed.
- Parasitoids - CALM's Dr Janet Farr is investigating how many insect species parasitize skeletonizer caterpillars. The aim is to assess whether any of the species detected are effective parasitoids. As skeletonizer occurs in other States, it would also be useful to evaluate parasitoids of these populations for possible introduction to W.A.
- Insecticide - similar problems to those encountered for leafminer.

The young larvae of gum-leaf skeletonizer have just emerged from the egg-raft on this leaf.

The area of forest affected by the two species has increased every year ...



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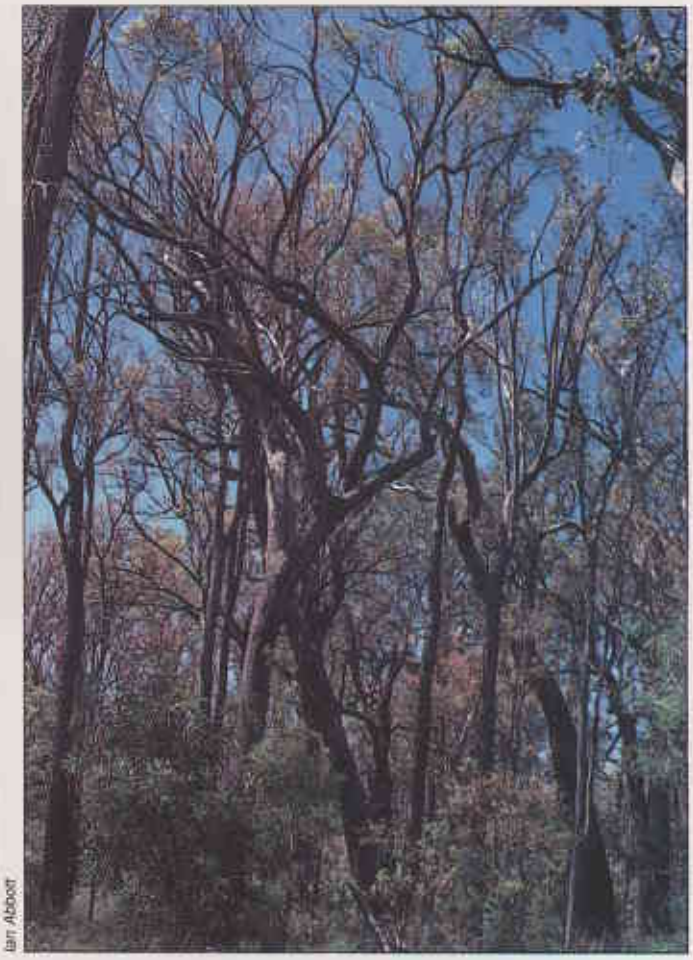
Jarrah trees infested by jarrah leafminer near the Perup River.



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The canopy and advanced growth of these trees near Spring Block have been severely affected by gum-leaf skeletonizer.

These worrying findings, and their possible impact on water supply quality, have prompted CALM to double its research into forest entomology. Two research teams, each made up of one scientist and two technical assistants, are now based at CALM's Manjimup and Como research centres. The Manjimup team is seeking an effective biological control method for skeletonizer while the Perth team researches a control strategy for leafminer.

The study of these insect pests is one of CALM's major research activities. A Task Force on Economically Important Insects of Jarrah Forest, comprised of experts from CALM, the CSIRO's Division of Entomology, the W.A. Water Authority and the Forest Products Association, helps research the causes and control of insect outbreaks.

The area of forest affected by the two species has increased every year. In the last five years, the leafminer has moved into the northern jarrah forest and moves a few kilometres north each year. Skeletonizer also appears to be moving north, although at present it is not in outbreak north of the Blackwood River.

CSIRO's Division of Entomology has monitored plots around Manjimup for 20 years and, to date, continual leafminer infestation has not killed many jarrah trees. Furthermore, up to a quarter of all jarrah trees appear to be resistant to attack. However, the crowns of susceptible trees have deteriorated and seem unlikely to recover. If an effective remedy is not found, the future forest will have a higher proportion of marri along with jarrah resistant to leafminer. It is not yet known whether any jarrah are skeletonizer resistant.

Leafminer and skeletonizer could have a far greater impact on the vigour and growth of jarrah than dieback disease caused by the fungus *Phytophthora cinnamomi*. Unlike dieback, severe insect outbreaks occur over many of the site-vegetation types in jarrah forest.

LANDSCOPE

VOLUME 4 NO 3 AUTUMN EDITION 1989

EDITORIAL

A prerequisite for the successful management of land and wildlife is an understanding of the processes that drive ecosystems, and managers who can manipulate these processes.

In Western Australia, we are fortunate that we have a wealth of talent in different government agencies, tertiary institutions and private companies who can provide these research and management skills.

Of course, obtaining a perfect understanding of ecosystems and ways to manage them brings to mind the frog who wants to reach a creek, but can only jump half the distance every time.

But it is not the complexities of understanding or managing ecosystems which provide the greatest difficulty.

Social and political factors are far more difficult to accommodate.

All the scientific and managerial skills in the world are worth nothing if the community and, often more importantly, selected constituencies within the community do not support the management strategies.

Unfortunately, there is often an inverse relationship between a scientist's or manager's skills in his profession and his capacity to handle social and political factors in the community. This is not surprising, since most scientists and managers have received little training in basic communication skills, let alone community politics.

CALM is attempting to address this problem in a variety of ways. But the people who should know the most about how to obtain community support for public land management strategies are the public. *Landscope* readers are an important and influential constituency. If you have thoughts on this issue we would like to hear from you.

What a sterling idea! A new management plan for CALM's South Coast Region - page 28.

Are insects gradually eating away our jarrah forests? Turn to page 18.

What lies beneath the waters of Marmion Marine Park? See page 25.

COVER

A rose by any other name... Does its name detract from the beauty of the common eggfly (Hypolimnas bolina)? *Photograph - Jiri Lochman*

FEATURES

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Managing Editor: Sweton Stewart
Editors: Kylie Byfield/Carolyn Thomson
Designers: Louise Burch/Robyn Mundy
Production: Karen Addison/Margaret Wilke
Advertising: Tim Langford-Smith ☎ (09) 389 8644
Colour Separations by The Colour Set
Printed in Western Australia by Kaleidoscope

Published by Dr S Shea, Executive Director,
Department of Conservation and Land Management,
50 Hayman Road, Como, Western Australia 6152.