



Jarrah leafminer: a damaging pest of jarrah forest

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Background

The jarrah leafminer (*Perthida glyphopa*), formerly a rare species, is native to Western Australia. Its first known appearance was detected on herbarium specimens collected in 1878 near Perth. On the coastal plain around Perth, populations of leafminer reached pest levels by the first decades of the 20th century. Despite the development of this earlier outbreak, the jarrah leafminer only became a pest in the main jarrah forest around 1960 when high population levels caused severe damage east of Manjimup. In subsequent decades the outbreak gradually extended west, south and north in the main jarrah forest. By 1985 it had reached about 10 km north of Collie. Meanwhile, the severity of outbreak around Manjimup had abated, though leafminer is still present across extensive areas east of Manjimup.



View from Kepal fire tower (about 20k NE of Manjimup) in 1966 of brown, leafminer affected jarrah. Photos: S. Curry



Leafminer affected jarrah leaves. Note capsules and cutout holes of successful larvae

Jarrah leafminer is so called because its caterpillar stage lives between the outer surfaces of jarrah leaves and feeds on the green leaf tissue. Leafminer outbreaks cause repeated loss of leaf area due to the loss of leaf tissue to mines, browning of unmined tissue, and premature leaf fall at high mine densities. The vigour of jarrah trees is diminished and crown condition deteriorates as branches progressively die back from their tips. The loss of leaf area in turn affects tree growth, root system vigour, and ultimately the volume of wood, flowers and fruit produced. More subtly, the balance of competitive relationships between jarrah and other components of jarrah forest vegetation is probably altered. It is likely that reduction of green leaf tissue affects the abundance of other native invertebrates that feed on this substrate and may also adversely affect bird populations.

Following outbreaks in areas subject to timber harvesting, there has been considerable research into the effects of forest management practices on leafminer populations. In outbreak conditions, timber harvesting and periodic fuel reduction fires have no significant effect on leafminer populations, or the spread of leafminer outbreak.

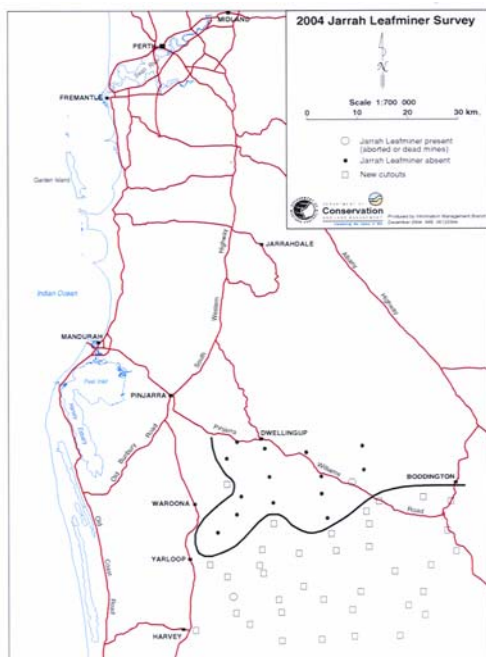
Monitoring spread and severity of leafminer populations in the northern jarrah

After 70 years of high leafminer population levels on the coastal plain around Perth, the outbreak had not spread eastwards into the adjacent main jarrah forest. In 1987 the then Department of Conservation and Land Management commenced a program to monitor the spread of leafminer from the south into the northern jarrah forest. Presence of oval cutout holes by larvae was used as an indicator of the presence of viable populations of leafminer. Annual monitoring between 1987 and 1992 considered the spread of leafminer in relation to logging operations and spring fuel

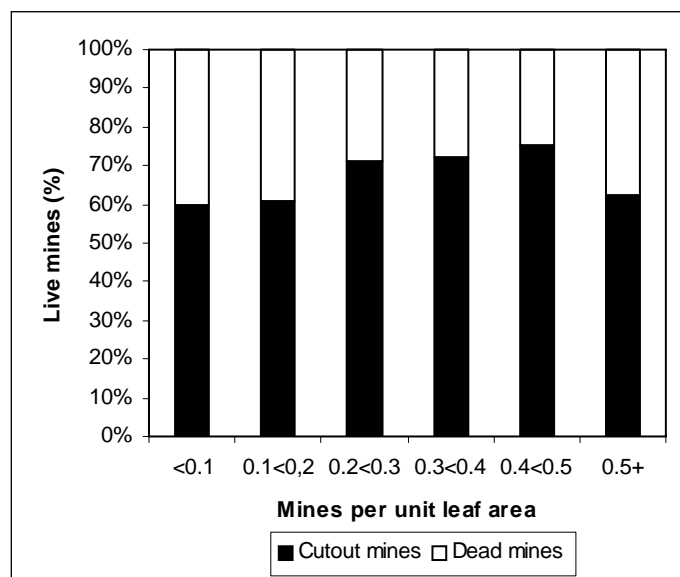
reduction fires. In 2004 populations per unit of leaf area were determined for samples on a transect across the outbreak front along Tallanalla and Nanga Roads between Dee Vee Road (about 40 km S of Dwellingup) and Dwellingup.

Findings

- Advances and retreats in the distribution of viable populations of leafminer were unrelated to spring burning and logging.
- Northward advance of leafminer was initially rapid but has slowed since 1996.
- In 2004, leafminer populations increased rapidly from undetectable near Dwellingup to high levels over a distance of about 20 km along a road transect south of Dwellingup.
- The structured differences in population density formed by the advancing outbreak front present an opportunity to examine the relationship between population density and mortality during the life cycle of the pest.
- In outbreak conditions around Collie, excluding resistant trees, rates of larval mortality on individual leaves were related to the mine density on the leaves. Leaves with intermediate mine densities have highest mine success rates while leaves with high or low mine densities have lowest mine success rates. There was about a 10% difference between highest and lowest success rates.



Extent of northward advance of jarrah leafminer into the northern jarrah forest is marked by the black line



Small but statistically significant variation in larval mortality rates according to mine density on leaves from jarrah trees in outbreak conditions around Collie

Management Implications

- Further northward expansion of leafminer remains a threat to the jarrah forest, including invertebrates and birds dependent on jarrah forest.
- Leafminer outbreaks tend to become self-promoting and then self-sustaining for long periods because survival rate at a key period of the life cycle is highest at intermediate population densities.
- Management of jarrah forest involving timber harvesting or fuel reduction through prescribed fire has no adverse or beneficial effect on large-scale spread of leafminer populations in either outbreak or low population conditions.