Northern extent of Jarrah Leafminer infestation:
Survey November 2004

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Summary

Jarrah forest between Collie and Dwellingup has been periodically inspected for presence of jarrah leafminer (JLM) since 1987 (Abbott *et al.* 1995).

Initial monitoring was completed annually for the years 1987 to 1992 when rapid encroachment of the JLM outbreak into the northern jarrah forest from the central forest around Collie was thought to be imminent.

Encroachment of JLM into the northern jarrah forest has been slow and the status of infestation was subsequently monitored at longer intervals in the years 1996, 1999 and 2004.

Presence and absence of leafminer mines and cutouts was mapped at a scale of 1:700,000 and a boundary between locations where cutouts were detected and not detected was hand drawn.

There has been no apparent progress northwards of JLM populations since the last survey in 1999. Indeed there appears to be slight contractions southwards in the area containing populations of JLM.

Progress northwards of the JLM outbreak from the central forest region around Collie appears to have slowed to a standstill, despite rapid northwards movement in the late 1980s.

Continued monitoring of the outbreak at 5 yearly intervals is therefore recommended.

Introduction

Feeding by the larvae of the jarrah leafminer *Perthida glyphopa* is an important cause of defoliation of jarrah across extensive areas of jarrah-dominated forest in Western Australia. Defoliation is by two processes, firstly the area mined within leaves causes a loss of photosynthetic leaf area and secondly, when populations of mines within leaves are great enough death of green leaf area between mines results in leaf browning and premature abscission of affected leaves. Areas where jarrah leafminer (JLM) populations are in outbreak are characterised by brown crowns in late spring and summer. JLM became a pest in jarrah forest around 1960 when annually repeated feeding by the larvae caused extensive damage to the crowns of jarrah trees. The infestation has gradually extended west, south and north.

Occurrences of JLM on jarrah are rare in the northern jarrah forest, despite JLM being in outbreak on the adjacent Swan Coastal Plain since the early 20th century (Abbott *et al.* 1999). Jarrah forest between Collie and Dwellingup has been periodically inspected for presence of JLM since 1987 (Abbott *et al.* 1995). Initial monitoring was completed annually for the years 1987 to 1992 when rapid encroachment of the JLM outbreak into the northern jarrah forest from the central forest around Collie was thought to be imminent. Encroachment of JLM into the northern jarrah forest has been slow and the status of infestation was subsequently monitored at longer intervals in

the years 1996, 1999 and 2004. We report here the results of monitoring in November 2004.

Methods

Jarrah advance growth plants at a network of roadside locations in jarrah forest blocks between AMG 6336000 mN in the south and AMG 6380000 mN in the north were inspected on 2nd and 5th of November 2004 for indications of the status of JLM infestation. These indications were:

- Absence of JLM mines;
- presence of JLM mines without cutout holes;
- presence of JLM mines with cutout holes indicating successful abscission of mature larvae from the leaves. Presence or absence of indications of JLM was recorded and a GPS position of the observation site was taken and recorded. Searching was for up to 5 minutes if no mines were found. Descriptions of the life cycle and photographs of leaves with abscised mines can be found in Abbott *et al.* (1995). A sample of 5 leaves was taken from 3 jarrah plants at a series of points along the north-south aligned Tallanalla and Nanga roads. The number of mines and cutouts per unit was counted and calculated per unit of adaxial (leaf upper side) leaf area.

Results and Discussion

Presence of leafminer populations can be detected at low abundance per unit of adaxial leaf area. The lowest frequency that mines were detected was 0.015 mines cm^{-2} leaf area (Fig. 1). At total mine populations below 0.1 mines and above 0 mines cm^{-2} leaf area, frequency of abscised mines varied between 0 and 0.005 cutouts cm^{-2} leaf area. Thus, the presence of cutouts is a robust indicator of viable populations of JLM.

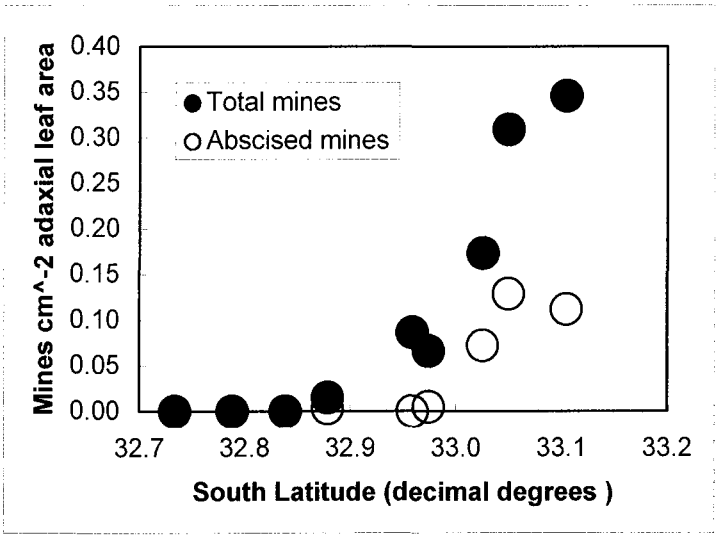


Fig.1. Mines cm^{-2} adaxial leaf area along a north to south transect of sites along Nanga and Tallanalla Roads

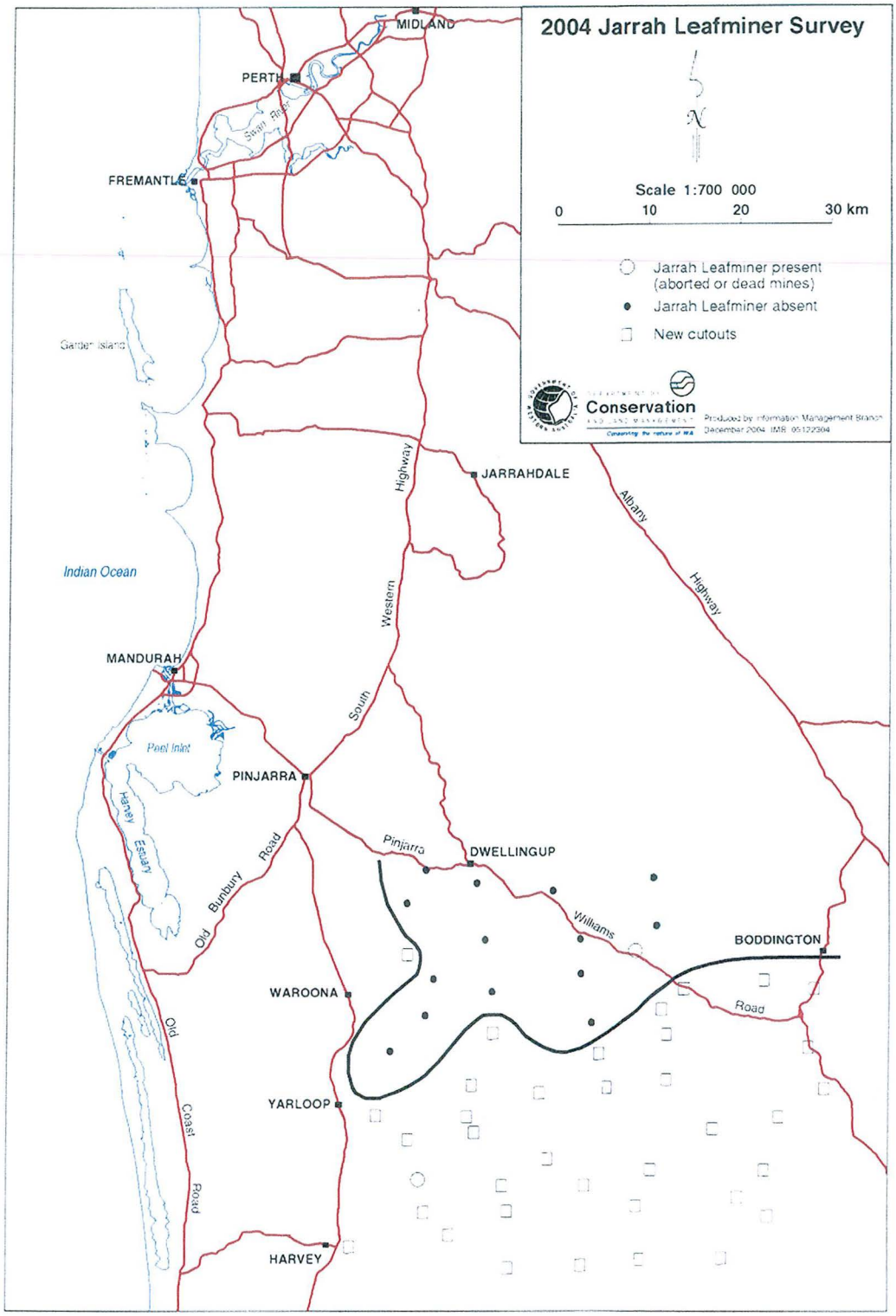


Fig. 2. Sites surveyed November 2004 for presence of jarrah leafminer. Bold black line delineates the northern boundary of the area where successfully completed mines were found.

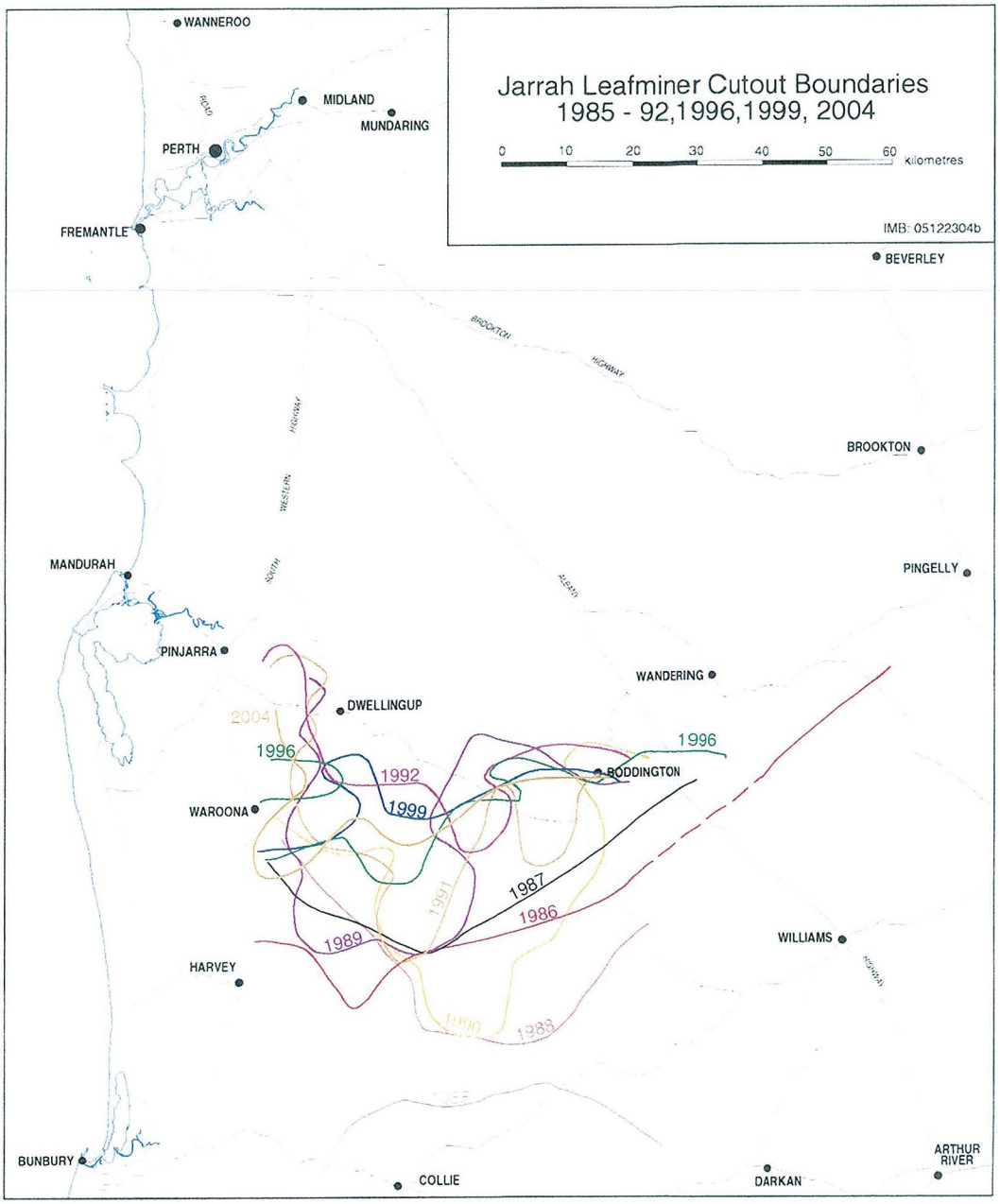


Fig. 3. Changes in the northern boundary of the area where successfully completed mines were found. Note relatively minor changes, including recession of some areas, since 1992.

Presence - absence of leafminer mines and cutouts was mapped at a scale of 1:700,000 and a boundary between locations where cutouts were detected and not detected was hand drawn (Fig. 2). There has been no apparent progress northwards of JLM populations since the last survey in 1999. Indeed there appears to be slight contractions southwards in the area containing populations of JLM. Definition of the northwards extent of JLM populations in the eastern part of the forest north of Boddington is difficult due to much of the landscape being private property. An

isolated area of light to moderate browning occurs along Harvey-Quindanning Road in the vicinity of the Murray River.

Progress northwards of the JLM outbreak from the central forest region around Collie appears to have slowed to a standstill, despite rapid northwards movement in the late 1980s (Fig. 3). In this context continued monitoring of the outbreak at 5 yearly intervals seems appropriate.

The reasons for slowing and halting of encroachment of JLM outbreak populations into the northern jarrah forests are unclear. Fuel reduction fires and timber harvesting, conditions hypothesized as elsewhere promoting JLM outbreak, have also been practised in the northern jarrah forest without inducing JLM population outbreak. It may be that the phenotypic structure of stands in the northern jarrah forest is different from central forest and Swan Coastal plains stands and this may contribute to resistance of jarrah to oviposition by JLM female moths or mine development.

Recommendations

Continued monitoring of the outbreak front is warranted at 5 yearly intervals.

The area north of Boddington needs to be covered. Sites should be monitored along the Boddington – Marradong Rd and in both Wandering and Gyngoorda forest blocks.

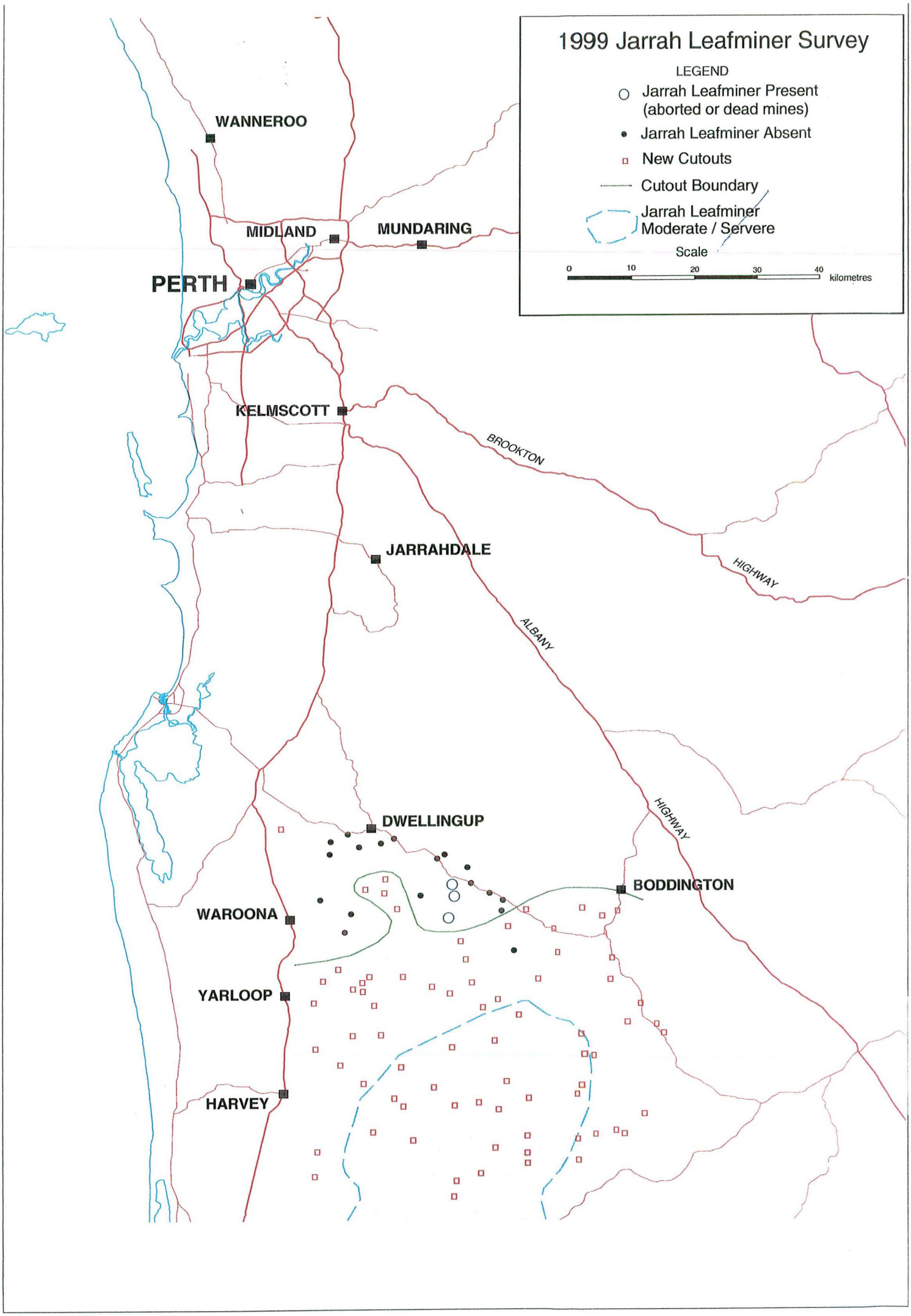
Acknowledgements

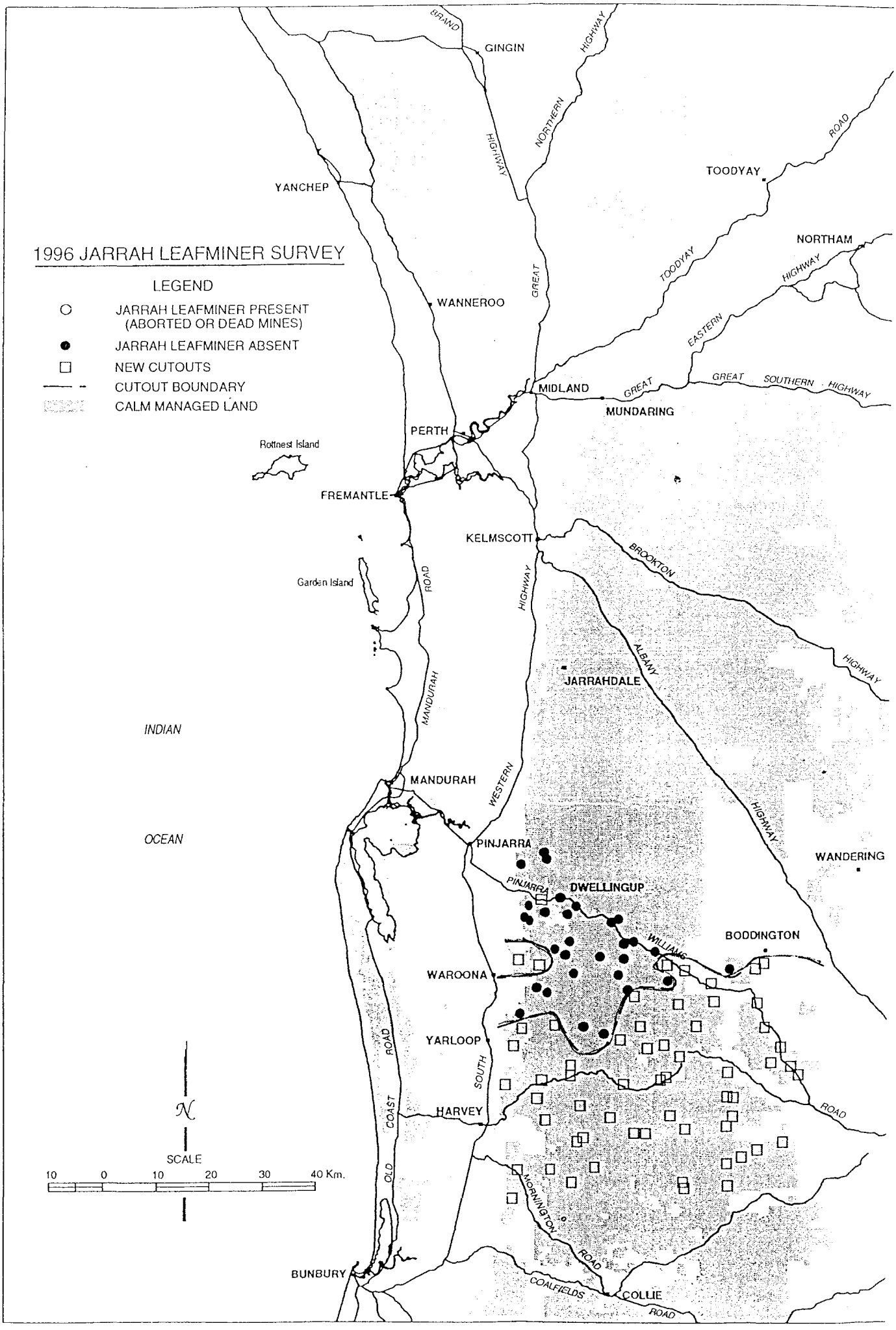
We thank Holly Smith for drafting Figures 2 and 3.

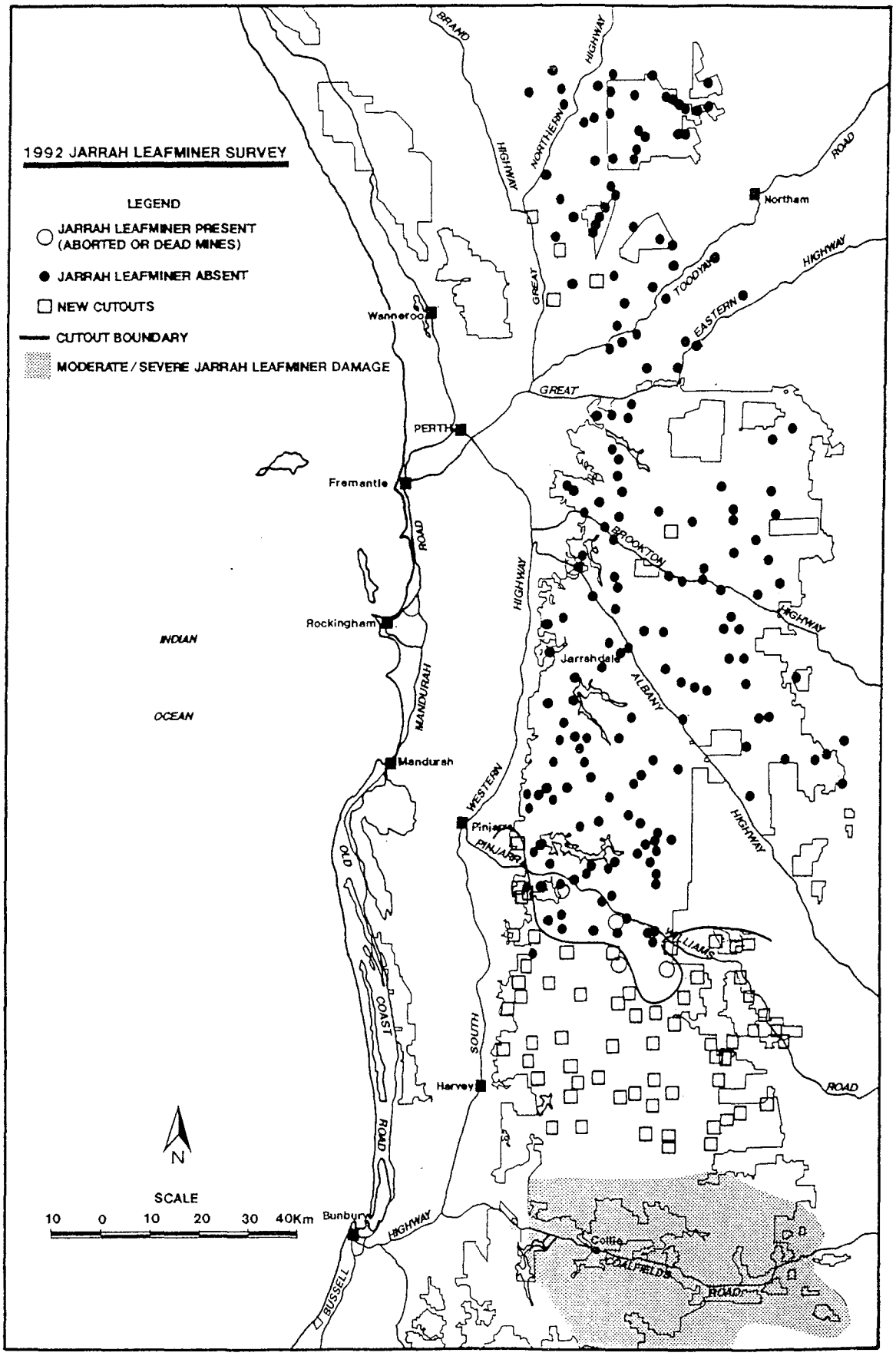
References

Abbott I., Van Heurck P., Burbidge T. and Wills A. (1995) Cutting out the leafminer. *Landscope* **11(1)**: 43-47.

Abbott I., Wills A. and Burbidge T. (1999) Historical incidence of *Perthida* leafminer species (Lepidoptera) in southwest Western Australia based on herbarium specimens. *Australian Journal of Ecology* **24**: 144-150.


1999 Jarrah Leafminer Survey
LEGEND
Jarrah Leafminer Present (aborted or dead mines)
Jarrah Leafminer Absent
New Cutouts
Cutout Boundary
Jarrah Leafminer Moderate / Servere
Scale
0 10 20 30 40 kilometres
WANNEROO
MIDLAND
MUNDARING
PERTH
KELMSCOTT
BROOKTON
HIGHWAY
JARRAHDALE
ALBANY
HIGHWAY
DWELLINGUP
BODDINGTON
WAROONA
YARLOOP
HARVEY


1996 JARRAH LEAFMINER SURVEY
LEGEND
JARRAH LEAFMINER PRESENT (ABORTED OR DEAD MINES)
JARRAH LEAFMINER ABSENT
NEW CUTOUTS
CUTOUT BOUNDARY
CALM MANAGED LAND
BRAND HIGHWAY
GINGIN
NORTHERN HIGHWAY
YANCHEP
TOODYAY ROAD
TOODYAY
NORTHAM
HIGHWAY
WANNEROO
GREAT EASTERN HIGHWAY
MIDLAND
GREAT SOUTHERN HIGHWAY
MUNDARING
PERTH
Rottnest Island
FREMANTLE
KELMSCOTT
BROOKTON HIGHWAY
Garden Island
ROAD
HIGHWAY
ALBANY HIGHWAY
JARRAHDALE
MANDURAH ROAD
INDIAN
OCEAN
MANDURAH
WESTERN HIGHWAY
PINJARRA
WANDERING
PINJARRA
DWELLINGUP
WILLIAMS
BODDINGTON
WAROONA
YARLOOP
SOUTH
COAST ROAD
OLD
HARVEY
ROAD
MORNINGTON ROAD
BUNBURY
COALFIELDS ROAD
COLLIE
N
SCALE
10 0 10 20 30 40 Km.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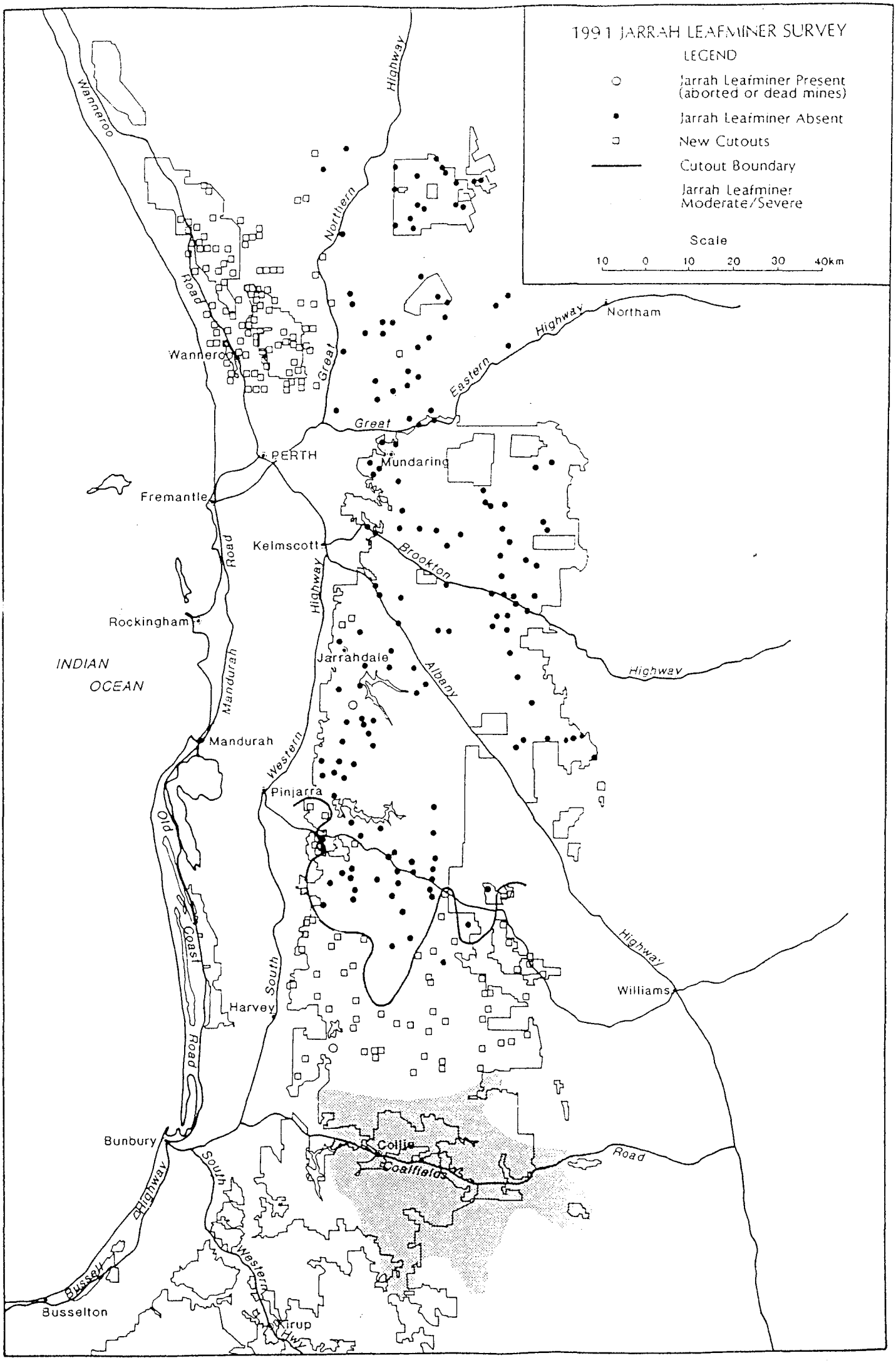
JARRAH LEAFMINER ABSENT
NEW CUTOUTS
CUTOUT BOUNDARY
MODERATE / SEVERE JARRAH LEAFMINER DAMAGE
BRAND HIGHWAY
NORTHERN HIGHWAY
GREAT NORTHERN HIGHWAY
Northam
TOODYAY ROAD
EASTERN HIGHWAY
GREAT EASTERN HIGHWAY
Wanneroo
PERTH
Fremantle
ROCKINGHAM ROAD
BROOKTON HIGHWAY
Rockingham
INDIAN OCEAN
Jarrahdale
ALBANY HIGHWAY
MANDURAH ROAD
Mandurah
WESTERN HIGHWAY
Pinjarra
PINJARRA WILLIAMS ROAD
OLD COAST ROAD
SOUTH WESTERN HIGHWAY
Harvey
N
SCALE
10 0 10 20 30 40Km
Bunbury
RUSSELL HIGHWAY
Collie
COALFIELDS ROAD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Wanneroo Road
Northern Highway
Great Eastern Highway
Northam
Wanneroo
PERTH
Mundaring
Fremantle
Kelmscott
Brookton Highway
Albany Highway
Rockingham
Mandurah Road
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Hwy
Kirup