

*Parks Victoria is responsible for managing the Victorian protected area network, which ranges from wilderness areas to metropolitan parks and includes both marine and terrestrial components.*

*Our role is to protect the natural and cultural values of the parks and other assets we manage, while providing a great range of outdoor opportunities for all Victorians and visitors.*

*A broad range of environmental research and monitoring activities supported by Parks Victoria provides information to enhance park management decisions. This Technical Series highlights some of the environmental research and monitoring activities done within Victoria's protected area network.*

*Healthy Parks Healthy People*

For more information contact the Parks Victoria Information Centre on 13 1963, or visit [www.parkweb.vic.gov.au](http://www.parkweb.vic.gov.au)



Healthy Parks  
Healthy People



PARKS VICTORIA TECHNICAL SERIES • NUMBER 31 EXAMINATION OF THE EFFECTS OF THE 2002 WILDFIRE IN THE BIG DESERT ON TERRESTRIAL VERTEBRATES



## PARKS VICTORIA TECHNICAL SERIES

NUMBER 31

### Examination of the Effects of the 2002 Wildfire in the Big Desert on Terrestrial Vertebrates

Interim Report 1: Results from Summer 2003/04

*Peter Robertson, Charles Silveira, John Coventry,  
Dan Eyles, Amanda Williams and Ian Sluiter  
February 2006*



© Parks Victoria

All rights reserved. This document is subject to the Copyright Act 1968, no part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form, or by any means, electronic, mechanical, photocopying or otherwise without the prior permission of the publisher.

First published 2005

Published by Parks Victoria  
Level 10, 535 Bourke Street, Melbourne Victoria 3000

Opinions expressed by the Authors of this publication are not necessarily those of Parks Victoria, unless expressly stated. Parks Victoria and all persons involved in the preparation and distribution of this publication do not accept any responsibility for the accuracy of any of the opinions or information contained in the publication.

**Principal author:**

Peter Robertson – Herpetologist.  
Currently employed by Wildlife Profiles Pty. Ltd, Heidelberg, Victoria.

National Library of Australia  
Cataloguing-in-publication data

Includes bibliography.  
ISSN 1448-4935

**Citation:**

Robertson, P., Silveira, C., Coventry, J., Eyles, D., Williams, A. and Sluiter, I. (2006). *Examination of the effects of the 2002 wildfire in the Big Desert on terrestrial vertebrates. Interim report 1: Results from Summer 2003/04.* Parks Victoria Technical Series No. 31. Parks Victoria, Melbourne.



Printed on environmentally friendly paper

**Parks Victoria Technical Paper Series No. 31**

**Examination of the Effects of the 2002  
Wildfire in the Big Desert on Terrestrial  
Vertebrates.**

**Interim Report 1: Results from Summer  
2003/04.**

**Peter Robertson<sup>1</sup>, Charles Silveira<sup>2</sup>, John Coventry<sup>3</sup>, Dan  
Eyles<sup>4</sup>, Amanda Williams<sup>4</sup> and Ian Sluiter<sup>5</sup>.**

**1. Ecologist, Wildlife Profiles Pty. Ltd. 2. Associate Ornithologist,  
Wildlife Profiles Pty. Ltd. 3. Curator Emeritus, Museum Victoria. 4.  
Department of Sustainability and Environment, Mildura. 5. Botanist,  
Ogyris Ecological Research Pty. Ltd.**

**February 2006**



## EXECUTIVE SUMMARY

During December 2002, a wildfire burnt approximately 189,360 ha within the central and northern areas of the Big Desert in north-western Victoria. As part of the approved rehabilitation plan, a requirement was to examine the effects of the fire on selected and threatened birds, mammals and reptiles, in order to guide appropriate management actions

Some historical information was available from survey work conducted by the Fisheries and Wildlife Division between 1985 and 1987 – twenty sites from that survey were within the vicinity of the 2002 fire. It was decided, therefore, to re-examine in detail the fauna of these twenty sites, in December 2003 and February 2004, as well as to establish some additional sites. Two over-riding objectives were: to compare the vertebrate fauna present in the north-west of the Big Desert in 2003/04 with that recorded in 1985/87; and to compare the fauna present within burnt areas 12 months after the December 2002 fire with that of adjacent unburnt areas.

Fourteen species of mammal, including four introduced taxa, are known from the study area. The reptile fauna included seven species of snake and 27 lizard species - it is likely that this represents nearly the complete lizard fauna of the study area, with the exception of the Heath Monitor, known from the south of the Big Desert but not found during the survey, and the Heath Skink, which was found during the survey and appears to have a very localised distribution in the central south of the Big Desert. Of particular note was the discovery during the 2003/04 survey of the threatened Mallee Worm-Lizard (*Aprasia aurita*) in the north of the study area – it was previously known only from the eastern fringe of the Big Desert. Only three species of frog (family Myobatrachidae) are known from the area. Eighty-one bird species were recorded, including the threatened Malleefowl, Regent Parrot, Mallee Emu-wren and Red-lored Whistler.

With only two sample points in time (1985/87 and 2003/04), it was difficult to confidently attribute the observed differences in species occurrences to the effects of time (with its concomitant changes in vegetation succession), or to the effects of the recent fire – both may contribute to some of the observed changes. Furthermore, natural fluctuations in species abundance (and/or detectability) may occur, in response to factors such as long-term weather patterns, such as the recent protracted drought. However, some generalisations on the short-term post-fire responses of the vertebrate fauna are presented below.

Some rare and localised/specialised bird species (e.g. Mallee Emu-wren, Striated Grasswren and Red-lored Whistler) were not found post-fire – their future in the burnt area is uncertain. Low mobility, localised or high site-fidelity species are probably dependent on their habitat patches remaining unburnt – or some may be able to move into small unburnt patches, with subsequent recolonisation over time, provided that source populations are available. The responses of other species were variable, with increases or decreases apparent in populations. Many may be able to survive in unburnt patches and then recolonise/increase populations as habitat becomes suitable. Others have the capacity to move over larger distances, to recolonise later. Many birds may be more mobile than other vertebrates, with the capacity to move in or out of fire areas – although there must be habitat elsewhere for them to move to and from. The effects of fire on some species may extend to adjacent non-burnt areas, if these remaining areas of habitat are too small to maintain viable populations until the burnt areas recover – such may be the case with the Malleefowl. Some small mammal species were not found post-fire. Their populations may be extremely small in the study area, or they may have been excluded. Their recovery will depend upon their capacity to either increase populations as habitat conditions change, or to recolonise from source populations elsewhere. The responses of reptiles to fire are likely to be variable. Burrowing species may be able to survive the fire – their subsequent recovery will depend upon their ability to survive in the changed conditions after the fire. Non-burrowing species are likely to be killed during fire, with the subsequent recovery of their populations probably dependent

upon their capacity for recolonisation from unburnt patches. Artificial barriers to movement may inhibit recolonisation.

The overriding aim of management of the Big Desert, an area where conservation values are acknowledged as the primary consideration, must be to maintain long-term ecological function and biodiversity. Determining how best to achieve this aim is, however, extremely problematic. Obviously, one of the major forces driving this ecosystem is fire. The biota of the Big Desert is adapted to fire, and relies on it to maintain long-term ecological function. The timing, location, size and intensity of fire will influence how this biota responds. Current and past 'European' management has concentrated on fire 'protection' and 'suppression', with an emphasis on protection of human assets and infrastructure around the margins of the desert, often with little cognisance of the effects such a strategy may be having on conservation values within the Big Desert ecosystem.

It appears that past fire management practices have brought about a decrease in fire frequency, but generally a large increase in the area burnt in any one fire – fire suppression methods may have inadvertently contributed to this outcome. The result has been an uneven distribution of age-classes within the vegetation communities present, often with large areas of just one age-class predominating. Consequently, elements of the biota requiring particular successional stages may be disadvantaged – or, alternatively, other elements may be advantaged. Management of fire in the Big Desert, according to the historical patterns alluded to above, for the fauna appears to have resulted in progressive simplification of the ecosystem – the common, generalist, widespread, fire-tolerant, high-fecundity or mobile taxa are persisting – the rare, specialised, localised, high site-fidelity, fire-sensitive, low-fecundity or low-mobility taxa appear to be in decline. Examples of the latter group may include the Malleefowl, Striated Grasswren, Mallee Emu-wren, Red-lored Whistler, Mallee Whipbird, Western Blue-tongued Lizard, Bardick, Heath Monitor, Mitchell's Hopping Mouse and perhaps Mallee Ningui. When the added potential effects of introduced predators on these sensitive elements of the fauna are considered, the future of some may be tenuous. Detailed knowledge of the ecologies and life-histories of such taxa will be required to guide informed management.

It is imperative, therefore, that management, especially with regard to fire, address these issues. Fire management must be based on informed ecological principles founded on detailed knowledge – its primary aim, at least within the core of large and relatively undisturbed conservation areas, must be switched from the often poorly-defined 'protection' objectives of the past to sound ecological management objectives. Obviously, this ecological management will need to be integrated with requirements for protection of significant private or localised public assets where these may occur, such as at the margins of the large conservation areas.

It is apparent that smaller fires are likely to have fewer long-term negative effects on the vertebrate fauna. It is imperative, therefore, to develop a strategy of applied fire and fire protection based on sound ecological principles. The strategy should aim for a relatively stable fire age-class distribution within the Big Desert, must also consider the location of these age-classes, and should be cognisant of the location and age-class structure requirements of individual EVCs. In its application, we must also be especially cautious of the requirements of rare, specialised or localised taxa, as these appear to be the ones most at risk from inappropriate fire, and may be those most dependent on later seral stages.

Important factors to consider when formulating the strategy include:

- Because unburnt patches within fire areas are likely to be so important for the fauna, it is essential that the behaviour and location of any imposed fire is planned to retain as many remnants as possible, and that these are well-distributed within the fire area. Different vegetation types will have different capacities to 'produce' remnants, and fire intensity will influence the likelihood of patches being left unburnt.

- Need careful consideration of the effects of barriers to movement which may impede recolonisation, particularly when implementing firebreaks or constructing roads.
- Consideration of patch sizes required to maintain viable populations is important when planning fire areas/barriers.
- Special protection/management of particular rare or localised taxa is likely to be required, when planning fires (or suppression). Similarly, the successional stage requirements of these taxa are an important consideration.
- Some species may be more vulnerable to fire during drought when distributions and/or populations contract to 'drought refugia'. The characteristics and locations of these drought refugia needs to be known so that they can be given appropriate protection from fire.

Detailed studies should be supported or initiated to address the following knowledge requirements:

- Population responses post-fire of selected 'indicator' taxa;
- Movement capabilities of selected taxa;
- Potential movement barriers;
- Life-history characteristics which may influence recolonisation capabilities of selected taxa;
- Utilisation of unburnt patches during and immediately after fire;
- Fire characteristics/behaviour which influences remnant formation;
- Distribution/habitat of selected localised/threatened taxa;
- Conservation ecology/demography of selected taxa;
- Effects of drought, and its interactions with fire;
- Characteristics/locations and importance of drought refugia for selected taxa.

# CONTENTS

<b>EXECUTIVE SUMMARY .....</b>	<b>II</b>
<b>CONTENTSINDEX OF FIGURES AND TABLES .....</b>	<b>V</b>
<b>INDEX OF FIGURES AND TABLES.....</b>	<b>VII</b>
<b>1. INTRODUCTION .....</b>	<b>1</b>
Objectives.....	1
Target species.....	1
<b>2. METHODS.....</b>	<b>3</b>
The Study Area .....	3
Methodology.....	3
Survey timing.....	4
Site selection .....	4
Target species .....	7
Pitfall trapping.....	8
Elliott trapping.....	8
Bird census.....	8
Targeted searches.....	9
Quadrat searches .....	12
Incidental observations.....	12
Historical data.....	12
Invertebrates.....	12
Vegetation .....	13
Weather .....	13
Standards and permits .....	13
<b>3. FIELD DATA AND DISCUSSION .....</b>	<b>14</b>
Pitfall trapping results .....	20
Elliott trapping results .....	27
Species composition – comparisons 1985/87 to 2003/04 .....	28
Mammals .....	31
Reptiles.....	31
Birds .....	32
Burnt / unburnt comparisons 2003/04 .....	34
Mammals .....	35
Reptiles.....	35
Birds .....	36
Vehicle traverses.....	37
Quadrat raking searches .....	37

Burrow survey for <i>Egernia</i> spp.....	40
Threatened mammals and reptiles.....	40
Threatened and other targeted bird species .....	41
<b>4. STATISTICAL EXAMINATION OF TRAPPING DATA.....</b>	<b>42</b>
Summer Comparisons: 1985-87 VS 2003-04 .....	42
Data Set.....	42
Data Analysis.....	43
Burnt - Unburnt Site Comparisons .....	48
Data Set.....	48
Data Analysis.....	48
<b>5. OVERVIEW .....</b>	<b>52</b>
Options for animals faced with fire in Mallee environments .....	53
Summary of fire responses of the fauna .....	54
Limitations of the study.....	55
<b>6. MANAGEMENT IMPLICATIONS.....</b>	<b>56</b>
Possibilities for management .....	57
Further research required.....	58
<b>7. ACKNOWLEDGMENTS.....</b>	<b>59</b>
<b>8. REFERENCES .....</b>	<b>60</b>
<b>9. APPENDICES .....</b>	<b>62</b>
Appendix 1. 1985/87 data from sites 61 to 80. Note that all data other than from bird census periods are included here. ....	62
Appendix 2. 2003/04 data from sites 61 to 80 and sites 03/01 to 03/16. ....	70
Appendix 3. All incidental records from the 2003/04 survey. ....	76
Appendix 4. Mammal and reptile pitfall trapping data from the 2003/04 survey according to fire history at each site.....	78
Appendix 5. Results of burrow searches for <i>Egernia</i> spp. ....	81
Appendix 6. Results of <i>Egernia multiscutata</i> burrow assessments in quadrats. ....	83

# INDEX OF FIGURES AND TABLES

## FIGURES

Figure 1. Location of the study area, showing the extent of the 2002 fire in the Big Desert. ...	3
Figure 2. Location of the 36 survey sites within the north-western Big Desert.....	6
Figure 3. Mammals recorded from pitfall traps at sites 61 to 80 only, during the two summer sampling trips of 1985/87 and the two summer sampling trips of 2003/04.....	31
Figure 4. Lizards recorded from pitfall traps at sites 61 to 80 only, during the two summer sampling trips of 1985/87 and the two summer sampling trips of 2003/04.....	32

**TABLES**

Table 1. Field survey periods, 1985/87 and 2003/04. ....	4
Table 2. Details of all 36 survey sites.....	5
Table 3. List of target taxa and survey methods employed for each taxon. ....	7
Table 4. Details of vehicle transects along tracks. ....	9
Table 5. Details of trapping periods and survey effort at the 36 survey sites during 2003/04. .....	10
Table 6. Sites searched for burrows of <i>Egernia</i> spp. ....	11
Table 7. Weather conditions prevailing during the 2003/04 survey periods.....	13
Table 8. Numbers of each mammal, reptile and amphibian species recorded from survey sites in the north-western Big Desert, 1985/87 and 2003/04.....	15
Table 9. Bird species recorded from the north-western Big Desert, 1985/87 and 2003/04...	16
Table 10. Numbers of observations by each survey method during the five sampling trips of the 1985/87 survey. (Does not include bird census information).....	19
Table 11. Total number of pitfall captures of each mammal, reptile and amphibian species at sites 61 to 80 during the five sampling trips of the 1985/87 survey.....	21
Table 12..... Total number of pitfall captures of each mammal and reptile species at sites 61 to 03/16 during the two sampling trips of the 2003/04 survey. ....	23
Table 13..... Total numbers of captures in Elliott traps during each survey trip, 1985/87 and 2003/04. ....	27
Table 14. Total numbers of pitfall captures of mammals, reptiles and amphibians, from sites 61 to 80 only, during each sampling trip of both the 1985/87 and 2003/04 surveys. ....	28
Table 15. Total numbers of pitfall captures of mammals and reptiles, from sites 61 to 80 only, during the two summer sampling trips of 1985/87 and the two summer sampling trips of 2003/04. ....	29
Table 16. Birds recorded during censuses at sites 61 to 80 only, during the summer sampling trips of 1985/87 and 2003/04. A "p" indicates that the species was present, but off the census plots. ....	33
Table 17. Mammals recorded in pitfall traps at sites in burnt and unburnt vegetation during the two field trips of summer 2003/04.....	35
Table 18. Reptiles recorded in pitfall traps at sites in burnt and unburnt vegetation during the two field trips of summer 2003/04.....	36
Table 19.... Birds recorded in December 2003 during censuses at survey sites in burnt, partly burnt and unburnt vegetation. ....	38
Table 20. Results of the paired comparisons test in which numbers of each pitfall-trapped species in the initial sampling, Period 1 (1985/87) were compared with the numbers trapped during Period 2 (2003/04), 18 years later.....	44
Table 21. Results of multiple linear regression analysis of transformed pitfall trap data from sites 61-80.....	46

Table 22. Results from log-linear analysis of the pitfall trap data, expressed as percentage occurrence. .... 47

Table 23. Results of the Kruskal-Wallis test that the various species samples came from the same statistical population. .... 49

# 1. INTRODUCTION

During December 2002, a wildfire burnt approximately 189,360 ha within the central and northern areas of the Big Desert in north-western Victoria. As part of the approved rehabilitation plan (Anon. 2003), a requirement was identified to examine the effects of the fire on selected and threatened birds, mammals and reptiles, in order to guide appropriate management actions. This proposal addresses that requirement.

Survey work conducted in the Victorian Mallee by the then Fisheries and Wildlife Division (now Department of Sustainability and Environment) between 1985 and 1987 concentrated on collecting detailed seasonal information on the fauna of 122 permanent study sites (Robertson *et al.* 1989). Twenty of these sites were situated in the north-west of the Big Desert. Consequently, some historical information with which to compare the fauna present after the fire was available. It was decided, therefore, to re-examine in detail the fauna of these twenty sites, in December 2003 and February 2004 (that is, one year after the December 2002 fire), using similar methodologies to those employed during the earlier work. In addition, some more widespread targeted survey for particular threatened species was considered important.

## Objectives

In order to assist in determining any appropriate rehabilitation measures and, more importantly, to gain insights into how future fires may be managed to minimise deleterious effects on conservation values, it was necessary to understand the responses of the fauna to the recent fire. Parks Victoria and the Department of Sustainability and Environment commissioned Wildlife Profiles Pty. Ltd. to assist in examining the effects of the 2002 fire on the vertebrate fauna. In particular, the following objectives were addressed:

- Compare the vertebrate fauna present in the north-west of the Big Desert in 2003/04 with that recorded in 1985/87.
- Examine the fauna present within burnt areas 12 months after the December 2002 fire, and how it may differ from that in unburnt areas.
- Survey for the presence of threatened species of vertebrates within the area burnt during the fire of December 2002.
- Collect samples of invertebrates for later examination of changes with fire and time, as above.
- Examine how changes in the vertebrate fauna may relate to vegetation responses to fire and its seral progression.

In addition, recommendations on the following management issues were requested:

- Any particular sites, rare or threatened species and/or communities which need protection in the event of further fires in the study area.
- Any threats (other than fire) to rare or threatened species which might warrant short term management intervention.
- Any long term management actions that might be required to mitigate the risks to rare or threatened fauna in the Big Desert area.

Because knowledge of vegetation responses to fire is also important in determining appropriate management, and because the fauna is obviously integrally dependent upon vegetation characteristics, an investigation of the vegetation within the study area was also commissioned. This has been reported separately (Sluiter 2004).

## Target species

A preliminary identification of species of interest was submitted for examination, based on their recorded occurrences within the Big Desert in the vicinity of the December 2002 fire. They are listed below:

Common Dunnart	<i>Sminthopsis murina</i>
Mitchell's Hopping-mouse	<i>Notomys mitchelli</i>
Bandy Bandy	<i>Vermicella annulata</i>
†Bardick	<i>Echiopsis curta</i>
†Desert Skink	<i>Egernia inornata</i>
†Heath Skink	<i>Egernia multiscutata</i>
†Lined Earless Dragon	<i>Tympanocryptis lineata lineata</i>
†Port Lincoln Snake	<i>Suta spectabilis</i>
†Heath Monitor	<i>Varanus rosenbergi</i>
Western Blue-tongued Lizard	<i>Tiliqua occipitalis</i>
†Australian Bustard	<i>Ardeotis australis</i>
†Black-eared Miner	<i>Manorina flavigula melanotis</i>
Bush Stone-curlew	<i>Burhinus grallarius</i>
Grey Falcon	<i>Falco hypoleucos</i>
Grey Goshawk	<i>Accipiter novaehollandiae</i>
Grey-fronted Honeyeater	<i>Lichenostomus plumulus</i>
Ground Cuckoo-shrike	<i>Coracina maxima</i>
Letter-winged Kite	<i>Elanus scriptus</i>
Major Mitchell's Cockatoo	<i>Cacatua leadbeateri</i>
†Mallee Emu-wren	<i>Stipiturus mallee</i>
†Malleefowl	<i>Leipoa ocellata</i>
Purple-gaped Honeyeater	<i>Lichenostomus cratitius</i>
Red-lored Whistler	<i>Pachycephala rufogularis</i>
†Redthroat	<i>Pyrrholaemus brunneus</i>
Shy Heathwren	<i>Calamanthus cautus</i>
Slender-billed Thornbill	<i>Acanthiza iredalei</i>
Southern Scrub-Robin	<i>Drymodes brunneopygia</i>
Square-tailed Kite	<i>Lophoictinia isura</i>
†Striated Grasswren	<i>Amytornis striatus</i>
†Mallee Whipbird	<i>Psophodes leucogaster</i>

† Species considered to be potentially at enhanced risk as a result of recent fire events.

## 2. METHODS

### The Study Area

The study area comprised the north-west of the Big Desert, south of Murrayville in north-western Victoria. Survey was concentrated in the area burnt during the 2002 wildfire (Fire '47'), but was also conducted in adjacent unburnt areas. Figure 1 shows the general location of the study area.

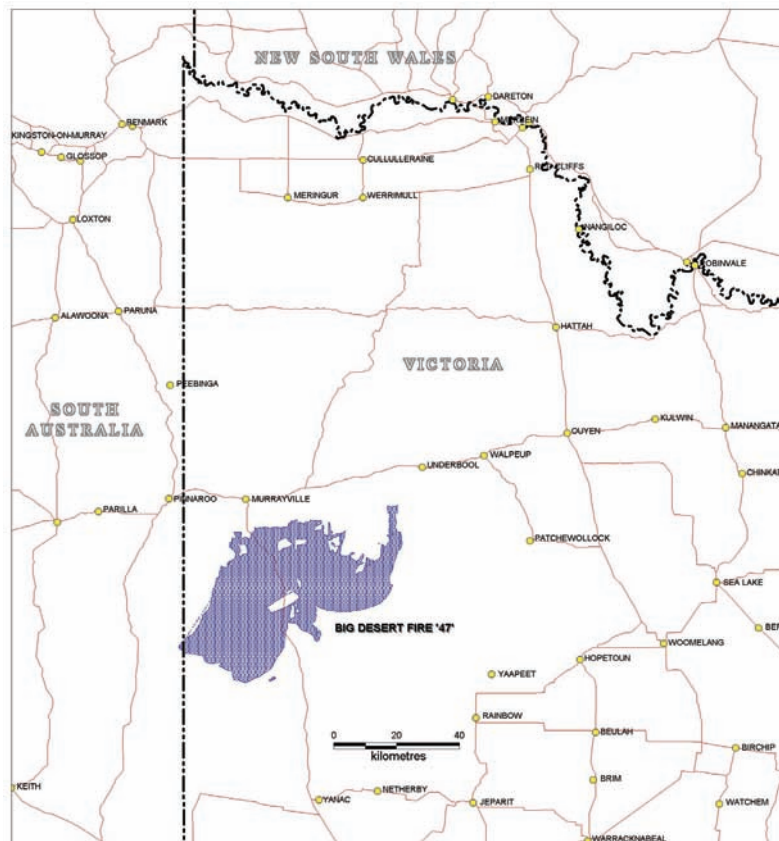


Figure 1. Location of the study area, showing the extent of the 2002 fire in the Big Desert.

The study area incorporates parts of the Big Desert State Forest, the Big Desert Wilderness Park and Wyperfeld National Park. Vegetation of the study area is predominantly mallee and mallee heath, represented by the following Ecological Vegetation Classes (EVCs): Dunefield Heathland, Heathy Mallee, Loamy Sands Mallee, Lowan Sands Mallee, Red Swale Mallee, Sandstone Ridge Shrubland, Shallow Sands Woodland and Plains Savanna. Descriptions of these EVCs may be found in ARI (2003) and in Sluiter (2004). The EVC nomenclature utilised herein differs from that previously recognised (LCC 1987), as it is derived from an extensive recent review (ARI 2003) intended to replace the earlier EVC descriptions. Note that the EVC nomenclature used in Anon 2003 has now been superseded by the recent review.

The study area has a complex fire history. Prior to the 2002 wildfire, there were some areas of 'long-unburnt' vegetation (uncertain age, ~pre-1950), some burnt in 1959, some in 1980, and some in 1997.

## Methodology

### Survey timing

During the 1985/1987 survey, field trips were conducted seasonally over an eighteen month period, to encompass the range of potential variability of vertebrate occurrence and activity. Five field trips were conducted during that period, in the spring of 1985, the summer of 1985/86, the autumn/winter of 1986, the spring of 1986, and the summer of 1986/87.

During the recent survey (2003/2004) two field trips were undertaken, both in the summer of 2003/04, approximately one year after the wildfire of December 2002. The duration and dates of all field trips are indicated in Table 1.

**Table 1.** Field survey periods, 1985/87 and 2003/04.

Field trip	Dates
1. Spring 1985	12/11/85 – 22/11/85
2. Summer 1985/86	18/02/86 – 27/02/86
3. Autumn/Winter 1986	17/06/86 – 26/06/86
4. Spring 1986	14/10/86 – 23/10/86
5. Summer 1986/87	17/02/87 – 26/02/87
6. Summer 2003/04	8/12/03 – 14/12/03
7. Summer 2003/04	15/02/04 – 20/02/04

### Site selection

The twenty sites selected for intensive sampling during the 1985/87 survey were stratified according to the vegetation communities recognised at that time, chosen to incorporate repeated sampling of each of the communities present, with an attempt to encompass the range of variability apparent in each community. At that time, the vegetation was either long-unburnt, or 26 years old (previously burnt in 1959).

Because many of the previously sampled sites were burnt during the 2002 wildfire, when they were sampled again in 2003/04 it was necessary to establish a number of new sites to enable stratification according to both fire history and EVC. Ten such new sites were selected. Furthermore, an additional six sites were selected to sample an area of six-year old vegetation, burnt in 1997.

The locations of all survey sites are listed in Table 2, indicating fire-history, EVC (after ARI 2003), and previously recognised vegetation community (according to LCC 1987). Figure 2 shows the location of these sites, superimposed on a satellite image with the 2002 wildfire area clearly apparent. Site numbers 61 to 80 are those established in 1985 and sampled during both 1985/87 and 2003/04, while site numbers 03/01 to 03/15 were established and sampled in 2003/04.

**Table 2.** Details of all 36 survey sites. B = Burnt December t December 2002, PB = Partly burnt 2002, U = Unburnt December 2002, 1997 = Burnt 1997.

Site No.	Track	Fire History	1985-87 Vegetation Community	2003 EVC
61	Cactus Bore Track	B	Broombush Mallee	93 Sandstone Ridge Shrubland
03/01	Cactus Bore Track	B	Broombush Mallee	93 Sandstone Ridge Shrubland
62	Cactus Bore Track	U	Mallee Heath	88 Heathy Mallee
63	Cactus Bore Track	U/PB	Mallee Heath	88 Heathy Mallee
64	Cactus Bore Track	B	Red Swale Mallee	91 Loamy Sands Mallee
65	Cactus Bore Track	B	Mallee Heath	88 Heathy Mallee
66	Cactus Bore Track	B	Yellow Gum Woodland	882 Shallow Sands Woodland
67	Cactus Bore Track	B	Swale Mallee Heath	91 Loamy Sands Mallee
68	Cactus Bore Track	B	Mallee Heath	93 Sandstone Ridge Shrubland
03/02	Cactus Bore Track	U	Sandplain Heath	89 Dunefield Heathland
03/03	Cactus Bore Track	U	Dunecrest Tree Heath	87 Lowan Sands Mallee
69	Cactus Bore Track	B	Mallee Heath	88 Heathy Mallee
70	Cactus Bore Track	U/PB	Dunecrest Tree Heath	87 Lowan Sands Mallee
03/04	Cactus Bore Track	B	Dunecrest Tree Heath	87 Lowan Sands Mallee
03/08	Murrayville Track	U	Red Swale Mallee	95 Red Swale Mallee
03/07	Murrayville Track	U	Broombush Mallee	93 Sandstone Ridge Shrubland
03/06	Murrayville Track	U	Mallee Heath	88 Heathy Mallee
03/05	White Springs Track	U	Sandplain Heath	89 Dunefield Heathland
71	Johns Bore Track	B	Swale Mallee Heath	88 Heathy Mallee
72	Johns Bore Track	B	Swale Mallee Heath	88 Heathy Mallee
73	Johns Bore Track	B	Mallee Heath	88 Heathy Mallee
74	Johns Bore Track	B	Mallee Heath	88 Heathy Mallee
75	Johns Bore Track	U	Mallee Heath	88 Heathy Mallee
76	Johns Bore Track	U	Mallee Heath	88 Heathy Mallee
77	Johns Bore Track	B	Mallee Heath	88 Heathy Mallee
03/09	Johns Bore Track	B	Red Swale Mallee	95 Red Swale Mallee
78	Johns Bore Track	B	Red Swale Mallee	95 Red Swale Mallee
03/10	Johns Bore Track	U	Swale Mallee Heath	88 Heathy Mallee
79	Johns Bore Track	B/PB	Swale Mallee Heath	88 Heathy Mallee
80	Johns Bore Track	B	Pine Buloke Woodland	826 Plains Savanna
03/15	Murrayville Track	1997	Dunecrest Tree Heath	87 Lowan Sands Mallee
03/14	Murrayville Track	1997	Sandplain Heath	89 Dunefield Heathland
03/13	Murrayville Track	1997	Sandplain Heath	89 Dunefield Heathland
03/12	Murrayville Track	1997	Sandplain Heath	89 Dunefield Heathland
03/11	Murrayville Track	1997	Sandplain Heath	89 Dunefield Heathland
03/16	Murrayville Track	1997	Sandplain Heath	89 Dunefield Heathland



**Figure 2.** Location of the 36 survey sites within the north-western Big Desert. Orange circles indicate sites established in 1985 and sampled during both the 1985/87 and 2003/04 survey periods; yellow circles indicate sites established in 2003 and sampled during 2003/04.

## Target species

In addition to the intensive quantitative survey for a broad range of the vertebrates known to occur in the Big Desert, the study was planned to particularly target a number of species known to be rare and/or potentially vulnerable to fire in the Big Desert. The methods 1 to 8 listed below were employed for each taxon as indicated in Table 3. These methods are explained in detail below.

1. Pitfall trapping. Undertaken at all 36 permanent sampling sites.
2. Elliott cage trapping. Undertaken at all pitfall sites, to target *Notomys mitchelli*.
3. Bird census. Timed, defined area. Call playback of target threatened species also employed.
4. Small patch sampling. Litter raking in defined quadrats to census sheltering reptiles.
5. Targeted survey – burrow searching. On transects/quadrats to detect *Egernia* spp.
6. Targeted survey – vehicle transects. To quantify tracks of Varanid lizards.
7. Predator scat collection. Opportunistic collection to examine for reptile and mammal remains.
8. Incidental observations. Recorded during the conduct of other survey activities.

**Table 3.** List of target taxa and survey methods employed for each taxon.

Species	Method	Comments
Bandy Bandy	1	Rare in Victoria, may not be detected during survey
Bardick	1,4	Potentially affected by fire
Common Dunnart	1,2	Potentially affected by fire
Desert Skink	1,5	Potentially affected by fire
Heath Skink	5	Known to occur south of fire area only, potentially affected by fire
Lined Earless Dragon	1,8	One record only in Big Desert, may not be detected
Mitchell's Hopping-mouse	2	Must use Elliott traps
Port Lincoln Snake	1,4	Rare in Big Desert
Heath Monitor	1,6	Heathland specialist, rarely encountered
Western Blue-tongued Lizard	1,2,4,8	Potentially affected by fire
Australian Bustard	8	Rare in Victoria, patchy and ephemeral occurrences in northern Big Desert, may not be detected
Black-eared Miner	8	Rare in Big Desert, may not be detected
Bush Stone-curlew	8	Rare in Big Desert, may not be detected
Grey Falcon	8	Very rare in Victoria, may not be detected
Grey Goshawk	8	Rare in Big Desert, may not be detected
Grey-fronted Honeyeater	3	Rare in Big Desert, may not be detected
Ground Cuckoo-shrike	3,8	Rare in Big Desert, may not be detected
Letter-winged Kite	8	Very rare in Victoria, may not be detected
Major Mitchell's Cockatoo	3,8	
Mallee Emu-wren	3	High site fidelity, potentially affected by fire
Malleefowl	3,8	All signs of activity at mounds will be recorded
Purple-gaped Honeyeater	3	
Red-lored Whistler	3	High site fidelity, potentially affected by fire
Redthroat	3	Very rare in Victoria, may not be detected
Shy Heathwren	3	High site fidelity, potentially affected by fire
Slender-billed Thornbill	3	Potentially affected by fire

Species	Method	Comments
Southern Scrub-robin	3	Potentially affected by fire
Square-tailed Kite	8	Rare in Big Desert, may not be detected
Striated Grasswren	3	High site fidelity, potentially affected by fire
Mallee Whipbird	3	Very rare in Victoria, may not be detected

## Pitfall trapping

Pitfall / drift-fence trapping was the main systematic technique employed to obtain records of the reptile, amphibian and terrestrial small mammal fauna of the study area. Pitfall trapping involved the installation of ten plastic buckets, (each 20 litre, 27 cm diameter by 40 cm deep) at five metre intervals, buried such that the lip of each bucket (trap) was level or slightly below the soil surface. A twenty centimetre high flywire drift-fence was erected joining the buckets in a 50 metre line, crossing the centre of each bucket. The fence was held upright with wire pegs, and its base was buried two to three centimetres below the soil surface.

One such trapline was installed at each of the 36 sample sites. Traplines were installed during November 2003, at 20 sites from the previous 1985/87 survey (sites '61' to '80'), and at 16 newly established sites. At sites 61 to 80, traplines were installed at the precise locations employed during the 1985/87 survey.

Pitfall traplines were opened and closed on the dates indicated in Table 5. All traps were checked at least twice daily, as near as practicable to sunrise and sunset. Between the two field trips (December 2003 and February 2004), lids were placed on each trap and they were then covered with sand. Note that during the 1985/87 survey, five trapping periods, each of at least five days duration, were sampled.

## Elliott trapping

Five aluminium small mammal traps (Elliott Scientific Equipment, type A box traps; 32 x 10 x 9 cm) were placed in shaded locations in the vicinity of each of the 36 pitfall traplines. The Elliott traps were baited only with sunflower seed, specifically to attract Hopping-mice.

Elliott traps were opened and closed on the dates indicated in Table 5, for three nights on each of the two survey trips. All traps were checked at least twice daily, as near as practicable to sunrise and sunset. They were closed during daylight hours to prevent mortality of any animals which may have been captured during the heat of the day. Note that during the 1985/87 survey, five trapping periods, each of at least three days duration, were sampled.

## Bird census

Sites 61 to 70. At each site, a total of 20 minutes was spent sampling a total of 2 ha in each of spring, summer and autumn/winter 1985-87 and again in December 2003. The same 0.5 ha (50 m X 100 m) north-south aligned rectangular plot, established in 1985, was sampled during 1985-87 and 2003. The ends of the north-south aligned 100 m midline of that plot were marked by a metal star picket. Four strip transect censuses, each of five minutes duration, were conducted on each plot; two in the morning and two in the evening. During each census, the observer began at the north end and, heading south, traversed the 100 m midline of the plot at an average speed of 1.2 km/h counting the number of individuals of all species seen or heard calling within 25 m on either side of the midline. Any species observed off or above the canopy of the 0.5 ha plot during the census was also noted and recorded as having been off the plot. Censuses were restricted to the first six hours after

sunrise and the last four hours before sunset to maximize the detection of species, many of which call more frequently in the morning and evening.

Sites 71 to 80 and new sites 1 to 5, 9 and 10. At each site, a total of 20 minutes was spent sampling a total of 2 ha in December 2003. Whereas, a total of 10 minutes was spent sampling a total of 1 ha at Sites 71 to 80 in summer 1985-87. New Sites 1 to 5 and 9 and 10 were not sampled in 1985-87. During the 2003 sample, four strip transect censuses, each of five minutes duration and each of a 0.5 ha (50 m X 100 m) rectangular plot, were conducted in the same habitat. The observer traversed the 100 m midline of the plot at an average speed of 1.2 km/h counting the number of individuals of all species seen or heard calling within 25 m on either side of the midline. Any species observed off or above the canopy of the 0.5 ha plot during the census was also noted and recorded as having been off the plot. Censuses were conducted throughout the day. During the 1985-87 sample, two strip transect censuses, each of five minutes duration and each of a 0.5 ha (50 m X 100 m) rectangular plot, were conducted in the same habitat. Censuses were conducted throughout the day.

## Targeted searches

To survey for the presence of species not readily detected by the methods outlined above, and to increase the geographic coverage of the survey, some specific methods to target taxa of particular interest were employed. These are detailed below.

Vehicle transects. To examine the distribution of the Varanid lizards, the Heath Monitor and Sand Goanna (*Varanus gouldii*), vehicle transects along tracks were undertaken. All observations of these lizards or their distinctive tracks were recorded. (Note that it is not possible to distinguish between the tracks of these two species – such observations were recorded as ‘*Varanus* sp.’) In addition to any such observations made along the regular routes traversed while checking pitfall traps, further traverses were undertaken – these are listed in Table 4. Any tracks of the fox (*Vulpes vulpes*), dog (*Canis* sp.) and cat (*Felis catus*) seen during these traverses were also recorded.

**Table 4.** Details of vehicle transects along tracks.

Transect no.	Date	Time	Locality and route	Distance traversed (km)
1	10 Dec 2003	19.19 - 22.00	Delisio track, from Murrayville Track to Mt Ida and return.	15.6
2	11 Dec 2003	08.30 - 16.40	Chinaman's Well Track, from Murrayville Track and return.	39.6
3	12 Dec 2003	09.35 - 13.30	Milmed Track, from Murrayville Track to Pigeon Springs and return.	22
4	13 Dec 2003	08.00 - 14.00	Delisio track, from Murrayville Track, via White Springs to Ross's Spring.	52
5	18 Feb 2004	07.30 - 10.30	White Springs Track, from Murrayville Track to Cowangie/Nhill Track and return.	11
6	19 Feb 2004	10.00 - 13.30	Coburn's Track, from Cactus Bore Track to Firebreak Track.	17

**Table 5.** Details of trapping periods and survey effort at the 36 survey sites during 2003/04. Numbers in columns indicate trapping dates, with trapnights shown in parentheses. B = Burnt December 2002, U = Unburnt December 2002, PB = Partly burnt December 2002, 1997 = Burnt 1997, tn = trap-nights, Y = full bird census(es) conducted.

Site No.	Track	Fire History	Pitfall trapping effort Dec 03	Pitfall trapping effort Feb 04	Elliott trapping effort Dec 03	Elliott trapping effort Feb 04	Birds 85-87	Birds 03-04
61	Cactus Bore Track	B	8-13 (50tn)	15-20 (50tn)	9-12 (15tn)	17-19 (15tn)	Y	Y
03/01	Cactus Bore Track	B	8-13 (50tn)	15-20 (50tn)	9-12 (15tn)	17-19 (15tn)		Y
62	Cactus Bore Track	U	8-13 (50tn)	15-20 (50tn)	9-12 (15tn)	17-19 (15tn)	Y	Y
63	Cactus Bore Track	U/PB	8-13 (50tn)	15-20 (50tn)	9-12 (15tn)	17-19 (15tn)	Y	Y
64	Cactus Bore Track	B	8-13 (50tn)	15-20 (50tn)	9-12 (15tn)	17-19 (15tn)	Y	Y
65	Cactus Bore Track	B	8-13 (50tn)	15-20 (50tn)	9-12 (15tn)	17-19 (15tn)	Y	Y
66	Cactus Bore Track	B	8-13 (50tn)	15-20 (50tn)	9-12 (15tn)	17-19 (15tn)	Y	Y
67	Cactus Bore Track	B	8-13 (50tn)	15-20 (50tn)	9-12 (15tn)	17-19 (15tn)	Y	Y
68	Cactus Bore Track	B	8-13 (50tn)	15-20 (50tn)	9-12 (15tn)	17-19 (15tn)	Y	Y
03/02	Cactus Bore Track	U	8-13 (50tn)	15-20 (50tn)	9-12 (15tn)	17-19 (15tn)		Y
03/03	Cactus Bore Track	U	8-13 (50tn)	15-20 (50tn)	9-12 (15tn)	17-19 (15tn)		Y
69	Cactus Bore Track	B	8-13 (50tn)	15-20 (50tn)	9-12 (15tn)	17-19 (15tn)	Y	Y
70	Cactus Bore Track	U/PB	8-13 (50tn)	15-20 (50tn)	9-12 (15tn)	17-19 (15tn)	Y	Y
03/04	Cactus Bore Track	B	8-13 (50tn)	15-20 (50tn)	9-12 (15tn)	17-19 (15tn)		Y
03/08	Murrayville Track	U	8-13 (50tn)	15-20 (50tn)	9-12 (15tn)	17-19 (15tn)		
03/07	Murrayville Track	U	8-13 (50tn)	15-20 (50tn)	9-12 (15tn)	17-19 (15tn)		
03/06	Murrayville Track	U	8-13 (50tn)	15-20 (50tn)	9-12 (15tn)	17-19 (15tn)		
03/05	White Springs Track	U	8-13 (50tn)	15-20 (50tn)	9-12 (15tn)	17-19 (15tn)		Y
71	Johns Bore Track	B	8-13 (50tn)	15-20 (50tn)	9-12 (15tn)	17-19 (15tn)		Y
72	Johns Bore Track	B	8-13 (50tn)	15-20 (50tn)	9-12 (15tn)	17-19 (15tn)		Y
73	Johns Bore Track	B	8-13 (50tn)	15-20 (50tn)	9-12 (15tn)	17-19 (15tn)		Y
74	Johns Bore Track	B	8-13 (50tn)	15-20 (50tn)	9-12 (15tn)	17-19 (15tn)		Y
75	Johns Bore Track	U	8-13 (50tn)	15-20 (50tn)	9-12 (15tn)	17-19 (15tn)		Y
76	Johns Bore Track	U	8-13 (50tn)	15-20 (50tn)	9-12 (15tn)	17-19 (15tn)		Y
77	Johns Bore Track	B	8-13 (50tn)	15-20 (50tn)	9-12 (15tn)	17-19 (15tn)		Y
03/09	Johns Bore Track	B	8-13 (50tn)	15-20 (50tn)	9-12 (15tn)	17-19 (15tn)		Y
78	Johns Bore Track	B	8-13 (50tn)	15-20 (50tn)	9-12 (15tn)	17-19 (15tn)		Y
03/10	Johns Bore Track	U	8-13 (50tn)	15-20 (50tn)	9-12 (15tn)	17-19 (15tn)		Y
79	Johns Bore Track	B/PB	8-13 (50tn)	15-20 (50tn)	9-12 (15tn)	17-19 (15tn)		Y
80	Johns Bore Track	B	8-13 (50tn)	15-20 (50tn)	9-12 (15tn)	17-19 (15tn)		Y
03/15	Murrayville Track	1997	8-13 (50tn)	15-20 (50tn)	10-13 (15tn)	17-19 (15tn)		
03/14	Murrayville Track	1997	8-13 (50tn)	15-20 (50tn)	10-13 (15tn)	17-19 (15tn)		
03/13	Murrayville Track	1997	8-13 (50tn)	15-20 (50tn)	10-13 (15tn)	17-19 (15tn)		
03/12	Murrayville Track	1997	8-13 (50tn)	15-20 (50tn)	10-13 (15tn)	17-19 (15tn)		
03/11	Murrayville Track	1997	8-13 (50tn)	15-20 (50tn)	10-13 (15tn)	17-19 (15tn)		
03/16	Murrayville Track	1997	8-13 (50tn)	15-20 (50tn)	10-13 (15tn)	17-19 (15tn)		

**Burrow examination.** Two species of threatened skinks, the Desert Skink (*Egernia inornata*) and the Heath Skink (*Egernia multiscutata*) are not readily assessed by any of the methods described above. They do, however, construct characteristic burrows which are readily identifiable by careful searching in potential localities. It appears that favoured locations of such burrows are often on the north faces of large dunes.

Several large dunes, in areas of apparently potential habitat encompassing both burnt and unburnt vegetation throughout the study area, were examined for the presence of burrows. The dune faces were carefully traversed on foot several times, looking for burrows used by either of these species, or for fresh tracks - burrows in use usually have evidence of many tracks near the entrance. Localities searched in this manner are listed in Table 6. Any burrows found were recorded, and whether they were 'active' or 'inactive' was determined. Some burrows were excavated to determine which species was present.

**Table 6.** Sites searched for burrows of *Egernia* spp. (Other than at the two 'known' sites, 'Egernia Hill' and 'Trig Point Hill', at which detailed burrow censuses were undertaken – see below.)

Search no.	Date	Locality	Easting	Northing
1	10 Dec 2004	Mt Ida		
2	10 Dec 2004	Dune on E side of Mt Ida	532720	6077730
3	11 Dec 2004	Chinaman's Well Track	537962	6042295
4	11 Dec 2004	Chinaman's Well Track	538345	6042287
5	11 Dec 2004	Chinaman's Well Track	538408	6042280
6	11 Dec 2004	Chinaman's Well Track	538449	6042259
7	11 Dec 2004	Chinaman's Well Track, 7.2 km E of Moonlight Tank		
8	12 Dec 2004	Murrayville/Nhill Track	528423	6060044
9	12 Dec 2004	Milmed Track	531000	6060759
10	12 Dec 2004	Murrayville/Nhill Track	536596	6061517
11	12 Dec 2004	Murrayville/Nhill Track	530706	6052241
12	12 Dec 2004	Murrayville/Nhill Track	532587	6049987
13	12 Dec 2004	Moonlight Tank, Murrayville/Nhill Track	534279	6041709
14	13 Dec 2004	Delisio Track	527586	6075645
15	14 Dec 2004	White Springs		
16	19 Feb 2004	200m W of Site 70, Cactus Bore Track	514555	6077897
17	19-20 Feb 2004	Lookout Hill, on Coburn's track	510603	6076135

The Heath Skink has been the subject of some preliminary assessments at sites along the Chinaman's Well Track (Coventry *et al.* 2003), where wildfire burnt one previously known locality (the largest population known in Victoria) in April 2002. Coventry *et al.* (2003) also documented the existence of another population nearby, in unburnt vegetation. These localities were termed 'Egernia Hill' and 'Trig Point Hill' respectively.

In order to examine the effects of fire on this species, sampling quadrats were established at these two sites on the 11<sup>th</sup> December, 2003. One quadrat was carefully marked at each site, measuring 33 metres by 33 metres, aligned north-south and straddling the crest of the dune in each case

Every burrow (or joined system of burrow entrances, known as a 'warren') within each quadrat was located, marked, and its position recorded. Each entrance was classified as 'used' or 'unused', as determined by the presence of distinctive tracks of the species, or by

sighting of a lizard. Warrens observed outside the quadrats were also recorded. These data should provide a valuable baseline for future monitoring to assess any changes in the populations as the vegetation recovers after the fire.

**Bird Call Playback.** In addition to the strip transect censuses previously described, call playback for targeted bird species was utilised during December 2003. On arrival at a site, five minutes was spent listening for the calls of any of the targeted species. A CD with calls of the targeted species was then played and the output broadcast through a megaphone. A further 15 minutes was then spent listening for responses from any of the targeted species.

## **Quadrat searches**

To examine the value of small unburnt patches, and the effects of patch size and isolation on ground fauna, searches for litter-dwelling reptiles were undertaken within defined area quadrats in unburnt patches of vegetation within the general fire area. Each quadrat of five metres by five metres was delineated and carefully searched by a team of four people. All vegetation was examined, all litter was carefully raked, and soil was raked to a depth of five centimetres. Any animals observed were documented.

Two sites were examined in this way, on 18<sup>th</sup> February 2004, as below:

- White's Spring Track - 10 quadrats;
- Cowangie/Murrayville Track - 5 quadrats.

Because only a small number of individuals was found during these searches, they were discontinued. It is likely that the very hot and dry seasonal conditions prevailing at the time influenced detectability of litter-dwelling reptiles. Similar searches undertaken elsewhere (pers. obs.) can produce larger numbers of observations sufficient to enable analyses. For future surveys, it would be advisable therefore to undertake such searches under seasonal conditions more conducive to reptile activity within the litter layer (Spring), and perhaps sooner after fire.

## **Incidental observations**

All observations of animals encountered during the conduct of other survey activities were recorded. In addition, distinctive scats, tracks, skeletal remains, sloughs or other characteristic signs (such as Malleefowl mounds), were recorded.

## **Historical data**

The database of the Atlas of Victorian Wildlife (AVW) was searched for any pertinent records of vertebrates within the study area.

## **Invertebrates**

Selected invertebrates captured in the pitfall trap lines during the 2003/04 survey were collected for later analysis. All spiders, scorpions, beetles and centipedes were collected, preserved in 70% ethanol, and lodged with the Department of Primary Industries. These are available for examination should this be desired. All invertebrate material similarly collected from the survey sites during the 1985/1987 survey was lodged with Museum Victoria and has been identified and documented.

## Vegetation

Detailed information on structural and floristic attributes of the vegetation at survey sites was collected in conjunction with the vertebrate survey. Vegetation data were collected from quadrats established at 28 of the 36 survey sites, in accordance with the methodology outlined by Sluiter (2004). Results of the vegetation assessments have been reported separately (Sluiter 2004).

## Weather

During the field trips, daily maximum and minimum temperatures were recorded to 1.0°C with the aid of a shaded 'max-min' thermometer. Observations on cloud, wind and rainfall were made daily – cloud was assessed on a scale of 0-8, wind on a scale of 0-3, and occurrence of any rainfall noted. Weather conditions prevailing during the 2003/04 survey are shown in Table 7.

**Table 7.** Weather conditions prevailing during the 2003/04 survey periods.

Date	Min. temp.	Max. temp.	Notes
8 Dec 2003	-	37	Pitfall traps opened. Cloud 6, wind 1, no rain
9 Dec 2003	20	39	Cloud 0, wind 0, no rain
10 Dec 2003	est. 15	29	Cloud 3, wind 0, no rain
11 Dec 2003	13	28	Cloud 0-1, wind 1, no rain
12 Dec 2003	10	26	Cloud 5-8, wind 0-2, no rain
13 Dec 2003	12	-	Pitfall traps closed. Cloud 4, wind 1, no rain
15 Feb 2004	-	est. 45	Pitfall traps opened. Cloud 0, wind 0-1, no rain
16 Feb 2004	20	36	Cloud 1-2, wind 1, no rain
17 Feb 2004	11	40	Cloud 0, wind 0-1, no rain
18 Feb 2004	17	36	Cloud 0-1, wind 0-1, no rain
19 Feb 2004	17	36	Cloud 0, wind 0-1, no rain
20 Feb 2004	19	43	Pitfall traps closed. Cloud 0, wind 0-2, no rain

## Standards and permits

The scientific names utilised herein for vertebrate species are those outlined in the following authoritative texts for each faunal group: Menkhorst & Knight (2001) for mammals, Stanger *et al.* (1998) for non-passerine birds, Schodde & Mason (1999) for passerine birds, and Cogger (2000) for reptiles and amphibians. All records of vertebrates obtained during this study have been lodged with the Atlas of Victorian Wildlife (DSE 2004). Any reptile or mammal specimens retained have been lodged with Museum Victoria.

Accurate localities for all observations were determined with the aid of a handheld Geographic Positioning System (Garmin 12XL or Garmin GPSII+), with all positional data herein presented in UTM projection and MGA94 (Zone 54) map datum. Generally, accuracy to within 10 metres was achievable. The positional data from the study have been stored on MapInfo GIS, and are available in Microsoft Excel format to enable entry to other GIS systems. The satellite imagery base for the maps produced within this report was supplied by Parks Victoria. Photographs were taken of all survey sites, and are available for perusal.

Standard measurements of snout-vent length or weight were recorded for all captures of reptiles and mammals. All survey work undertaken during this study was carried out in accordance with the requirements of DSE Research Permit No. 10002713, pursuant to the provisions of the *Wildlife Act* 1975 and the *National Parks Act* 1975.

### 3. FIELD DATA AND DISCUSSION

The vertebrates known to occur within the north-western Big Desert, as determined during the 1985/87 and 2003/04 surveys are shown in Tables 8 and 9. The numbers of each species of mammal, reptile and amphibian recorded are presented in Table 8 according to survey period, and for the 2003/04 period are divided according to site 'group' to enable broad comparisons between the two survey periods. It should be borne in mind, however, that a more diverse range of survey methods was employed, for more field trips over a range of seasons, during the 1985/87 survey – see Table 10.

Fourteen species of mammal, including four introduced taxa were recorded from the area. With the exception of bats, this probably well represents the mammal fauna of the area - bats were not well represented in the survey results, with only one species, the Chocolate Wattled Bat (*Chalinolobus morio*), recorded, probably due to the inherent difficulties of sampling this group in mallee environments, and the low targeted survey effort with bat traps. One additional species, the White-striped Freetail Bat (*Tadarida australis*) was heard in farmland to the north of the study area.

The reptile fauna of the 36 sample sites within the study area included 27 lizard species, comprising five geckos (family Gekkonidae), six legless lizards (family Pygopodidae), five dragons (family Agamidae), ten skinks (family Scincidae) and one goanna (family Varanidae). It is likely that this represents nearly the complete lizard fauna of the study area, with the exception of the Heath Monitor, known from the south of the Big Desert but not found during the survey, and the Heath Skink, which was found during the survey and appears to have a very localised distribution in the central south of the Big Desert. Of particular note was the discovery during the 2003/04 survey of the threatened Mallee Worm-Lizard (*Aprasia aurita*) in the north of the study area – it was previously known only from the eastern fringe of the Big Desert. Seven species of snakes – two Blind Snakes (family Typhlopidae) and five venomous species (family Elapidae) – were recorded. Although only small numbers of these species were detected, it is unlikely that further species occur within the study area. Only three species of frog (family Myobatrachidae) are known from the area.

Table 9 lists the species of bird found in the north-western Big Desert during both survey periods. Eighty-one species were recorded, including the threatened Malleefowl, Regent Parrot, Mallee Emu-wren and Red-lored Whistler.

Detailed results of the 1985/87 trapping at survey sites are presented in Appendix 1, and those from the 2003/04 survey are presented in Appendix 2. Only summaries of the bird census data for 1985/87 and 2003/04 are presented herein (see later). All incidental records (at trapping sites and elsewhere) from the 2003/04 survey, records from bird call playback (away from sites), from vehicle transects, from quadrat raking searches and from burrow searches for *Egernia* spp. (at both intensive quadrats and elsewhere) are presented in Appendix 3.

**Table 8.** Numbers of each mammal, reptile and amphibian species recorded from survey sites in the north-western Big Desert, 1985/87 and 2003/04.

Species	Total observed 1985/87 (from 5 field trips). Sites 61-80 only sampled	Total observed 2003/04 (from 2 field trips). Sites 61-80 data only	Total observed 2003/04 (from 2 field trips). Data from all 36 sites
<b>Mammals</b>			
<i>Tachyglossus aculeatus</i>	3		1
<i>Ningauai yvonneae</i>	22		
<i>Sminthopsis murina</i>	5	9	23
<i>Cercartetus concinnus</i>	55		
<i>Cercartetus lepidus</i>	31		
<i>Macropus fuliginosus</i>	78		
<i>Chalinolobus morio</i>	1		
<i>Mus musculus</i>	51	52	107
<i>Pseudomys apodemoides</i>	104	4	152
<i>Notomys mitchelli</i>	44		
<i>Oryctolagus cuniculus</i>	12		
<i>Canis familiaris</i>	2		
<i>Vulpes vulpes</i>	2		
<i>Felis catus</i>	1		
<b>Lizards</b>			
<i>Diplodactylus intermedius</i>	17	6	13
<i>Diplodactylus vittatus</i>	13	15	31
<i>Lucasium damaeum</i>	48	116	195
<i>Christinus marmoratus</i>	5	3	6
<i>Underwoodisaurus milii</i>	4		5
<i>Aprasia aurita</i>			3
<i>Aprasia inaurita</i>	18	5	7
<i>Delma australis</i>	27	3	10
<i>Delma butleri</i>	7		1
<i>Lialis burtonis</i>	3	3	7
<i>Pygopus lepidopodus</i>	1		
<i>Amphibolurus nobbi</i>	31	8	20
<i>Amphibolurus norrisi</i>	6		2
<i>Ctenophorus fordi</i>	158	6	73
<i>Ctenophorus pictus</i>	10	2	32
<i>Pogona vitticeps</i>	28	6	18
<i>Varanus gouldii</i>	5		2
<i>Varanus sp.</i>		1	3
<i>Ctenotus brooksi</i>	19	8	35
<i>Ctenotus orientalis</i>	12	1	9
<i>Ctenotus robustus</i>	45	2	21
<i>Egernia inornata</i>	6	1	1

Species	Total observed 1985/87 (from 5 field trips). Sites 61-80 only sampled	Total observed 2003/04 (from 2 field trips). Sites 61-80 data only	Total observed 2003/04 (from 2 field trips). Data from all 36 sites
<i>Lerista bougainvillii</i>	39	32	47
<i>Lerista punctatovittata</i>	1	15	19
<i>Menetia greyii</i>	87	4	7
<i>Morethia obscura</i>	72	16	17
<i>Tiliqua occipitalis</i>	5		
<i>Trachydosaurus rugosus</i>	57		2
<b>Snakes</b>			
<i>Ramphotyphlops australis</i>	1		2
<i>Ramphotyphlops bituberculatus</i>	1	1	3
<i>Drysdalia mastersii</i>	4		
<i>Echiopsis curta</i>	1		
<i>Pseudonaja textilis</i>	3	1	1
<i>Pseudonaja sp.</i>	1		
<i>Suta nigriceps</i>	7	6	13
<i>Suta spectabilis</i>	3		
<b>Frogs</b>			
<i>Limnodynastes dumerilii</i>	4		
<i>Neobatrachus pictus</i>	2		
<i>Neobatrachus sudelli</i>	1		
<i>Neobatrachus sp.</i>	3		

**Table 9.** Bird species recorded from the north-western Big Desert, 1985/87 and 2003/04.

"+" indicates that the species was recorded by C.E. Silveira. "++" indicates that tracks of the species were recorded by C.E. Silveira. "#" indicates additional species recorded by P. Robertson and J. Coventry. *Corvus sp.* indicates either the Australian Raven, Little Raven or Little Crow.

Species	1985/87 records	2003 records	Common Name
<i>Dromaius novaehollandiae</i>	+	+	Emu
<i>Leipoa ocellata</i>	++	++	Malleefowl
<i>Accipiter fasciatus</i>	+		Brown Goshawk
<i>Accipiter cirrhocephalus</i>	+		Collared Sparrowhawk
<i>Aquila audax</i>	+	+	Wedge-tailed Eagle
<i>Hieraaetus morphnoides</i>	+	+	Little Eagle
<i>Falco berigora</i>		+	Brown Falcon
<i>Turnix velox</i>		+	Little Button-quail
<i>Phaps chalcoptera</i>	+	+	Common Bronzewing
<i>Cacatua roseicapilla</i>	+	+	Galah
<i>Nymphicus hollandicus</i>	+		Cockatiel
<i>Glossopsitta porphyrocephala</i>	+		Purple-crowned Lorikeet

Species	1985/87 records	2003 records	Common Name
<i>Polytelis anthopeplus</i>	+		Regent Parrot
<i>Barnardius zonarius barnardi</i>	+		Australian (Mallee) Ringneck
<i>Psephotus varius</i>	+	+	Mulga Parrot
<i>Melopsittacus undulatus</i>		#	Budgerigar
<i>Chalcites basalis</i>	+	+	Horsfield's Bronze-Cuckoo
<i>Ninox boobook</i>	+	+	Southern Boobook
<i>Podargus strigoides</i>	+		Tawny Frogmouth
<i>Aegotheles cristatus</i>	+		Australian Owlet-nightjar
<i>Eurostopodus argus</i>	+	#	Spotted Nightjar
<i>Merops ornatus</i>	+	+	Rainbow Bee-eater
<i>Climacteris picumnus</i>	+	+	Brown Treecreeper
<i>Malurus lamberti</i>	+	+	Variiegated Fairy-wren
<i>Malurus splendens</i>	+	+	Splendid Fairy-wren
<i>Stipiturus mallee</i>	+		Mallee Emu-wren
<i>Amytornis striatus</i>	+		Striated Grasswren
<i>Pardalotus punctatus xanthopyge</i>	+	+	Spotted (Yellow-rumped) Pardalote
<i>Pardalotus striatus</i>	+		Striated Pardalote
<i>Calamanthus cautus</i>	+	+	Shy Heathwren
<i>Smicromnis brevirostris</i>	+	+	Weebill
<i>Acanthiza apicalis</i>	+	+	Inland Thornbill
<i>Acanthiza uropygialis</i>	+	+	Chestnut-rumped Thornbill
<i>Acanthiza reguloides</i>	+	+	Buff-rumped Thornbill
<i>Acanthiza iredalei</i>	+		Slender-billed Thornbill
<i>Acanthiza chrysorrhoa</i>	+	+	Yellow-rumped Thornbill
<i>Acanthiza nana</i>		+	Yellow Thornbill
<i>Lichenostomus virescens</i>	+	+	Singing Honeyeater
<i>Lichenostomus leucotis</i>	+	+	White-eared Honeyeater
<i>Lichenostomus cratitius</i>	+		Purple-gaped Honeyeater
<i>Lichenostomus ornatus</i>	+	+	Yellow-plumed Honeyeater
<i>Manorina flavigula</i>	+		Yellow-throated Miner
<i>Melithreptus brevirostris</i>	+	+	Brown-headed Honeyeater
<i>Acanthagenys rufogularis</i>	+	+	Spiny-cheeked Honeyeater
<i>Anthochaera carunculata</i>	+	+	Red Wattlebird
<i>Phylidonyris novaehollandiae</i>	+		New Holland Honeyeater
<i>Gliciphila melanops</i>	+	#	Tawny-crowned Honeyeater
<i>Phylidonyris albifrons</i>	+	+	White-fronted Honeyeater
<i>Epthianura tricolor</i>		+	Crimson Chat
<i>Epthianura albifrons</i>	+	+	White-fronted Chat
<i>Melanodryas cucullata</i>		+	Hooded Robin
<i>Microeca fascinans</i>		+	Jacky Winter

Species	1985/87 records	2003 records	Common Name
<i>Petroica goodenovii</i>	+	+	Red-capped Robin
<i>Drymodes brunneopygia</i>	+	+	Southern Scrub-robin
<i>Pomatostomus superciliosus</i>	+	+	White-browed Babbler
<i>Cinclosoma castanotus</i>	+	+	Chestnut Quail-thrush
<i>Daphoenositta chrysoptera</i>	+		Varied Sittella
<i>Pachycephala rufogularis</i>	+		Red-lored Whistler
<i>Pachycephala inornata</i>	+	+	Gilbert's Whistler
<i>Pachycephala pectoralis</i>	+	+	Golden Whistler
<i>Pachycephala rufiventris</i>	+	+	Rufous Whistler
<i>Colluricincla harmonica</i>	+	+	Grey Shrike-thrush
<i>Oreoica gutturalis</i>	+	+	Crested Bellbird
<i>Rhipidura albiscapa</i>	+		Grey Fantail
<i>Rhipidura leucophrys</i>	+	+	Willie Wagtail
<i>Cracticus torquatus</i>	+	+	Grey Butcherbird
<i>Gymnorhina tibicen</i>	+	+	Australian Magpie
<i>Strepera versicolor melanoptera</i>	+	+	Grey (Black-winged) Currawong
<i>Artamus personatus</i>	+	+	Masked Woodswallow
<i>Artamus superciliosus</i>	+	+	White-browed Woodswallow
<i>Artamus cyanopterus</i>	+		Dusky Woodswallow
<i>Coracina novaehollandiae</i>	+	+	Black-faced Cuckoo-shrike
<i>Lalage tricolor</i>	+		White-winged Triller
<i>Corvus mellori</i>	+	+	Little Raven
<i>Corvus coronoides</i>	+	+	Australian Raven
<i>Corvus sp.</i>		+	Corvus sp.
<i>Corcorax melanorhamphos</i>	+		White-winged Chough
<i>Cheramoeca leucosternus</i>	+		White-backed Swallow
<i>Hirundo neoxena</i>	+	+	Welcome Swallow
<i>Hirundo nigricans</i>		+	Tree Martin
<i>Zosterops lateralis</i>	+	+	Silvereye
<i>Anthus australis</i>	+	+	Australian Pipit

**Table 10.** Numbers of observations by each survey method during the five sampling trips of the 1985/87 survey. (Does not include bird census information).

Species	Observation / Trap type													Total
	Digging	Scat	Skeletal	Slough	Footprint	Tracks	Seen	Hand caught	Cage trap	Elliott trap	Snake trap	Bat trap	Pit trap	
<b>Birds</b>														
Grey Shrike-thrush									1					1
Chestnut Quail-thrush									2		3		1	6
White-browed Babbler									1					1
Grey Butcherbird									1					1
Australian Magpie									1					1
<b>Mammals</b>														
<i>Tachyglossus aculeatus</i>	3													3
<i>Ningau yvonneae</i>													22	22
<i>Sminthopsis murina</i>													5	5
<i>Cercartetus concinnus</i>											1		54	55
<i>Cercartetus lepidus</i>													31	31
<i>Macropus fuliginosus</i>		58			2		18							78
<i>Chalinolobus morio</i>												1		1
<i>Mus musculus</i>									2	9			40	51
<i>Pseudomys apodemoides</i>									10	11		6	77	104
<i>Notomys mitchelli</i>					1	1			26	15			1	44
<i>Oryctolagus cuniculus</i>	1	11												12
<i>Canis familiaris</i>		1			1									2
<i>Vulpes vulpes</i>					2									2
<i>Felis catus</i>			1											1
<b>Lizards</b>														
<i>Diplodactylus intermedius</i>								1					16	17
<i>Diplodactylus vittatus</i>													13	13
<i>Lucasium damaeum</i>													48	48
<i>Christinus marmoratus</i>													5	5
<i>Underwoodisaurus milii</i>											1		3	4
<i>Aprasia inaurita</i>								1					17	18
<i>Delma australis</i>								1					26	27
<i>Delma butleri</i>													7	7
<i>Lialis burtonis</i>								2					1	3
<i>Pygopus lepidopodus</i>								1						1
<i>Amphibolurus nobbi</i>							2	1			1		27	31
<i>Amphibolurus norrisi</i>								2					4	6
<i>Ctenophorus fordi</i>							2						156	158
<i>Ctenophorus pictus</i>								1					9	10

Species	Observation / Trap type													Total
	Digging	Scat	Skeletal	Slough	Footprint	Tracks	Seen	Hand caught	Cage trap	Elliott trap	Snake trap	Bat trap	Pit trap	
<i>Pogona vitticeps</i>							1			1	2		24	28
<i>Varanus gouldii</i>							2		1				2	5
<i>Ctenotus brooksi</i>							1						18	19
<i>Ctenotus orientalis</i>													12	12
<i>Ctenotus robustus</i>							2	1	1				41	45
<i>Egernia inornata</i>							1	3					2	6
<i>Lerista bougainvillii</i>													39	39
<i>Lerista punctatovittata</i>													1	1
<i>Menetia greyii</i>							4	1					82	87
<i>Morethia obscura</i>							3						69	72
<i>Tiliqua occipitalis</i>								2	2	1				5
<i>Trachydosaurus rugosus</i>				1			3		49	1	3			57
<b>Snakes</b>														
<i>Ramphotyphlops australis</i>													1	1
<i>Ramphotyphlops bituberculatus</i>													1	1
<i>Drysdalia mastersii</i>								2					2	4
<i>Echiopsis curta</i>													1	1
<i>Pseudonaja textilis</i>							2						1	3
<i>Pseudonaja sp.</i>				1										1
<i>Suta nigriceps</i>													7	7
<i>Suta spectabilis</i>													3	3
<b>Frogs</b>														
<i>Limnodynastes dumerilii</i>													4	4
<i>Neobatrachus pictus</i>													2	2
<i>Neobatrachus sudelli</i>													1	1
<i>Neobatrachus sp.</i>										1			2	3

## Pitfall trapping results

Pitfall trapping was the main survey method employed to examine the terrestrial fauna of the study area. Examination of the number of observations of each species recorded by each survey method during the intensive 1985/87 survey (Table 10) reveals the reason for concentrating mainly on pitfall trapping during the 2003/04 survey. Detailed results of the 1985/87 pitfall trapping at survey sites are included in Appendix 1, and those from the 2003/04 survey are presented in Appendix 2, with summaries of these data presented below in Tables 11 and 12.

**Table 11.** Total number of pitfall captures of each mammal, reptile and amphibian species at sites 61 to 80 during the five sampling trips of the 1985/87 survey.

Species	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	TOTAL
<b>Mammals</b>																					
<i>Tachyglossus aculeatus</i>																					
<i>Ningau yvonneae</i>							1	1		1	3				1		1	14			22
<i>Sminthopsis murina</i>																	1	2	2		5
<i>Cercartetus concinnus</i>	3	1	3	2	5	5	3	1	3	16	1	2	1	2	1	2	3				54
<i>Cercartetus lepidus</i>	2	6	2		2		1	1	2	1	1		1	4	1			2	6		31
<i>Macropus fuliginosus</i>																					
<i>Chalinolobus morio</i>																					
<i>Mus musculus</i>	1	1	1	3	1		1	3		2	8	2	2	1	3	2	1	1	4	5	40
<i>Pseudomys apodemoides</i>					1			1	7	4			7	12	16	26		3			77
<i>Notomys mitchelli</i>	1																				1
<i>Oryctolagus cuniculus</i>																					
<i>Canis familiaris</i>																					
<i>Vulpes vulpes</i>																					
<i>Felis catus</i>																					
<b>Lizards</b>																					
<i>Diplodactylus intermedius</i>	1	2								1	1	3	1	1	1	2	2		1		16
<i>Diplodactylus vittatus</i>	2	1		3		3				1				2				1			13
<i>Lucasium damaeum</i>	1	3	12		4		1	5	5	1	1			8	1	3					48
<i>Christinus marmoratus</i>		2			1					2											5
<i>Underwoodisaurus milii</i>																				3	3
<i>Aprasia inaurita</i>					3		4	5	1		1	1		1					1		17
<i>Delma australis</i>	1				1	2	7	1	2	2	2	2		1	4					1	26
<i>Delma butleri</i>							2				3					1		1			7
<i>Lialis burtonis</i>											1										1
<i>Pygopus lepidopodus</i>																					
<i>Amphibolurus nobbi</i>	3	3	2	1		1	1	1		2	2	2	2	2	4		1	2	3		27
<i>Amphibolurus norrisi</i>						1	2	1													4
<i>Ctenophorus fordi</i>							17	41	40	10	9	1		12	3	8	10		5		156
<i>Ctenophorus pictus</i>					1			7								1					9
<i>Pogona vitticeps</i>	1				2		2		1	1	1	1	2	2		1		1	4	5	24

Species	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	TOTAL
<i>Varanus gouldii</i>													2								2
<i>Ctenotus brooksi</i>									11	3				3	1						18
<i>Ctenotus orientalis</i>		2		2	1		1	1	2											3	12
<i>Ctenotus robustus</i>					1		2	2	5	3	3	3	3	2	3	4	9	1	3		41
<i>Egernia inornata</i>								1		1											2
<i>Lerista bougainvillii</i>	1	1	3	4	4	5	1	4	3	6	1	3					1	1	1		39
<i>Lerista punctatovittata</i>						1															1
<i>Menetia greyii</i>	3	2	5	4	2	8	3	8	3	11	5	3	3	1		2	5	6	6	2	82
<i>Morethia obscura</i>		2	1	3	12	11	2	2	8	8	6	4		1	2	2		5			69
<i>Tiliqua occipitalis</i>																					
<i>Trachydosaurus rugosus</i>																					
<b>Snakes</b>						1															1
<i>Ramphotyphlops australis</i>			1																		1
<i>Ramphotyphlops bituberculatus</i>																					1
<i>Drysdalia mastersii</i>							1					1									2
<i>Echiopsis curta</i>																			1		1
<i>Pseudonaja textilis</i>	1																				1
<i>Pseudonaja sp.</i>																					
<i>Suta nigriceps</i>			1			1												3	1	1	7
<i>Suta spectabilis</i>																				3	3
<b>Frogs</b>																					
<i>Limnodynastes dumerilii</i>							1		3												4
<i>Neobatrachus pictus</i>				1	1																2
<i>Neobatrachus sudelli</i>								1													1
<i>Neobatrachus sp.</i>		1							1												2

**Table 12.** Total number of pitfall captures of each mammal and reptile species at sites 61 to 03/16 during the two sampling trips of the 2003/04 survey.

Species	Site numbers																Total, sites 61 to 80 only				
	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76		77	78	79	80
<b>Mammals</b>																					
<i>Tachyglossus aculeatus</i>																					
<i>Ningau yvonneae</i>																					
<i>Smynthopsis murina</i>				5						3		1									9
<i>Cercartetus concinnus</i>																					
<i>Cercartetus lepidus</i>																					
<i>Macropus fuliginosus</i>																					
<i>Chalinolobus morio</i>																					
<i>Mus musculus</i>	4	5	2	4	3			1	5	8	4	4	2	4	1				2	2	51
<i>Pseudomys apodemoides</i>				1				1					1	1							4
<i>Notomys mitchelli</i>																					
<i>Oryzolagus cuniculus</i>																					
<i>Canis familiaris</i>																					
<i>Vulpes vulpes</i>																					
<i>Felis catus</i>																					
<b>Lizards</b>																					
<i>Diplodactylus intermedius</i>		2							1						2				1		6
<i>Diplodactylus vittatus</i>					1				1	1	1	2			5	2	1		1		15
<i>Lucasium damaeum</i>	4	6	8	8	6	3	7	6	28	5	6	10	13	2	1	9					116
<i>Christinus marmoratus</i>									1		1				1						3
<i>Underwoodisaurus miii</i>																					
<i>Aprasia aurita</i>																					
<i>Aprasia inaurita</i>				1				1	1	2											5
<i>Delma australis</i>						1			1									1			3
<i>Delma butleri</i>																					
<i>Lialis burtonis</i>									1						2						3
<i>Pygopus lepidopodus</i>																					

Species	Site numbers															Total, sites 61 to 80 only					
	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75		76	77	78	79	80
<i>Amphibolurus nobbi</i>			3	1		2									1				1		8
<i>Amphibolurus norrisi</i>																					
<i>Ctenophorus fordi</i>				2				2				1	1								6
<i>Ctenophorus pictus</i>																		1			1
<i>Pogona vitticeps</i>			1								1	2			1						5
<i>Varanus gouldii</i>																					
<i>Varanus sp.</i>																					
<i>Ctenotus brooksi</i>								6							1						8
<i>Ctenotus orientalis</i>						1															1
<i>Ctenotus robustus</i>															1						1
<i>Egernia inornata</i>										1											1
<i>Lerista bougainvillii</i>	3	3	4		1	4	4	1	2	1	4	3						2			32
<i>Lerista punctatovittata</i>			2			5							2					5	1		15
<i>Menetia greyii</i>		1	2																		3
<i>Morethia obscura</i>	1			2		5	1	1			1	4							1		16
<i>Tiliqua occipitalis</i>																					
<i>Trachydosaurus rugosus</i>																					
Snakes																					
<i>Ramphotyphlops australis</i>																					
<i>Ramphotyphlops bituberculatus</i>											1										1
<i>Drysdalia mastersii</i>																					
<i>Echiopsis curta</i>																					
<i>Pseudonaja textilis</i>																					
<i>Pseudonaja sp.</i>																					
<i>Suta nigriceps</i>				1					1	1		2	1								6
<i>Suta spectabilis</i>																					

Species	Site numbers																TOTAL all 36 sites
	03/ 01	03/ 02	03/ 03	03/ 04	03/ 05	03/ 06	03/ 07	03/ 08	03/ 09	03/ 10	03/ 11	03/ 12	03/ 13	03/ 14	03/ 15	03/ 16	
<b>Mammals</b>																	
<i>Tachyglossus aculeatus</i>							1										1
<i>Ningaui yvonneae</i>																	
<i>Smithopsis murina</i>									1	2	3	1	5		2	23	
<i>Cercartetus concinnus</i>																	
<i>Cercartetus lepidus</i>																	
<i>Macropus fuliginosus</i>																	
<i>Chalinolobus morio</i>																	
<i>Mus musculus</i>	6	4	2	1	2	2	8	1	3	6	4	6	2	4	4	106	
<i>Pseudomys apodemoides</i>		2	1		3						28	17	37	32	17	11	152
<i>Notomys mitchelli</i>																	
<i>Oryctolagus cuniculus</i>																	
<i>Canis familiaris</i>																	
<i>Vulpes vulpes</i>																	
<i>Felis catus</i>																	
<b>Lizards</b>																	
<i>Diplodactylus intermedius</i>	1		1			3						1		1		13	
<i>Diplodactylus vittatus</i>			1	2		5	1				2			3	2	31	
<i>Lucasium damaeum</i>	2	6	10	11	6	5	1	7	1		2	4	4	6	7	7	195
<i>Christinus marmoratus</i>							1					1			1	6	
<i>Underwoodisaurus miihi</i>										5						5	
<i>Aprasia aurita</i>							2	1								3	
<i>Aprasia inaurita</i>															1	7	
<i>Delma australis</i>	1	2			1	2					1					10	
<i>Delma butleri</i>		1														1	
<i>Lialis burtonis</i>			2									1		1		7	
<i>Pygopus lepidopodus</i>																	
<i>Amphibolurus nobbi</i>			1		1						3	1			5	1	20
<i>Amphibolurus norrisi</i>												2				2	2

Species	Site numbers																TOTAL all 36 sites
	03/ 01	03/ 02	03/ 03	03/ 04	03/ 05	03/ 06	03/ 07	03/ 08	03/ 09	03/ 10	03/ 11	03/ 12	03/ 13	03/ 14	03/ 15	03/ 16	
<i>Ctenophorus fordi</i>	1	3	3	2						1	4	10	14	10	9	8	71
<i>Ctenophorus pictus</i>				2							5	8		6	8		30
<i>Pogona vitticeps</i>											3			6	1	1	16
<i>Varanus gouldii</i>	2																2
<i>Varanus sp.</i>																	
<i>Ctenotus brooksi</i>		1					1		1	2	1	3	2	2	15	1	35
<i>Ctenotus orientalis</i>											1	2	2			3	9
<i>Ctenotus robustus</i>	1	5		2						5	2	1	1	2			20
<i>Egernia inornata</i>																	1
<i>Lerista bougainvillii</i>	1	1	2		1	6	2		2								47
<i>Lerista punctatovittata</i>						2	2										19
<i>Menetia greyii</i>	1	1	1														6
<i>Morethia obscura</i>						1											17
<i>Tiliqua occipitalis</i>																	
<i>Trachydosaurus rugosus</i>						1											1
<b>Snakes</b>																	
<i>Ramphotyphlops australis</i>									1	1							2
<i>Ramphotyphlops</i> <i>Petrucciosaurus</i>									1			1					3
<i>Drysdalia mastersii</i>																	
<i>Echlopsis curta</i>																	
<i>Pseudonaja textilis</i>																	
<i>Pseudonaja sp.</i>																	
<i>Suta nigriceps</i>	1	1		1		1	1			1					1		13
<i>Suta spectabilis</i>																	

During the 1985/87 survey, 20 pitfall sites were examined intensively, with five sampling trips seasonally over an 18 month period. This sampling produced a wide range of terrestrial species (Table 11) – however, some species were not encountered as frequently by this technique as might be expected. The large and medium-sized mammals are obviously not recorded by pitfall trapping, whilst Mitchell’s Hopping-mouse can usually escape from pitfalls. The large lizards, the Sand Goanna, Western Blue-tongued Lizard and Stumpy-tailed Lizard (*Trachydosaurus rugosus*), rarely enter pitfalls, although they may be present within the trapping area. Similarly, the Common Scaly-foot (*Pygopus lepidopodus*) appears capable of avoiding pitfalls, as it is known to be more abundant than trapping results would indicate. Only small numbers of snakes were detected in pitfall traps, perhaps reflecting both their sparse populations in the study area and their generally low mobility. Frogs are readily captured in pitfall traps, but the three species present in the Big Desert are active above ground (and hence able to be captured) usually only during or immediately after periods of considerable rainfall.

The pitfall trapping from the 2003/04 survey (Table 12) captured a similar range of species as the earlier survey, but with notable differences in abundances, to be detailed later. The occurrence of the Mallee Worm-lizard in the 2003/04 survey, from a newly established site, indicates that this species may be quite restricted in its distribution and habitat within the study area.

## Elliott trapping results

Of the seven species of small terrestrial mammals occurring in the study area, only three were captured in Elliott traps (see Table 13). Fortunately, the other four species, including both species of pygmy-possums (*Cercartetus* spp.) and the Mallee Ningai (*Ningai yvonnae*), are readily detected by pitfall trapping. The species targeted by Elliott trapping, Mitchell’s Hopping-mouse, was captured in moderate numbers during all trapping trips of the 1985/87 survey (it was also captured in the larger wire cage traps employed during that survey - see Table 10), but none was found (by any method) during the 2003/04 survey. Only insignificant numbers of reptiles were captured in Elliott traps, possibly due to the lack of suitable bait for these species. The Stumpy-tailed Lizard was, however, caught in considerable numbers in wire cage traps during the 1985/87 survey (see Table 10).

**Table 13.** Total numbers of captures in Elliott traps during each survey trip, 1985/87 and 2003/04.

Note: Data from sites 61-80 only, no captures at other sites. \* = not trapped.

Species	Trapping period							Total
	Spring 85*	Summer 85/86	Winter 86	Spring 86	Summer 86/87	Dec 2003	Feb 2004	
<i>Mus musculus</i>		1	1	2	5		1	10
<i>Pseudomys apodemoides</i>			2	5	4			11
<i>Notomys mitchelli</i>		5	2	6	2			15
<i>Pogona vitticeps</i>					1			1
<i>Tiliqua occipitalis</i>		1						1
<i>Trachydosaurus rugosus</i>				1				1
<i>Pseudonaja textilis</i>						1		1
Trapping effort	0*	360	360	360	360	300	300	

## Species composition – comparisons 1985/87 to 2003/04

To compare species composition at sites between the two surveys (1985/87 and 2003/04), the trapping data from sites 60 to 80 only were compiled – these are presented in Table 14. To enable valid comparisons, only the summer sample trips, involving similar survey effort and seasonal conditions should be used – these are presented in Table 15.

**Table 14.** Total numbers of pitfall captures of mammals, reptiles and amphibians, from sites 61 to 80 only, during each sampling trip of both the 1985/87 and 2003/04 surveys.

Species	Trapping Period						
	Spring 1985	Summer 1985/86	Winter 1986	Spring 1986	Summer 1986/87	December 2003	February 2004
<b>Mammals</b>							
<i>Ningauia yvonneae</i>	10	4	5	2	1		
<i>Sminthopsis murina</i>	3				2	4	5
<i>Cercartetus concinnus</i>	23	12	3	8	8		
<i>Cercartetus lepidus</i>	8	5	2	12	4		
<i>Mus musculus</i>	1	3	1	5	30	4	47
<i>Pseudomys apodemoides</i>	15	6	5	18	33	2	2
<i>Notomys mitchelli</i>				1			
<b>Lizards</b>							
<i>Diplodactylus intermedius</i>	3	5		6	2		6
<i>Diplodactylus vittatus</i>	1	5		5	2	6	9
<i>Lucasium damaeum</i>	18	13		6	11	59	57
<i>Christinus marmoratus</i>		2		2	1	1	2
<i>Underwoodisaurus milii</i>		2			1		
<i>Aprasia inaurita</i>	9	2		2	4	4	1
<i>Delma australis</i>	17	2			7	2	1
<i>Delma butleri</i>	2	4			1		
<i>Lialis burtonis</i>	1					2	1
<i>Amphibolurus nobbi</i>	9	7		2	9	5	3
<i>Amphibolurus norrisi</i>		1			3		
<i>Ctenophorus fordii</i>	58	65		8	25		6
<i>Ctenophorus pictus</i>	1	4		2	2		1
<i>Pogona vitticeps</i>	2	7		2	13		5
<i>Varanus gouldii</i>		1			1		
<i>Ctenotus brooksi</i>	9	4		2	3	4	4
<i>Ctenotus orientalis</i>	6	4			2	1	
<i>Ctenotus robustus</i>	7	19		1	14		1
<i>Egernia inornata</i>	2						1
<i>Lerista bougainvillii</i>	17	11		4	7	22	10
<i>Lerista punctatovittata</i>	1					12	3
<i>Menetia greyii</i>	39	15		15	13	3	

Species	Trapping Period						
	Spring 1985	Summer 1985/86	Winter 1986	Spring 1986	Summer 1986/87	December 2003	February 2004
<i>Morethia obscura</i>	19	17		13	20	8	8
<b>Snakes</b>							
<i>Ramphotyphlops australis</i>				1			
<i>Ramphotyphlops bituberculatus</i>					1	1	
<i>Drysdalia mastersii</i>		1			1		
<i>Echiopsis curta</i>	1						
<i>Pseudonaja textilis</i>		1					
<i>Suta nigriceps</i>	6				1	4	2
<i>Suta spectabilis</i>		2			1		
<b>Frogs</b>							
<i>Limnodynastes dumerilii</i>	2		2				
<i>Neobatrachus pictus</i>				2			
<i>Neobatrachus sudelli</i>			1				
<i>Neobatrachus</i> sp.	2						

**Table 15.** Total numbers of pitfall captures of mammals and reptiles, from sites 61 to 80 only, during the two summer sampling trips of 1985/87 and the two summer sampling trips of 2003/04.

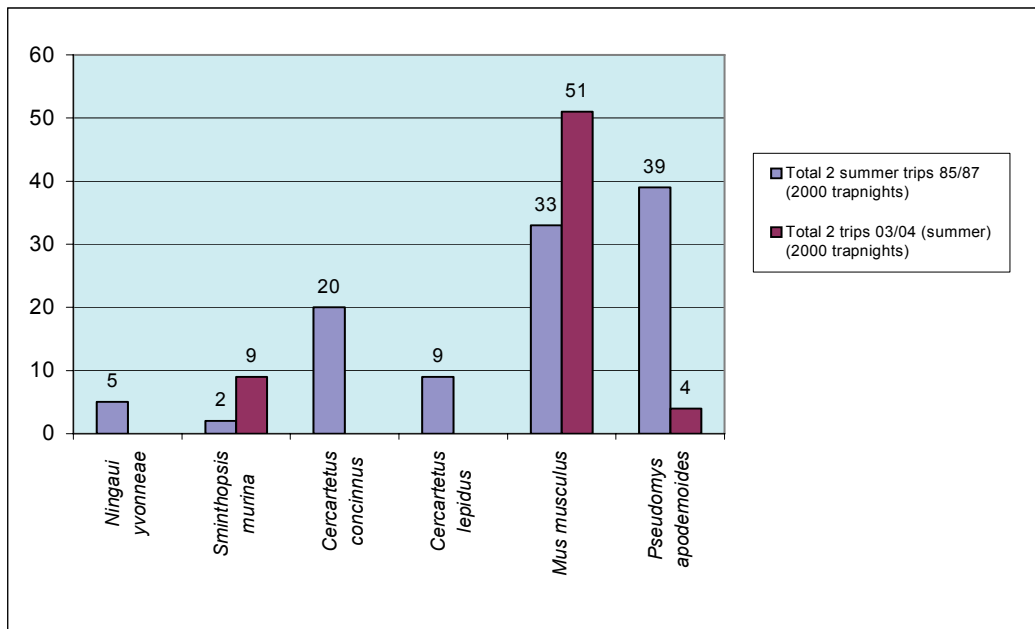
Species	Survey period	
	1985/87 Total 2 summer trips (2000 trap-nights)	2003/04 Total 2 summer trips (2000 trap-nights)
<b>Mammals</b>		
<i>Ningauai yvonneae</i>	5	
<i>Sminthopsis murina</i>	2	9
<i>Cercartetus concinnus</i>	20	
<i>Cercartetus lepidus</i>	9	
<i>Mus musculus</i>	33	51
<i>Pseudomys apodemoides</i>	39	4
<i>Notomys mitchelli</i>		
<b>Lizards</b>		
<i>Diplodactylus intermedius</i>	7	6
<i>Diplodactylus vittatus</i>	7	15
<i>Lucasium damaeum</i>	24	116

Species	Survey period	
	1985/87 Total 2 summer trips (2000 trap-nights)	2003/04 Total 2 summer trips (2000 trap-nights)
<i>Christinus marmoratus</i>	3	3
<i>Underwoodisaurus milii</i>	3	
<i>Aprasia inaurita</i>	6	5
<i>Delma australis</i>	9	3
<i>Delma butleri</i>	5	
<i>Lialis burtonis</i>		3
<i>Amphibolurus nobbi</i>	16	8
<i>Amphibolurus norrisi</i>	4	
<i>Ctenophorus fordi</i>	90	6
<i>Ctenophorus pictus</i>	6	1
<i>Pogona vitticeps</i>	20	5
<i>Varanus gouldii</i>	2	
<i>Ctenotus brooksi</i>	7	8
<i>Ctenotus orientalis</i>	6	1
<i>Ctenotus robustus</i>	33	1
<i>Egernia inornata</i>		1
<i>Lerista bougainvillii</i>	18	32
<i>Lerista punctatovittata</i>		15
<i>Menetia greyii</i>	28	3
<i>Morethia obscura</i>	37	16
<b>Snakes</b>		
<i>Ramphotyphlops australis</i>		
<i>Ramphotyphlops bituberculatus</i>	1	1
<i>Drysdalia mastersii</i>	2	
<i>Echiopsis curta</i>		
<i>Pseudonaja textilis</i>	1	
<i>Suta nigriceps</i>	1	6
<i>Suta spectabilis</i>	3	

Generally, the figures in Table 15 enable an assessment of the changes in relative abundance of many species between the two survey periods, with some species showing marked differences. These are detailed below. Note that no frogs were detected during these summer periods, conditions at the time being unsuitable for their activity.

## Mammals

Differences in numbers of captures of small terrestrial mammals in pitfall traps are illustrated in Figure 3. The absence of three species, the Mallee Ningai and both pygmy-possums, is immediately apparent, while numbers of the Silky Mouse (*Pseudomys apodemoides*) declined markedly between survey periods. As seen from the Elliott trapping data, Mitchell's Hopping Mouse, also declined between surveys. The Common Dunnart, although captured only in low numbers, may have increased between surveys.

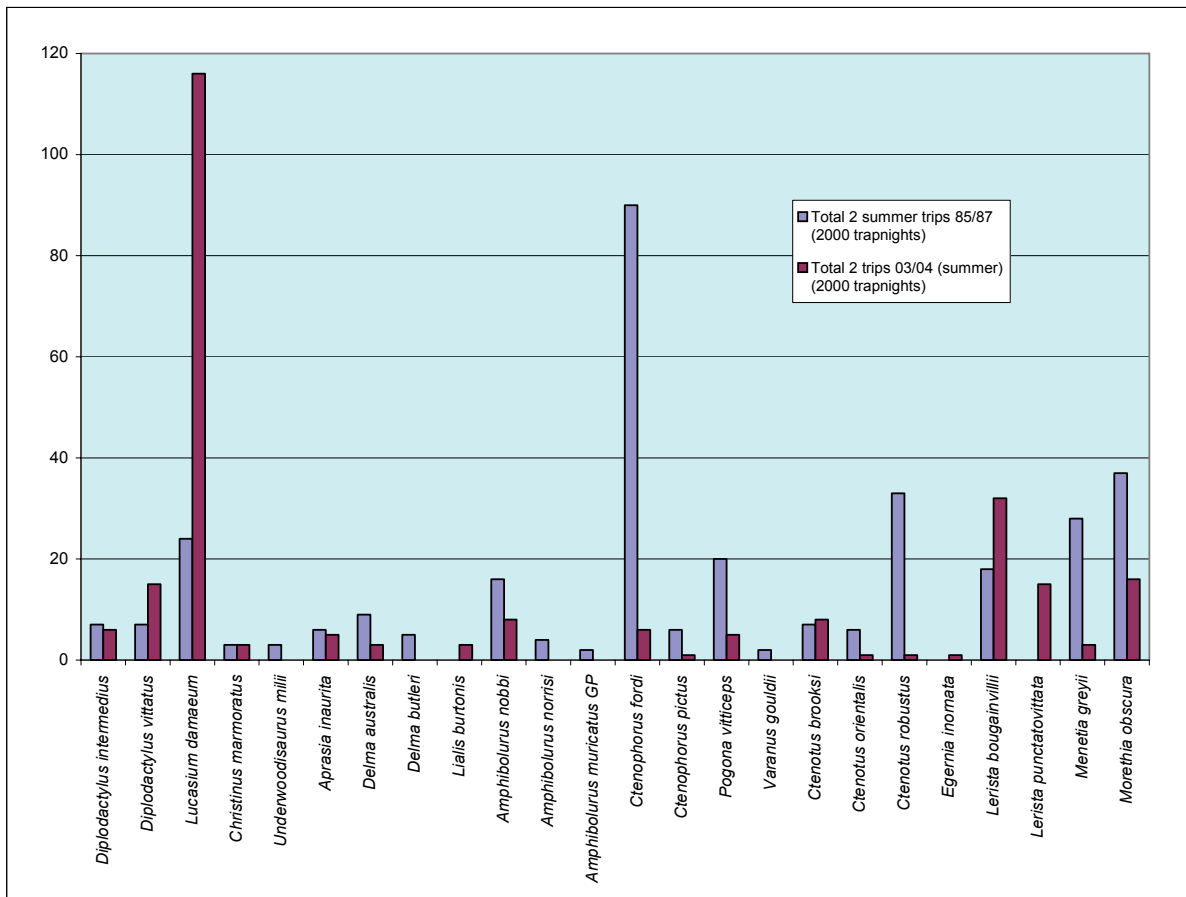


**Figure 3.** Mammals recorded from pitfall traps at sites 61 to 80 only, during the two summer sampling trips of 1985/87 and the two summer sampling trips of 2003/04.

## Reptiles

Only those reptiles detected in pitfall traps are included within Table 15. Of these, several species exhibited marked differences in relative abundance between survey periods. Generally, too few snakes were detected to enable any comparisons – however the numbers of species found did decrease between 1985/87 and 2003/04. One species, Mitchell's Short-tailed Snake (*Unechis nigriceps*), was found in greater numbers during the recent survey.

Differences in numbers of captures of lizards in pitfall traps are illustrated in Figure 4. Two of the most frequently encountered species displayed large differences between survey period. Captures of the nocturnal, ground-dwelling Beaded Gecko (*Lucasium damaeum*) increased nearly five fold, whilst captures of the diurnal, terrestrial and *Triodia*-dependent Mallee Dragon (*Ctenophorus fordi*) plummeted. Similar, but less extreme declines were apparent in the other dragon species. Although captures were very low, the litter or *Triodia*-dwelling legless lizards, *Delma australis* and *D. butleri* both declined, while the fossorial Pink-nosed Worm-Lizard (*Aprasia inaurita*) remained similar.



**Figure 4.** Lizards recorded from pitfall traps at sites 61 to 80 only, during the two summer sampling trips of 1985/87 and the two summer sampling trips of 2003/04.

The litter-dwelling skinks, *Menetia greyii* and *Morethia obscura* both declined, as did the two larger striped skinks, *Ctenotus orientalis* and *C. robustus*, which prefer shelter of low shrubs and retreat into shallow burrows. Captures of the fossorial skinks *Lerista bougainvillii* and *L. punctatovittata* both increased.

### Birds

Data from the bird censuses conducted at sites 61 to 80 during the summers of 1985/87 and 2003/04 are presented in Table 16. Because collection of quantitative information is not always possible during such censuses, the most useful comparisons between survey periods may be obtained by examining the number of sites at which a species occurred during each survey (that is, the first two columns of Table 16), rather than the number of individuals recorded (second two columns). Further insights into the differences in occurrence of bird species in the north-western Big Desert between survey periods may be gained by referring back to Table 9.

**Table 16.** Birds recorded during censuses at sites 61 to 80 only, during the summer sampling trips of 1985/87 and 2003/04. A "p" indicates that the species was present, but off the census plots.

Species	SITES		INDIVIDUALS	
	Summer 1985/87	Summer 2003/04	Summer 1985/87	Summer 2003/04
	Total number of sites at which species recorded	Total number of sites at which species recorded	Total number of individuals recorded on census plots	Total number of individuals recorded on census plots
Little Eagle		1		p
Little Button-quail		1		p
Galah	7	10	6	2
Australian (Mallee) Ringneck	1		p	
Mulga Parrot	2	9	p	p
Australian Owlet-nightjar	2		1	
Spotted Nightjar	1		p	
Horsfield's Bronze-Cuckoo		2		p
Rainbow Bee-eater	3	9	p	p
Variiegated Fairy-wren	3	1	5	2
Splendid Fairy-wren	1	2	3	p
Spotted (Yellow-rumped) Pardalote	3	7	16	p
Striated Pardalote	1		1	
Shy Heathwren	5	3	2	p
Weebill	19	3	42	p
Inland Thornbill	13	5	30	p
Yellow-rumped Thornbill	1	1	6	p
Buff-rumped Thornbill	1		5	
Singing Honeyeater		1		p
White-eared Honeyeater	18	9	9	p
Purple-gaped Honeyeater	4		6	
Yellow-plumed Honeyeater	8		18	
Brown-headed Honeyeater	3	3	1	8
Spiny-cheeked Honeyeater	5	14	1	p
Red Wattlebird	1		p	
White-fronted Honeyeater	7		2	
Tawny-crowned Honeyeater	1		p	
White-fronted Chat	2	1	p	40
Jacky Winter		3		p
Red-capped Robin	3	8	2	p
Southern Scrub-robin	5	2	p	p
White-browed Babbler	5	1	3	p
Chestnut Quail-thrush	2	3	1	p
Golden Whistler	8	10	3	p
Rufous Whistler		3		p
Grey Shrike-thrush	14	14	5	p
Crested Bellbird	1	4	1	p
Willie Wagtail		1		p
Grey Butcherbird	14	17	1	p

Species	SITES		INDIVIDUALS	
	Summer 1985/87	Summer 2003/04	Summer 1985/87	Summer 2003/04
	Total number of sites at which species recorded	Total number of sites at which species recorded	Total number of individuals recorded on census plots	Total number of individuals recorded on census plots
Australian Magpie	7	10	p	1
Grey (Black-winged) Currawong	2	11	p	3
Masked Woodswallow		1		p
White-browed Woodswallow		2		p
Dusky Woodswallow	1		p	
Black-faced Cuckoo-shrike		2		p
Little Raven		3		p
Australian Raven	2	7	p	p
White-winged Chough	1		p	
Silvereeye	1		p	
Australian Pipit	1	1	p	p
	<b>39 species</b>	<b>37 species</b>		

Several bird species showed pronounced differences between the two survey periods. The eucalypt seed-eating Mulga Parrot (*Psephotus varius*) was more widespread in the latter survey. Widespread predators/scavengers of open-country, such as the Little Raven (*Corvus mellori*) and Australian Raven (*C. coronoides*) were more prominent in the 2003/04 survey, as was the predatory Grey Currawong (*Strepera versicolor melanoptera*). Woodland species, such as the Jacky Winter (*Microeca fascinans*) and Rufous Whistler (*Pachycephala rufiventris*) also increased.

Conversely, nectar feeding species, such as most of the honeyeaters, were less common in the 2003/04 survey. Similarly, canopy leaf-gleaning species such as the Weebill (*Smicromnis brevirostris*) and most of the thornbills were far less common. Perhaps more importantly, all of the more specialised and less vagile species recognised as threatened or near threatened in the Big Desert, such as the Red-lored Whistler, Mallee Emu-wren, Striated Grasswren and Slender-billed Thornbill, displayed significant declines. The Malleefowl disappeared from most of the study area.

## Burnt / unburnt comparisons 2003/04

To examine the direct impacts of the December 2002 fire, the numbers of captures of each species during the 2003/04 survey, from burnt and unburnt sites, were compiled. The data for mammals and reptiles from pitfall trapping are presented in Appendix 4, with summaries below in Tables 17 and 18 respectively. The information in these tables is from all 36 sites examined during the 2003/04 survey. Note that in addition to the 'burnt' and 'unburnt' categories, the aggregated data from six of the sites was from an area burnt in 1997, but not in 2002. (One should be aware, when interpreting data from the 1997 fire area, that these six sites were remote from the others sampled, and in slightly different vegetation – consequently faunal composition may differ regardless of fire history.)

## Mammals

The data for captures of small terrestrial mammals are presented in Table 17, with the figures corrected for trapping effort (last three columns) of most relevance. The Common Dunnart, while present in all three fire-age categories, appears to increase in recently burnt habitats and is most common in the six-year old vegetation. Similarly, the Silky Mouse shows a large increase in the six-year old vegetation. Data for the ubiquitous introduced House Mouse (*Mus musculus*), a plague species, are uninformative.

**Table 17.** Mammals recorded in pitfall traps at sites in burnt and unburnt vegetation during the two field trips of summer 2003/04.

Species	Total numbers of captures			Total captures per 100 trap-nights		
	Burnt Dec 2002 (16 sites)	Burnt 1997 (6 sites)	Unburnt Dec 2002 (12 sites)	Burnt 2002 (1600 trap-nights)	Burnt 1997 (600 trap-nights)	Unburnt Dec 2002 (1200 trap-nights)
<i>Sminthopsis murina</i>	9	13	1	0.56	2.17	0.08
<i>Mus musculus</i>	39	20	42	2.44	3.33	3.50
<i>Pseudomys apodemoides</i>	3	142	7	0.19	23.67	0.58

## Reptiles

The data for captures of reptiles in fire-age categories are summarised in Table 18, with the figures corrected for trapping effort (last three columns) of most relevance. The Beaded Gecko, a species that increased markedly between the two survey periods, was widespread and abundant in all three fire-age categories. Conversely, two other geckos – the Wood Gecko (*Diplodactylus vittatus*), a ground dweller, and the Marbled Gecko (*Christinus marmoratus*), which lives under bark and in timber crevices – were less common in the recently burnt sites. The Southern Legless Lizard (*Delma australis*), an inhabitant of thick litter or large *Triodia* hummocks, was more abundant in the unburnt vegetation than in either of the two burnt categories, whilst its relative, Butlers Legless Lizard (*Delma butleri*), a *Triodia* specialist, was very uncommon. The mallee-bole-dwelling Nobbi Dragon (*Amphibolurus nobbi*) was more frequently observed in the 1997 fire-age class. Similarly, the Mallee Dragon, which had decreased dramatically in numbers between the two survey periods, was far more abundant in the 1997 fire-age class than in either recently burnt or unburnt vegetation. The striped skinks, *Ctenotus robustus* and *C. brooksi*, also in very low numbers in recently burnt or unburnt vegetation, were captured frequently in the 1997 fire-age class. Grey's Skink (*Menetia greyii*), a ubiquitous inhabitant of the area during the 1985/87 survey, is dependent upon the litter layer – it was found rarely during the 2003/04 survey, mostly in unburnt vegetation.

**Table 18.** Reptiles recorded in pitfall traps at sites in burnt and unburnt vegetation during the two field trips of summer 2003/04.

Species	Total numbers of captures			Total captures per 100 trap-nights		
	Burnt Dec 2002 (16 sites)	Burnt 1997 (6 sites)	Unburnt Dec 2002 (12 sites)	Burnt 2002 (1600 trap-nights)	Burnt 1997 (600 trap-nights)	Unburnt Dec 2002 (1200 trap-nights)
<i>Diplodactylus vittatus</i>	9	7	15	0.56	1.17	1.25
<i>Lucasium damaeum</i>	112	30	50	7.00	5.00	4.17
<i>Christinus marmoratus</i>	1	2	3	0.06	0.33	0.25
<i>Underwoodisaurus milii</i>			5			0.42
<i>Aprasia aurita</i>			3			0.25
<i>Aprasia inaurita</i>	3	1	3	0.19	0.17	0.25
<i>Delma australis</i>	1	1	7	0.06	0.17	0.58
<i>Delma butleri</i>			1			0.08
<i>Lialis burtonis</i>		2	5		0.33	0.42
<i>Amphibolurus nobbi</i>	2	10	6	0.13	1.67	0.50
<i>Amphibolurus norrisi</i>		2			0.33	
<i>Ctenophorus fordi</i>	9	55	7	0.56	9.17	0.58
<i>Ctenophorus pictus</i>	3	27		0.19	4.50	
<i>Pogona vitticeps</i>	3	11	2	0.19	1.83	0.17
<i>Varanus gouldii</i>	2			0.13		
<i>Ctenopus brooksi</i>	7	24	4	0.44	4.00	0.33
<i>Ctenopus orientalis</i>		8			1.33	
<i>Ctenopus robustus</i>		11	9		1.83	0.75
<i>Egernia inornata</i>			1			0.08
<i>Lerista bougainvillii</i>	23	2	18	1.44	0.33	1.50
<i>Lerista punctatovittata</i>	10		4	0.63		0.33
<i>Menetia greyii</i>	1		5	0.06		0.42
<i>Morethia obscura</i>	11		1	0.69		0.08
<i>Ramphotyphlops australis</i>		1	1		0.17	0.08
<i>Ramphotyphlops bituberculatus</i>	1	1	1	0.06	0.17	0.08
<i>Unechis nigriceps</i>	6	1	6	0.38	0.17	0.50

## Birds

The data from bird censuses in burnt, partly burnt and unburnt habitats are shown in Table 19. Because at some sites designated 'burnt' there were remnants of unburnt vegetation adjacent to or near the census plot, the data from each site are presented separately, with an indication of whether the observation was made in burnt (shown as 'b') or unburnt (shown as 'u') vegetation. Note that the 1997 fire-age category was not sampled for birds.

The seed-eating species – Galah (*Cacatua roseicapilla*), Little Button-quail (*Turnix velox*) and Mulga Parrot – were found predominantly in recently burnt areas. The honeyeater species which remained after the fire were found in both burnt and unburnt vegetation – note, however, that several species recorded in 1985/87 were not found in 2003/04. The Grey

Currawong appeared to prefer the open environment of burnt sites in which to forage for prey, as did the Red-capped Robin (*Petroica goodenovii*).

Several bird species appeared to display little preference for either burnt or unburnt vegetation, and were widespread in the study area. These included the Spiny-cheeked Honeyeater (*Acanthagenys rufogularis*), Golden Whistler (*Pachycephala pectoralis*), Rufous Whistler, Grey Shrike-thrush (*Colluricincla harmonica*) and Grey Butcherbird (*Cracticus torquatus*).

Both species of Fairy-wren occurred mainly in unburnt sites or in patches of unburnt vegetation near burnt sites, as did the Spotted Pardalote (*Pardalotus punctatus*). The Shy Heathwren, an uncommon specialist of dense low shrubs, was similarly found mainly in unburnt vegetation. The leaf-gleaning Weebill and thornbill species also occurred only in unburnt vegetation. The Southern Scrub-robin, a specialist inhabitant of the ground layer under thick shrubs, was found at few sites, all in unburnt vegetation, but was able to utilise small unburnt patches near burnt sites.

Threatened, rare or localised species were conspicuously absent from both burnt or unburnt sites.

## **Vehicle traverses**

All faunal records from vehicle transects conducted in December 2003 and February 2004 are included within Appendix 3. The two target species of these transects, the Sand Goanna and the Heath Monitor, were encountered too infrequently to comment upon their status.

## **Quadrat raking searches**

All faunal records from quadrat raking searches in February 2004 are included within Appendix 3. Because only a small number of individuals was found during these searches, they were discontinued. It is likely that the very hot and dry seasonal conditions prevailing at the time influenced detectability of litter-dwelling reptiles.





## **Burrow survey for *Egernia* spp.**

All faunal records from burrow searches for *Egernia* spp. (at both intensive quadrats and elsewhere) are presented in Appendix 3. Appendix 5 lists the areas searched for burrows, with results of the searches. The Desert Skink was found at a number of sites, widespread in both burnt and unburnt areas north of Moonlight Tank. The Heath Skink was found only along the Chinaman's Well Track, and may not be present in the north of the Big Desert. It was confirmed at one locality, just east of Moonlight Tank, at which the species had not been seen since 1980.

Results of the intensive burrow census for the Heath Skink within the two quadrats at "Egernia Hill" and "Trig Point Hill" are presented in Appendix 6. "Egernia Hill" was burnt in April 2002, whilst "Trig Point Hill" had not been burnt for at least twenty years. Forty-five burrow entrances, of which less than 47% were considered 'active', were located within the quadrat at "Egernia Hill" – a further 36 entrances were located outside the quadrat area. At the quadrat on "Trig Point Hill", in unburnt vegetation, 41 burrow entrances were located, of which 95% were considered 'active'.

## **Threatened mammals and reptiles**

The Common Dunnart was uncommon, but occurred in both unburnt and burnt vegetation, and may increase in numbers in early post-fire successional stages, as may the Silky Mouse. Of concern was the lack of any evidence of the presence of Mitchell's Hopping Mouse, Mallee Ningauai, Western Pygmy-possum or Little Pygmy-possum, in either burnt or unburnt vegetation, in the recent survey.

The Bardick, a small litter-dwelling Snake, was not recorded during the current survey, and may be adversely affected by fire. Neither of the burrowing snakes, the Bandy Bandy or Port Lincoln Snake were found during the 2003/04 survey, but these two species are never encountered commonly in Victoria, and are difficult to detect. Similarly, the Lined Earless Dragon is known only from one record in the Big Desert, from the south-east, and was not expected to be found during the survey.

The Western Blue-tongued Lizard was detected only as skeletal material during the recent survey, from a small burnt patch within the fire area, where it may have been dropped by a raptor – this relatively long-lived, surface dwelling skink is nowhere common in Victoria, and may have experienced significant mortality during and after the 2002 fire.

Monitor lizards were very uncommon during the recent survey, although their tracks were observed in both burnt and unburnt areas – however, it was not possible to confidently attribute these to either species, the Sand Goanna or Heath Monitor. All monitor sightings were of the Sand Goanna. Consequently, little can be postulated about the status of the localised and threatened Heath Monitor, or the potential effects of the 2002 fire, other than the observation that it is now apparently extremely uncommon.

Of the two threatened burrowing skinks, the Desert Skink and the Heath Skink, it appears that the Desert Skink is relatively widespread but uncommon, occurring in both burnt and unburnt areas, with the population possibly not seriously affected by fire. The Heath Skink, conversely, appears to be very restricted in its distribution, possibly occurring only at few sites in the south of the Big Desert. It does appear to be associated with very large dunes, the crests of which become mobile after fire, obscuring many burrows – this phenomenon was evident at the site burnt in April 2002. While the population at this site appears to have survived the fire, it has decreased in both geographic extent and in the number of occupied burrows in the census quadrat area. Burrow occupancy at the unburnt site was double that of the burnt site.

## **Threatened and other targeted bird species**

Tracks of the Malleefowl were seen throughout the areas censused on Cactus Bore Track, John's Bore Track and White Springs Track in the 1980's, whereas none was seen in any of those areas in 2003. Note that only one set of tracks was seen in 2003, at Ross's Spring, outside the 2002 fire area.

The Red-lored Whistler, Mallee Emu-wren, Striated Grasswren and Slender-billed Thornbill were recorded rarely in the '80s, but not at all in 2003. Of those, the Mallee Emu-wren, a weak flier, and the Striated Grasswren, a ground-dweller, are most likely to have been seriously affected by the fire. It is conceivable that the Red-lored Whistler and Slender-billed Thornbill could have escaped the flames and sought refuge in unburnt areas.

The Purple-gaped Honeyeater was recorded at a number of sites during the 1980's, but not at all in 2003. The Shy Heathwren and Southern Scrub-robin were recorded at many sites during the 1980's, but were recorded predominantly from unburnt sites or unburnt habitat near burnt sites in 2003.

## 4. STATISTICAL EXAMINATION OF TRAPPING DATA

### - Analyses, discussion and implications

The trapping study of small vertebrate populations was carried out over two time periods — 1985/1987 and 2003/2004 — in a variety of heathland, shrubland and mallee communities on sands near the northern fringe of the Big Desert, in the southern Mallee. Rainfall in the study area had been below average between the two periods, and much of it had experienced an extensive wildfire in December 2002, prior to the second time period.

The study basically sought answers to two research questions, *viz.* whether:

- populations of small vertebrates had changed significantly within the study area between the two sampling periods; and
- to what extent the wildfire might have affected those populations.

Most data were collected by pitfall trapping, supplemented by some trapping using Elliott small mammal traps. This section summarizes the results of analyses of the pitfall trap data collected, first by comparing trapping results from the two time periods, then by comparing burnt and unburnt site data from the second time period. Associated analyses examine the contributions of time period, fire and possible effects of sample site clustering on the data.

Although data had been collected within the first time period at several times of year, sampling during the second period was confined to the summer months. For comparative purposes, then, only data collected during the summer months are analysed here.

### Summer Comparisons: 1985-87 VS 2003-04

#### Data Set

*Sites:* Twenty sites, numbered 61-80, were sampled within two time periods, the second following the major fire which burnt out 15 of the 20 sites. The first 10 sites (Nos.61-70) were along a roughly north-south line in the western part of the study area; the other 10 sites (Nos.71-80) were along a roughly NW-SE roughly crescent-shaped line several kilometres to the east. Trap-site locations were therefore not completely geographically independent, but clustered in two rows some distance apart; pseudo-replication of samples was therefore a potential problem.

*Trapping Procedure:* Ten standard pits were dug at each site along the one trap-line, and opened for 5 day-plus-night periods, the sampling then repeated some time later (see below), giving 10 sampling occasions at each of the 20 sites, or 2000 trap-nights in all. There were many zero counts of particular species from each trapping site. For each trapping period, therefore, the numbers of individuals of each species caught in different pits along the one trap-line were pooled and totalled by species, as set out below:

*Sampling Periods:* Period 1: Summer 1985/86 and Summer 1986/87 (data pooled)  
 Period 2: December 2003 and February 2004 (data pooled)

*Number of Samples:* 100 trap-nights at each site, 2000 trap-nights in all for Period 1  
 100 trap-nights at each site, 2000 trap-nights in all for Period 2

**Species of Interest:** Native small mammals and reptiles, with a focus on those species found to be more abundant in the pitfall traps, viz:

Mammals — *Ningauai yvonneae*, *Sminthopsis murina*, *Cercartetus concinnus*, *Cercartetus lepidus*, *Pseudomys apodemoides* (5 mammal species)

Reptiles — *Diplodactylus intermedius*, *Diplodactylus vittatus*, *Lucasium damaeum*, *Christinus marmoratus*, *Underwoodisaurus milii*, *Aprasia inaurita*, *Delma australis*, *Delma butleri*, *Lialis burtonis*, *Amphibolurus nobbi*, *Amphibolurus norrisi*, *Ctenophorus fordi*, *Ctenophorus pictus*, *Pogona vitticeps*, *Varanus gouldii*, *Ctenotus brooksi*, *Ctenotus orientalis*, *Ctenotus robustus*, *Egernia inornata*, *Lerista bougainvillii*, *Lerista punctatovittata*, *Menetia greyii*, *Morethia obscura*, *Ramphotyphlops bituberculatus*, *Drysdalia mastersii*, *Suta nigriceps*, *Suta spectabilis* (27 reptile species)

Data analysis from pitfall trapping used data on these 32 vertebrate species from the 20 trapping sites.

## Data Analysis

The data collected are frequency data from series of small samples, and subject to the familiar problem of presenting highly right-skewed frequency distributions with a large number of zero values. The following statistical analyses were undertaken: numbers trapped from the two time periods were compared, species by species, using the nonparametric Wilcoxon signed-ranks test, while the possible contribution of time period, burn regime and clustering to species totals and small vertebrate species diversity was examined both by general linear modelling (GLM) and multiple linear regression (MLR) for those data where the data obtained allowed the assumptions of the particular analytic technique to be met either with or without data transformation. No individual species data sets proved usable with GLM, either because of heteroscedasticity or lack of statistical power, but MLR analyses yielded useful outcomes (see below).

### Comparing the Time Periods — Mammals and Reptiles Combined

The Wilcoxon Signed Ranks test is a nonparametric form of 'before-and-after' analysis which compares data matched for possibly-significant variables to reduce their effects on the analysis, and is a test which makes no assumptions about the frequency distributions of the data (although it may lack sensitivity if there are many zero values). To reduce the proportion of zero values and match samples to location, the 20 sets of 1-day samples were reduced to 10 sets of 2-day samples by combining the results from the first sampling period in twos, in order from north to south. Thus, Sample 61 was combined with Sample 71, 62 with 72, 63 with 73, and so on. The same procedure was carried out for data from the second sampling period. The Wilcoxon test was then carried out for each of the species of interest, using matched pairs (e.g. 61+71 from Period 1 vs 61+71 from Period 2, and so on - 10 matched pairs in all). Results were as set out in Table 20.

Results are ranked in order of Z-value, with statistically-significant differences marked by asterisks. The species have been shown in order, from those which decreased markedly over the period ('decreasers'), then those where the response is uncertain (due to inadequate data), to those which increased markedly ('increasers'). Although 7 species declined markedly in abundance in the pitfall traps over the period, only one increased.

**Table 20.** Results of the paired comparisons test in which numbers of each pitfall-trapped species in the initial sampling, Period 1 (1985/87) were compared with the numbers trapped during Period 2 (2003/04), 18 years later.

Species	Mean Counts		Z	P (2-tailed test)
	Per. 1	Per. 2		
<b>Decreasers:</b>				
<i>Menetia greyii</i>	2.8	0.3	-2.821	.005**
<i>Ctenotus robustus</i>	3.3	0.1	-2.684	.007**
<i>Ctenophorus fordi</i>	9	0.6	-2.652	.008**
<i>Cercartetus concinnus</i>	2	0	-2.41	.016*
<i>Ningauia yvonneae</i>	0.7	0	-2.33	.020*
<i>Pogona vitticeps</i>	2	0.5	-2.323	.020*
<i>Pseudomys apodemoides</i>	3.9	0.4	-2.201	.028*
<b>Effect Uncertain:</b>				
<i>Ctenotus orientalis</i>	0.7	0.1	-1.897	0.058
<i>Cercartetus lepidus</i>	0.9	0	-1.841	0.066
<i>Morethia obscura</i>	3.7	1.6	-1.793	0.073
<i>Delma butleri</i>	0.5	0	-1.633	0.102
<i>Amphibolurus norrisi</i>	0.4	0	-1.633	0.102
<i>Amphibolurus nobbi</i>	1.6	0	-1.513	0.13
<i>Drysdalia mastersii</i>	0.2	0	-1.414	0.157
<i>Ctenophorus pictus</i>	0.6	0	-1.342	0.18
<i>Delma australis</i>	0.9	0.3	-1.069	0.285
<i>Underwoodisaurus milii</i>	0.3	0	-1	0.317
<i>Varanus gouldii</i>	0.2	0	-1	0.317
<i>Suta spectabilis</i>	0.3	0	-1	0.317
<i>Aprasia inaurita</i>	0.6	0.5	-0.378	0.705
<i>Diplodactylus intermedius</i>	0.7	0.6	-0.333	0.739
<i>Christinus marmoratus</i>	0.3	0.3	0	1
<i>Ramphotyphlops bituberculatus</i>	0.1	0.1	0	1
<i>Ctenotus brooksi</i>	0.7	0.8	-0.106	0.915
<i>Diplodactylus vittatus</i>	0.7	1.5	-0.997	0.319
<i>Egernia inornata</i>	0	0.1	-1	0.317
<i>Sminthopsis murina</i>	0.2	0.8	-1.069	0.285
<i>Lialis burtonis</i>	0	0.3	-1.342	0.18
<i>Lerista bougainvillii</i>	1.5	3.2	-1.409	0.159
<i>Suta nigriceps</i>	0.1	0.6	-1.667	0.096
<i>Lerista punctatovittata</i>	0.1	1.5	-1.841	0.066
<b>Increasesers:</b>				
<i>Lucasium damaeum</i>	2.3	11.6	-2.812	.005**

Of the 32 species compared, only 8 provided sufficient data to show a statistically-significant change in abundance between the two time periods using this type of analysis. Seven species decreased significantly in abundance between Period 1 and Period 2: three are small mammals (*Cercartetus concinnus*, *Ningauia yvonnae* and *Pseudomys apodemoides*), while four are small lizards (*Menetia greyii*, *Ctenotus robustus*, *Ctenophorus fordi* and *Pogona vitticeps*). Only one species increased significantly in abundance over the time: a gecko (*Lucasium damaeum*).

Twenty-four of the species in the set did not change significantly in numbers according to the signed ranks test, although many of these showed decreases in the numbers trapped, some changed comparatively little or not at all, and a smaller number showed increases. Because of stochastic influences, some of the small-scale decreases and increases will indicate real population change while others will not; the study did not trap sufficient numbers of these species to yield statistically-significant differences. For those species, the study lacked statistical power.

*Estimating Statistical Power.* Unfortunately, with small samples, the Wilcoxon test has only modest statistical power and no ready way of estimating that power. As a rough guide to the statistical power of the pitfall-trapping study, paired-samples t-tests were also run using the paired pitfall-trap data. The results were then used to estimate how many samples would be required to identify a 50% change in abundance at a 0.05% level of significance with 90% certainty. To yield valid results, the paired-samples t-test requires that observations for each pair be made under the same conditions and the mean differences between the sample pairs be normally-distributed; and it is uncertain whether with all the species data both conditions are adequately met. On the assumption that they are adequate, the results suggest that, for a median species in the sample, about 90-100 pairs of comparisons would be needed to achieve this degree of power (compared to the 10 pairs used in the present study). Carrying out a study of that magnitude to identify statistically-significant changes in abundance for many more of these species therefore seems impracticable.

## Factors Predictive of Population Change

Data were examined statistically to determine the relative contributions of the factors time period, fire regime and sample locality on the results of the pitfall trapping study. To do this, the full set of 20 summer sites was used; data on individual species were transformed by a square-root transformation to reduce the amount of skewness and heteroscedasticity of the variances, and the three possibly-predictive factors given the following values:

- sampling time (1985-87: coded 1; 2003-04: coded 2);
- burn regime (recently burnt: 1; long unburnt: 2);
- location (western cluster: 1; eastern cluster: 2).

Two approaches were used to examine the pitfall data:

- General Linear Model analysis (GLM); and
- Multiple Linear Regression analysis (MLR).

For both techniques frequency data were used as the dependent variable and the three possibly-predictive factors as independent factors. GLM analyses require approximately symmetric distributions and homogeneity of the variances, while MLR analyses require independent observations, linear relationships between each independent factor and the dependent variable, and a normal distribution and constant variance of the dependent variable for each value of an independent variable. Tests exist for these and for power within standard statistical software; the vertebrate species biodiversity data met the requirements of both GLM and MLR, while individual species data did not meet the GLM requirements.

**Small Vertebrate Species Diversity.** Small vertebrate species totals were computed for each site and sampling time for Sites 61-80 and submitted to a univariate GLM and to a backward stepwise MLR. The main-effects general linear model produced met the assumptions of the technique and accounted for some 34% of the variance in the data set. Only the value of the constant in the model proved statistically-significant, none of the factors of interest were. The statistical power of the three was inadequate to be certain of their influence.

The MLR showed time period (as well as the intercept) as a statistically-significant predictor of species number ( $B=-3.7$ ,  $\beta=.586$ ,  $t=-4.45$ ,  $P<.001$ ), accounting for 33% of the variance in the sample. There is no doubt that changes in small vertebrate species diversity occurred in the study area between 1985/87 and 2003/04.

**Individual Species Abundances.** MLR analyses found, for 16 of the small vertebrate species, that statistically-significant proportions of the total sampling variance (adjusted  $R^2$ ) could be accounted for by one or more of the predictive variables time period, burn regime or sampling location, with the basic assumptions of the MLR being adequately met in each case. A summary of the results of these analyses is given in Table 21 below.

This type of analysis can partly 'tease out' the influence of predictive factors that are acting together on a given sample, and proves informative. All of the species found to change significantly in abundance in the paired-comparisons test also appear here; the remaining species in Table 21 were marginal species in the 'uncertain' group in the paired-comparisons test. For 12 of the 16 species in Table 21, something that changed with sampling period (probably rainfall) was predictive of abundance, site location was influential for 7 species, and burn regime for 4; however there were only 5 unburnt sample sites in the Period 2 data set. As might be expected, different small vertebrate species appear to respond differently to environmental change.

**Table 21.** Results of multiple linear regression analysis of transformed pitfall trap data from Sites 61-80. 'Beta' is a standardized regression coefficient for the predictive variable concerned; its magnitude (positive or negative) indicates the factor's degree of influence; negative values indicate that the effect is negative.

Species	Proportion of variance	Predictive Variables	Beta	t	Probability
<i>Ningauia yvonnae</i>	21%	sampling period	-0.42	-2.92	.006**
<i>Cercartetus concinnus</i>	36%	sampling period	-0.55	-4.31	<.001***
		site location	-0.31	-2.41	.021*
<i>Cercartetus lepidus</i>	14%	sampling period	-0.41	-2.74	.009**
<i>Pseudomys apodemoides</i>	10%	sampling period	-0.35	-2.27	.029*
<i>Diplodactylus intermedius</i>	15%	burn regime	-0.68	-2.92	.006**
<i>Lucasium damaeum</i>	24%	sampling period	0.51	3.65	.001***
<i>Lialis burtonis</i>	32%	sampling period	0.9	4.34	<.001***
		burn regime	-0.88	-4.2	<.001***
<i>Amphibolurus nobbi</i>	13%	site location	0.32	2.13	.04*
<i>Ctenophorus fordii</i>	20%	sampling period	-0.47	-3.28	.002**
<i>Pogona vitticeps</i>	20%	burn regime	-0.39	-2.69	.011*
		site location	0.33	2.27	.029*
<i>Ctenotus orientalis</i>	18%	sampling period	-0.32	-2.16	.038*
		site location	-0.34	-2.32	.026*
<i>Ctenotus robustus</i>	50%	sampling period	-0.63	-5.62	<.001***
		site location	0.36	3.19	.003**

Species	Proportion of variance	Predictive Variables	Beta	t	Probability
<i>Egernia inornata</i>	14%	sampling period	0.65	2.72	.010**
		burn regime	-0.62	-2.63	.012*
<i>Lerista bougainvillii</i>	26%	site location	-0.53	-3.8	.001***
<i>Lerista punctatovittata</i>	7%	sampling period	0.31	2.01	.05*
<i>Menetia greyii</i>	52%	sampling period	-0.41	-2.32	.026*
		site location	-0.3	-2.72	.010**

### Comparing the Time Periods using Presence/Absence Data

To enable a time period comparison using presence/absence data, small mammal pitfall trap data for the basic 20 sampling sites (Nos.61-80) were expressed as either present (coded 1) or absent (coded 0) and compared between the two sampling periods (1985/87 and 2003/04) using hierarchical log-linear analysis with only the occurrence data and the year entered for each of the small mammal species found abundantly in the pits. The results are shown in Table 22.

**Table 22.** Results from log-linear analysis of the pitfall trap data, expressed as percentage occurrence. Departures from expected values have been examined using the likelihood ratio chi-square test. Species have been listed in order of magnitude of change in occurrence. The two pygmy-possums (*Cercartetus* spp.) declined greatly, whereas the occurrences of the dunnart (*Sminthopsis murina*) and the introduced house mouse (*Mus musculus*) barely altered.

# Insufficient observations for reliable interpretation.

Species	Occurrence (20 samples)		Goodness-of-fit Test
	Period 1	Period 2	P
<i>Cercartetus concinnus</i>	10	0	<.001***
<i>Cercartetus lepidus</i>	6	0	.002**
<i>Ningauai yvonneae</i>	6	0	.002**
<i>Pseudomys apodemoides</i>	8	4	.38 <sup>ns</sup>
# <i>Sminthopsis murina</i>	1	2	.83 <sup>ns</sup>
<i>Mus musculus</i>	16	15	.93 <sup>ns</sup>

The changes in occurrence of small mammal species in the pitfall traps proved greatest for *Cercartetus* spp. and *Ningauai*, with no occurrences at all at the trapping sites during Period 2. The other three species' occurrences altered comparatively little, and not to the stage of statistical significance for the number of samples taken.

### Comparing the Time Periods using Elliott Trap Data

Elliott trapping was also carried out for 360 trap-nights in the summer of 1985-86 and the summer of 1986/87, both in Period 1, and for 300 trap-nights in December 2003 and February 2004, both in Period 2. Three small mammal and 4 reptile species were trapped, though only three of them (*Mus musculus*, *Pseudomys apodemoides* and *Notomys mitchelli*) yielded more than one individual caught over the entire trapping period. Data on these three were submitted to a Mann-Whitney test to compare trapping success across the time

periods, after adjustment for the variation in trapping effort. None of the changes proved statistically-significant; nor did the number of species caught change significantly either.

It is clear that useful quantitative results could only be achieved by Elliott trapping if there was a trapping effort very much greater than was employed in the present study. Considering the labour-intensive nature of Elliott trapping, this extra effort may not be justifiable.

## Burnt - Unburnt Site Comparisons

### Data Set

**Sites:** To examine the effect of fire independently of the rainfall effects associated with the time period difference in the above comparisons, pitfall-trapping data from the one time period (2003-04) were collected from sites which had experienced three different burn regimes. To achieve this, 18 of the 20 sampling sites described earlier were supplemented in 2003 by an additional 16 sites: some near the original sites, some in between, some well to the south.

**Burn Regimes:** The sites used for this study, and their fire regimes, were as follows:

Regime 1 [long-unburnt]: - Nos. 62, 63, 70, 75, 76, 03/02, 03/03, 03/05, 03/06, 03/07, 03/08, 03/70 (12 sites)

Regime 2 [burnt 6 years previously]: - Nos. 03/11, 03/12, 03/13, 03/14, 03/15/, 03/16 (6 sites)

Regime 3 [burnt 1 year previously]: - Nos. 61, 64, 65, 67, 68, 69, 71, 72, 73, 74, 77, 78, 79, 03/01, 03/04, 03/09 (16 sites)

**Species of Interest:** The list of small vertebrates chosen for the analysis differed in a few respects from that used for the time-period study described above but otherwise was very similar. It again focussed on small mammals and reptiles judged to be found sufficiently abundantly in the pits, viz:

Mammals — *Sminthopsis murina*, *Cercartetus concinnus*, *Cercartetus lepidus*, *Mus musculus*, *Pseudomys apodemoides* (5 mammal species)

Reptiles — *Diplodactylus intermedius*, *Diplodactylus vittatus*, *Lucasium damaeum*, *Christinus marmoratus*, *Underwoodisaurus milii*, *Aprasia inaurita*, *Delma australis*, *Delma butleri*, *Lialis burtonis*, *Amphibolurus nobbi*, *Amphibolurus norrisi*, *Ctenophorus fordi*, *Ctenophorus pictus*, *Pogona vitticeps*, *Varanus gouldii*, *Ctenotus brooksi*, *Ctenotus orientalis*, *Ctenotus robustus*, *Egernia inornata*, *Lerista bougainvillii*, *Lerista punctatovittata*, *Menetia greyii*, *Morethia obscura*, *Ramphotyphlops bituberculatus*, *Suta nigriceps* (25 reptile species)

Data analysis for the burn regime trapping study used data on these 30 small vertebrate species from the 34 trapping sites in this particular study.

### Data Analysis

The data collected are again frequency data from series of small samples, subject to the problems already described. To examine the effects of the differing fire regimes, the non-parametric Kruskal-Wallis test was used. This in some ways is a nonparametric equivalent of a one-way ANOVA, testing whether several independent samples are from the same

population; its use assumes that the underlying variable has an essentially continuous distribution, with a level of measurement at least ordinal.

### Comparing the Burn Regimes

The results of the Kruskal-Wallis test are set out in Table 23. Several results shown in this table are noteworthy: *Sminthopsis murina*, *Pseudomys apodemoides*, *Amphibolurus nobbi*, *Ctenophorus fordi*, *C.pictus*, *Pogona vitticeps*, *Ctenotus brooksi* and *C.orientalis* seem to favour natural communities part-way through a post-fire succession. As was the case with the time-period analysis, there will be power limitations resulting from the low trapping success with a number of species; several more species may well show apparent connections to different stages in post-fire successions if more data were available.

**Table 23.** Results of the Kruskal-Wallis test that the various species samples came from the same statistical population. [P values of less than 0.05 suggest that they do not; i.e. that the numbers trapped from at least one of the burn regimes are significantly different from the numbers trapped under the other regimes. The 'expected' mean rank is 17.0.] Notable results are shown in bold type. Species data marked with a hash (#) were too infrequent to interpret; other species recorded in low numbers may produce inaccurate P values.

Species	Years since fire	N	Mean no. per site	Mean rank	d.f.	Probability
<i>Sminthopsis murina</i>	many	12	.08 ± .08	14.2	2	.002**
	6	6	2.2 ± 0.7	27.3		
	1	16	0.6 ± 0.4	16.3		
<i>Mus musculus</i>	many	12	3.5 ± 0.6	20	2	.32ns
	6	6	3.3 ± 0.8	19.6		
	1	16	2.4 ± 0.6	14.8		
<i>Pseudomys apodemoides</i>	many	12	.25 ± .18	14.5	2	.001***
	6	6	19.0 ± 0.8	28.7		
	1	16	.38 ± .20	15.6		
<i>Diplodactylus intermedius</i>	many	12	.75 ± .31	20.6	2	.15ns
	6	6	.33 ± .21	18.2		
	1	16	.13 ± .09	14.9		
<i>Diplodactylus vittatus</i>	many	12	1.3 ± 0.5	18.4	2	.63ns
	6	6	1.2 ± 0.5	19.8		
	1	16	.56 ± .18	16		
<i>Lucasium damaeum</i>	many	12	4.2 ± 0.9	14.8	2	.48ns
	6	6	5.0 ± 0.8	17.8		
	1	16	7.0 ± 1.7	19.4		
<i>Christinus marmoratus</i>	many	12	.25 ± .13	18.8	2	.25ns
	6	6	.33 ± .21	20.2		
	1	16	.06 ± 0.6	16		
# <i>Underwoodisaurus milii</i>	many	12	.42 ± .42	18.4	2	.40ns
	6	6	.00 ± .00	17		
	1	16	.00 ± .00	17		
<i>Aprasia inaurita</i>	many	12	.25 ± .18	17.5	2	.99ns
	6	6	.17 ± .17	17.3		
	1	16	.19 ± .10	17.6		

Species	Years since fire	N	Mean no. per site	Mean rank	d.f.	Probability
<i>Delma australis</i>	many	12	.58 ± .23	21.3	2	.06ns
	6	6	.17 ± .17	16.7		
	1	16	.06 ± .06	15		
# <i>Delma butleri</i>	many	12	.08 ± .08	18.4	2	.40ns
	6	6	.00 ± .00	17		
	1	16	.00 ± .00	17		
<i>Lialis burtonis</i>	many	12	.42 ± .23	19.4	2	.08ns
	6	6	.33 ± .21	20.3		
	1	16	.00 ± .00	15		
<i>Amphibolurus nobbi</i>	many	12	.50 ± .26	18	2	.028*
	6	6	1.7 ± 0.8	24.6		
	1	16	.13 ± .09	14.4		
# <i>Amphibolurus norrisi</i>	many	12	.00 ± .00	17	2	.10ns
	6	6	.33 ± .33	19.8		
	1	16	.00 ± .00	17		
<i>Ctenophorus fordii</i>	many	12	.58 ± .29	15	2	<.001***
	6	6	9.2 ± 1.3	31.5		
	1	16	.50 ± .24	14.1		
<i>Ctenophorus pictus</i>	many	12	.00 ± .00	14.5	2	.001***
	6	6	4.5 ± 1.5	26.5		
	1	16	.19 ± .14	16.4		
<i>Pogona vitticeps</i>	many	12	.17 ± .11	16.1	2	.016*
	6	6	1.8 ± 0.9	25.3		
	1	16	.19 ± .14	15.6		
# <i>Varanus gouldii</i>	many	12	.00 ± .00	17	2	.57ns
	6	6	.00 ± .00	17		
	1	16	.13 ± .13	18.1		
<i>Ctenotus brooksi</i>	many	12	.33 ± .14	16.3	2	<.001***
	6	6	4.0 ± 2.2	29.8		
	1	16	.44 ± .38	13.8		
<i>Ctenotus orientalis</i>	many	12	.00 ± .00	15.5	2	<.001***
	6	6	1.3 ± 0.5	26.8		
	1	16	.00 ± .00	15.5		
# <i>Egernia inornata</i>	many	12	.08 ± .08	17.9	2	.79ns
	6	6	.00 ± .00	16.5		
	1	16	.19 ± .19	17.6		
<i>Lerista bougainvillii</i>	many	12	1.5 ± 0.6	18.4	2	.19ns
	6	6	.33 ± .33	11.3		
	1	16	1.4 ± 0.4	19.2		
<i>Lerista punctatovittata</i>	many	12	.50 ± .26	18.8	2	.43ns
	6	6	.00 ± .00	14.5		
	1	16	.50 ± .33	17.7		
<i>Menetia greyii</i>	many	12	.42 ± .19	20.7	2	.07ns
	6	6	.00 ± .00	15		
	1	16	.06 ± .06	16		

Species	Years since fire	N	Mean no. per site	Mean rank	d.f.	Probability
<i>Morethia obscura</i>	many	12	.08 ± .08	14.8		
	6	6	.00 ± .00	13.5		
	1	16	.69 ± .27	21	2	.031*
# <i>Ramphotyphlops australis</i>	many	12	.08 ± .08	17.9		
	6	6	.17 ± .17	19.3		
	16	16	.00 ± .00	16.5	2	.31ns
# <i>Ramphotyphlops bituberculatus</i>	many	12	.08 ± .08	17.9		
	6	6	.17 ± .17	19.3		
	16	16	.00 ± .00	16.5	2	.31ns
<i>Suta nigriceps</i>	many	12	.50 ± .15	19.8		
	6	6	.17 ± .17	14.3		
	16	16	.38 ± .16	17	2	.40ns

## 5. OVERVIEW

The two main questions to be addressed by this study were – how has the fauna changed between the two survey periods, and what were the effects of the December 2002 fire on this fauna? Of primary concern were the implications that the answers to these questions have for the conservation of threatened species, in particular, and for management of the Big Desert ecosystems, especially with regard to fire.

With only two sample points in time (1985/87 and 2003/04), it is difficult to confidently attribute the observed differences in species occurrences to the effects of time (with its concomitant changes in vegetation succession) or to the effects of the recent fire. Indeed, both may contribute to some of the observed changes. Furthermore, natural fluctuations in species abundance (and/or detectability) may occur, in response to factors such as long-term weather patterns (e.g. drought). To address these problems, more sample points in time are required – it will be desirable to regularly monitor the survey sites. (For example, yearly monitoring of sites in Ngarkat National Park for the past ten years has enabled important information regarding fire responses and conservation requirements of the Slender-billed Thornbill to be determined – Ward & Paton, 2004a.)

However, some generalisations from the current study, on short-term post-fire responses of the vertebrate fauna, are presented below:

### Short-term responses of birds to fire

- Increase in grass seed-eaters, such as parrots and quail able to exploit the flush of grasses emerging in mallee habitats after fire;
- Increase in open area foragers/predators, such as ravens, some raptors and butcherbirds given the increased scavenging and hunting opportunities;
- Decrease in leaf gleaners, such as pardalotes, with the reduction in this resource;
- Decrease in honeyeaters, with the reduction in available nectar sources;
- Decrease in *Triodia* specialists. Nearly all *Triodia* is consumed by fire, effectively removing this resource. Also, some *Triodia* dependent species have relatively low vagility;
- Decrease in dense shrub specialists;
- Decrease in rare and/or localised taxa. Many of these species have high site-fidelity and low mobility, perhaps making them particularly vulnerable to fire.

### Short-term responses of small terrestrial mammals to fire

- Opportunities for exotic plague species, such as *Mus*, a seed-eating and opportunistic omnivore;
- Immediate decrease in *Pseudomys* (seed eater), but likely to increase in later seral stages as populations recover and a diversity of seed becomes available;
- Disappearance(?) of Pygmy-possums, Ningai (*Triodia* specialist) and Hopping-mouse. All four would be extremely susceptible to fire, with only the Hopping-mouse usually sheltering underground. Apparent absences from the current survey may be compounded by seasonal factors affecting trappability, and by the effects of the recent protracted drought.

### Short-term responses of reptiles to fire

- Burrowers +/- decline, subsequent response variable, depending on resource requirements.
- *Triodia* and litter specialists decline, as individuals sheltering within this habitat have no protection from fire, and the resource is restricted to small unburnt patches after fire;
- Species utilising low shrubs and trees decline, with the reduction in this resource (e.g. Nobbi Dragon and Marbled Gecko);
- Open area species increase if able to survive fire (e.g, Beaded Gecko).
- Few data for elapid snakes, but possible decline other than burrowers. Coventry (1996b) found that even the burrowing species of elapid exhibited pronounced declines.

### Options for animals faced with fire in Mallee environments

When faced with fire in Mallee environments, vertebrates have limited options – they can either flee to evade the fire, or remain within the fire area. Relatively few species have the capacity to move away from fires, only the large mammals and some birds. Of those that remain within the fire area, burrowing species may be able to evade the flames, while all others are likely to be killed by the fire – within burnt areas in Mallee fires, changes are profound and no refugia remain above ground.

However, fire behaviour in Mallee environments is complex – fires usually run with a strong following wind, and display very little lateral spread. Consequently, often many small patches of vegetation can remain unburnt, providing areas in which non-burrowing vertebrates may survive and from which they can subsequently recolonise burnt areas as the vegetation recovers. The number, size and distribution of these unburnt remnants may be crucial in minimising the effects of fire on the vertebrate fauna. Fire conditions, vegetation type/age, topography and suppression activities may all influence where and when unburnt remnants are left during a fire event.

After fire, individuals of burrowing species which survive the flames are faced with very different conditions in which to live. Cover in which to evade predation is virtually non-existent, and food may be very scarce. The capacity to remain dormant underground for considerable periods is obviously an advantage in such circumstances – reptile species have variable capacities to do so, and for going without food for extended periods, whereas small burrowing mammals do not.

Vertebrate species unable to survive in the fire area must recolonise from elsewhere when habitat in the fire area again becomes suitable. Capacity for recolonisation will be influenced by a number of factors:

- There must be a source of individuals, either from outside the fire area, or from unburnt remnants within the fire area.
- The individual species must have the capacity to move the distances required within the time frame of recovery of the vegetation. Obviously, the capacity of different species for such movements will vary, and hence rates of recolonisation are also likely to vary.
- There must be no barriers to these populations movements – cleared firebreaks may be barriers to some species, while an area of young vegetation, for instance, may be a barrier to a species dependent upon mature vegetation. Width of such barriers is also an important consideration, and will affect each species differently.
- The life-history characteristics of each species will govern their capacity to increase population sizes as the vegetation regenerates and is able to support them.

To facilitate recolonisation of vertebrates after fire, therefore, fire size should be minimised, number of remnants within the fire area should be maximised, and age-class distribution of the vegetation before the fire should be such that each species is able to exist at many localities throughout the Big Desert. Furthermore, to ensure continued presence of each species through time, although their distributions may fluctuate, it is desirable that within each EVC (assuming that EVCs are an indication of different habitats for some vertebrates) there be a stable age-class distribution, and that these age-classes should be well dispersed. How to achieve these ends via appropriate management is the challenge!

## **Summary of fire responses of the fauna**

Some rare and localised/specialised bird species (e.g. Mallee Emu-wren, Striated Grasswren and Red-lored Whistler) were not found post-fire – their future in the burnt area is uncertain. Low mobility, localised or high site-fidelity species are probably dependent on their habitat patches remaining unburnt – or some may be able to move into small unburnt patches, with subsequent recolonisation over time, provided that source populations are available. The responses of other species were variable, with increases or decreases apparent in populations. Many may be able to survive in unburnt patches and then recolonise/increase populations as habitat becomes suitable. Others have the capacity to move over larger distances, to recolonise later. Many birds may be more mobile than other vertebrates, with the capacity to move in or out of fire areas – although there must be habitat elsewhere for them to move to and from. The effects of fire on some species may extend to adjacent non-burnt areas, if these remaining areas of habitat are too small to maintain viable populations until the burnt areas recover – such may be the case with the Malleefowl.

Some small mammal species were not found post-fire. Their populations may be extremely small in the study area, or they may have been excluded. Their recovery will depend upon their capacity to either increase populations as habitat conditions change, or to recolonise from source populations elsewhere.

The responses of reptiles to fire are likely to be variable. Burrowing species may be able to survive the fire – their subsequent recovery will depend upon their ability to survive in the changed conditions after the fire. Non-burrowing species are likely to be killed during fire, with the subsequent recovery of their populations probably dependent upon their capacity for recolonisation from unburnt patches. Artificial barriers to movement may inhibit recolonisation.

## Limitations of the study

Some shortcomings of the recent survey are readily identified:

- There were only two sample points in time, widely spaced by 17 years – we have no knowledge of what fluctuations may have occurred between these times, and there was no sampling shortly pre-fire.
- The observed changes in occurrences or populations may have been due to successional change, drought, fire or other causes – we cannot separate these potential causes without targeted ecological research.
- The natural patchiness of some species, or variability of vegetation within associations, may have influenced survey results – a larger sample size and/or targeted research may reduce this problem.
- Quadrat searches – because only a small number of individuals was found during these searches, they were discontinued. It is likely that the very hot and dry seasonal conditions influenced detectability of litter-dwelling reptiles. For future surveys, it would be advisable therefore to undertake such searches under seasonal conditions more conducive to reptile activity within the litter layer (Spring), and to initiate the work perhaps sooner after the fire.

## 6. MANAGEMENT IMPLICATIONS

The overriding aim of management of the Big Desert, an area where conservation values are acknowledged as the primary consideration, must be to maintain long-term ecological function and biodiversity. Determining how best to achieve this aim is, however, extremely problematic.

Obviously, one of the major forces driving this ecosystem is fire. The biota of the Big Desert is adapted to fire, and relies on it to maintain long-term ecological function. The timing, location, size and intensity of fire will influence how this biota responds. Current and past 'European' management has concentrated on fire 'protection' and 'suppression', with an emphasis on protection of human assets and infrastructure around the margins of the desert, often with little cognisance of the effects such a strategy may be having on conservation values within the Big Desert ecosystem.

It appears that past fire management practices have brought about a decrease in fire frequency, but generally a large increase in the area burnt in any one fire – fire suppression methods may have inadvertently contributed to this outcome. The result has been an uneven distribution of age-classes within the vegetation communities present, often with large areas of just one age-class predominating. Consequently, elements of the biota requiring particular successional stages may be disadvantaged – or, alternatively, other elements may be advantaged.

While largely undocumented, the capacity for some elements of the fauna to survive or recolonise after fire will be dependent upon, amongst other things, the distances required to be travelled for that recolonisation. The larger the fire, the greater the distance to be traversed, and the more difficult it becomes. There must also be a 'source' population, in unburnt habitat, from which recolonisation can proceed. The more intense the fire, the less likely there are to be unburnt patches left behind within the burnt area which might sustain 'population nuclei' from which some taxa can recolonise when suitable habitat conditions return. Different taxa will have different dispersal abilities, and consequently different abilities to recover after fire.

Management of fire in the Big Desert, according to the historical patterns alluded to above, for the fauna appears to have resulted in progressive simplification of the ecosystem – the common, generalist, widespread, fire-tolerant, high-fecundity or mobile taxa are persisting – the rare, specialised, localised, high site-fidelity, fire-sensitive, low-fecundity or low-mobility taxa appear to be in decline. Examples of the latter group may include the Malleefowl, Striated Grasswren, Mallee Emu-wren, Red-lored Whistler, Mallee Whipbird, Western Blue-tongued Lizard, Bardick, Heath Monitor, Mitchell's Hopping Mouse and perhaps Mallee Ningau. When the added potential effects of introduced predators on these sensitive elements of the fauna are considered, the future of some may be tenuous. Detailed knowledge of the ecologies and life-histories of such taxa will be required to guide informed management.

It is imperative, therefore, that management, especially with regard to fire, address these issues. Fire management must be based on informed ecological principles founded on detailed knowledge – its primary aim, at least within the core of large and relatively undisturbed conservation areas, must be switched from the often poorly-defined 'protection' objectives of the past to sound ecological management objectives. Obviously, this ecological management will need to be integrated with requirements for protection of significant private or localised public assets where these may occur, such as at the margins of the large conservation areas.

## Possibilities for management

It is apparent that more frequent, smaller fires are likely to have fewer long-term negative effects on the vertebrate fauna. (Note that 'more frequent' is on a desert-wide scale, not necessarily in any one area. Because the fires would be smaller, it is likely that at a particular site they would be less frequent.)

It is imperative to develop a strategy of applied fire for ecological reasons, including a flexible capacity to include wildfire in the strategy – the option to not suppress any particular wildfire must be included. The strategy should aim for a relatively stable fire age-class distribution within the Big Desert, must also consider the location of these age-classes, and should be cognisant of the location and age-class structure requirements of individual EVCs.

What comprises 'old-growth' (or long-unburnt') mallee in the Big Desert is worthy of brief mention here. Perceptions of 'old-growth' will profoundly affect the shape of any 'desired' age-class distribution curve, and the subsequent management aimed at achieving this age-class distribution. Beyond 'old-growth', vegetation becomes senescent and begins to lose species. However, the point at which the number of species declines may be difficult to determine, as some species may be represented in the community as soil-stored seed. At one site in New South Wales, mallee/*Triodia* vegetation showed virtually no loss of diversity after 90 years (R. Damon pers. comm.).

Mallee vegetation is thought not to become optimal for breeding by Malleefowl until after 30 to 60 years post-fire (Benshemesh 2000), and not optimal for the Black-eared Miner until 40 years post-fire (Baker-Gabb 2003). Furthermore, species which are known to reach their greatest numbers in early successional stages, such as the Silky Mouse at less than 10 years (Cockburn 1981), may still be present in low numbers in 50 year old vegetation. One must be careful, therefore, not to 'set the old-growth end' of the age-class distribution too young, and we must be conservative in such decisions so as not to, perhaps inadvertently, exclude taxa which peak in these later successional stages. Furthermore, different EVCs are also likely to have different successional climax points and different ages of 'old-growth' vegetation – 'old' for some of the heathy EVCs of the more mesic southern Big Desert is likely to be younger than for mallee-dominated communities elsewhere.

The currently proposed practice of dividing large areas of single age-class vegetation with 'floating' non-mechanical firebreaks (comprising narrow strip burns), to reduce the risk of large areas of a single age-class being burnt by any one wildfire, should help to achieve the objective of the strategy mentioned above. We must, however, be especially cautious of the requirements of rare, specialised or localised taxa when applying such a strategy, as these appear to be the ones most at risk from inappropriate fire.

Important factors to consider when formulating the strategy include:

- Because unburnt patches within fire areas are likely to be so important for the fauna, it is essential that the behaviour and location of any imposed fire is planned to retain as many remnants as possible, and that these are well-distributed within the fire area. Different vegetation types will have different capacities to 'produce' remnants, and fire intensity will influence the likelihood of patches being left unburnt.
- Need careful consideration of the effects of barriers to movement which may impede recolonisation, particularly when implementing firebreaks or constructing roads. Mechanical firebreaks within the Big Desert are not desirable for this reason.
- Consideration of patch sizes required to maintain viable populations is important when planning fire areas/barriers.
  - Special protection/management of particular rare or localised taxa is likely to be required, when planning fires (or suppression). Similarly, the successional stage requirements of these taxa are an important consideration.

- Some species may be more vulnerable to fire during drought when (or if) distributions and/or populations contract to 'drought refugia' (see Morton *et al* 1995). The characteristics and locations of these drought refugia needs to be known so that they can be given appropriate/timely protection from fire.

## Further research required

Following from the recent 2003/04 survey, some additional and immediate actions are desirable:

- Statistical analyses of all existing survey data – include power analysis to guide future sampling;
- Analysis and reporting of a repeat survey undertaken in Spring 2004 – in addition, this would enable the Spring samples from 1985/87 to be included in the analyses. This would increase sample size for the statistical analyses, and allow for potential seasonal variation to be examined;
- Planning for long-term monitoring of survey sites, with targeting of selected taxa. The statistical analyses conducted to date indicate that more data are required from each sampling – either by increasing the number of sample sites or by increasing the duration of the field sampling trips. A Spring and a Summer sample would be desirable for the next two years, after which analyses would guide the required intensity and frequency of further sampling;
- Continued regular (at least annual) monitoring of the two quadrats in *Egernia multiscutata* habitat;
- Analysis of correlation/association of vertebrate occurrences with vegetation floristics and structure.

Detailed studies should be supported or initiated to address the following knowledge requirements:

- Population responses post-fire of selected 'indicator' taxa;
- Movement capabilities of selected taxa;
- Potential movement barriers;
- Life-history characteristics which may influence recolonisation capabilities of selected taxa;
- Utilisation of unburnt patches during and immediately after fire;
- Fire characteristics/behaviour which influences remnant formation;
- Distribution/habitat of selected localised/threatened taxa;
- Conservation ecology/demography of selected taxa;
- Effects of drought, and its interactions with fire;
- Characteristics/locations and importance of drought refugia for selected taxa.

Targeted studies of particular species could include: Heath Skink, Heath Monitor, Mallee Emu-wren, Striated Grasswren, Red-lored Whistler, Western Blue-tongued Lizard, Bardick, Mitchell's Hopping Mouse, Western and Little Pygmy-possums, Mallee Ningau, Malleefowl, Slender-billed Thornbill.

## 7. ACKNOWLEDGMENTS

We wish to thank the Mallee Catchment Management Authority, Parks Victoria and the Department of Sustainability and environment for their generous support of the project, providing staff and resources for the field program, as well as other administrative and logistic assistance. In particular, Peter Kelly (DSE) and Peter Sandell (PV) warrant special mention for initiating the project and for their continued encouragement.

Several staff from DSE, PV and the CMA assisted with the field program. The many volunteers – in particular, Geoff Heard and Sam Howard – are thanked for their skilled assistance. Students from the Murrayville Primary School were also involved in the fieldwork, displaying interest and enthusiasm. Many local residents also gave of their time to provide information on the fauna of the area.

All personnel involved in the original 1985/97 survey program should also be thanked for their efforts at that time which enabled the current comparison of results.

David Morgan, from Melbourne University, kindly spent numerous hours undertaking the statistical analyses, and assisted with many fruitful discussions regarding interpretation of the data.

## 8. REFERENCES

- Anon. (2003). Mildura Fire District Fire No. 47 “Big Desert” Rehabilitation Plan. Department of Sustainability / Parks Victoria. Mildura. April 2003.
- ARI (2003). Common Terrestrial Ecological Vegetation Classes in North Western Victoria. Unpublished draft report, Arthur Rylah Institute for Environmental Research.
- Baker-Gabb, D. (2003). Recovery Plan for the Black-eared Miner *Manorina melanotis* 2002 – 2006. Department of Environment and Heritage, Canberra.
- Bennett, A.F., Lumsden, L.F., & Menkhorst, P.W. (1989). Mammals of the Mallee, South Eastern Australia. Pp 191-220 in: *Mediterranean Landscapes in Australia, Mallee ecosystems and their management*. Eds. Noble, J.C. and Bradstock, R.A. CSIRO.
- Benshemesh, J. (2000). National Recovery Plan for Malleefowl. Department of Environment and Heritage, Canberra.
- Christidis, L & Boles, W.E. (1994). *The Taxonomy and Species of Birds in Australia and its Territories*. RAOU Monograph Series No. 2. Royal Australasian Ornithologists Union, Melbourne.
- Cockburn, A. (1981). Population processes of the silky desert mouse, *Pseudomys apodemoides* (Rodentia). *Australian Wildlife Research* **8**: 499-514.
- Cogger, H.G. (2000). *Reptiles and Amphibians of Australia*. (8th edn.) Reed New Holland, NSW.
- Coventry A.J. (1996a). Results of surveys of the herpetofauna of several areas in north-western Victoria. *The Victorian Naturalist* **113**(6): 289-299.
- Coventry A.J. (1996b). The herpetofauna of the Chinaman Well area of the Big Desert, Victoria. *Proceedings of the Royal Society of Victoria* **108**(2): 107-119.
- Coventry, A.J. & Dixon, J.M.. (1984). Small native mammals from the Chinaman Well area, north-western Victoria. *Australian Mammalogy* **7**: 111-115.
- Coventry, A.J., & Robertson. (1980). New records of scincid lizards from Victoria. *The Victorian Naturalist* **97**(5): 190-193.
- Coventry, A.J., Robertson, P. & Heard, G. (2003). An assessment of the current status of the Heath Skink, *Egernia multiscutata* and its habitat in the Chinaman Well Track area of the Big Desert, after the fires of April 2002. Unpublished report.
- DSE (2004). Atlas of Victorian Wildlife. Unpublished database maintained by the Department of Sustainability and Environment, Victoria.
- Emison, W.B. & Bren, W.M. (1989). Common birds of the Mallee, Northwestern Victoria. In: *Mediterranean Landscapes in Australia, Mallee ecosystems and their management*. Eds. Noble, J.C. and Bradstock, R.A. 191-220. CSIRO.
- Gill, A.M., Woinarski, J.C.Z. & York, A. (1999). *Australia's biodiversity - responses to fire: plants, birds and invertebrates*. Biodiversity Technical Paper, No. 1. Environment Australia.
- LCC (1987). *Report on the Mallee Area Review*. Land Conservation Council, Melbourne.
- Mather, P.B. (1979). An examination of the reptile fauna of Wyperfeld National Park, using pitfall trapping. *The Victorian Naturalist* **96**: 98-101.
- Menkhorst, P.W. (1982). Pitfall trapping of reptiles in the Big Desert, Victoria. *Victorian Naturalist*, **99**: 66-70.

- Menkhorst, P.W. & Knight, F. (2001). *A Field Guide to the Mammals of Australia*. Oxford University Press, Melbourne.
- Morton, S.R., Short, J. & Barker, R.D. (1995). Refugia for Biological Diversity in Arid and Semi-arid Australia. Biodiversity Series, Paper No. 4. Department of the Environment, Sport and Territories, Canberra.
- Robertson, P., Bennett, A., Lumsden, L., Silveira, C., Johnson, P., Yen, A., Milledge, G., Lillywhite, P., & Pribble, J. (1989). *Fauna of the Mallee study area, north-western Victoria*. Arthur Rylah Institute for Environmental Research, Technical Report Series No. 87. Department of Conservation, Forests & Lands, Victoria.
- Schodde, R. & Mason, I.J. (1999). *The directory of Australian birds: passerines*. CSIRO Publishing, Melbourne.
- Sluiter, I.R.K. (2004). Flora of the 1997 and 2002 Big Desert Fire Areas South of Murrayville. 1). Draft Species Lists, EVC's, Rare and Threatened Plants, General Observations and Recommendations for Management. Ogyris Ecological Research Report No. 2004/01.
- Stanger, M., Clayton, M., Schodde, R., Wombey, J. & Mason, I. (1998). *CSIRO list of Australian vertebrates*. CSIRO Publishing, Melbourne.
- Ward, M.J. & Paton, D.C. (2004a). Responses to fire of Slender-billed thornbills, *Acanthiza iredalei headleyi*, in Ngarkat Conservation Park, South Australia. I. Densities, group sizes, distribution and management issues. *Emu* **104**(2): 157-168.
- Ward, M.J. & Paton, D.C. (2004b). Responses to fire of Slender-billed thornbills, *Acanthiza iredalei headleyi*, in Ngarkat Conservation Park, South Australia. II. Foraging behaviour. *Emu* **104**(2): 169-176.



2912	<i>Delma butleri</i>	0	0	0	0	0	0	0	0	0	0	0
2170	<i>Lialis burtonis</i>	0	0	0	0	0	0	0	0	0	0	0
2174	<i>Pygopus lepidopodus</i>	0	0	0	0	0	0	0	0	0	0	0
2917	<i>Amphibolurus nobbi</i>	0	2	1	0	2	1	0	1	0	0	0
2920	<i>Amphibolurus norrisi</i>	0	0	0	0	0	0	0	0	0	0	0
2918	<i>Amphibolurus muricatus</i> GP	1	0	0	0	0	0	1	0	0	0	0
2185	<i>Ctenophorus fordi</i>	0	0	0	0	0	0	0	0	0	0	0
2199	<i>Ctenophorus pictus</i>	0	0	0	0	0	0	0	0	0	1	1
2204	<i>Pogona vitticeps</i>	0	0	1	1	0	0	0	0	0	2	2
2271	<i>Varanus gouldii</i>	0	0	0	0	0	0	0	0	0	0	0
2933	<i>Ctenotus brooksi</i>	0	0	0	0	0	0	0	0	0	0	0
2936	<i>Ctenotus orientalis</i>	0	0	1	1	0	2	1	1	1	2	1
2375	<i>Ctenotus robustus</i>	0	0	0	0	0	0	0	0	0	0	1
2413	<i>Egernia inornata</i>	0	0	0	0	0	0	0	0	0	0	0
2475	<i>Lerista bougainvillii</i>	1	0	1	1	2	1	1	3	1	1	1
2499	<i>Lerista punctatovittata</i>	0	0	0	0	0	0	0	0	0	0	0
2519	<i>Menetia greyii</i>	3	1	1	2	2	2	1	2	2	4	1
2529	<i>Morethia obscura</i>	0	0	2	2	1	1	1	2	2	3	5
2579	<i>Tiliqua occipitalis</i>	0	0	0	0	0	0	0	0	0	0	2
2583	<i>Trachydosaurus rugosus</i>	0	0	0	0	0	0	0	0	0	0	0
2586	<i>Ramphotyphlops australis</i>	0	0	0	0	0	0	0	0	0	0	0
2588	<i>Ramphotyphlops bituberculatus</i>	0	0	0	0	0	0	1	0	0	0	0
2666	<i>Drysdalia mastersii</i>	0	0	0	0	0	0	0	0	0	0	0
2667	<i>Echiopsis curta</i>	0	0	0	0	0	0	0	0	0	0	0
2699	<i>Pseudonaja textilis</i>	1	0	0	0	0	0	0	0	0	0	0
2976	<i>Pseudonaja</i> sp.	0	0	0	0	0	0	0	0	0	0	0
2724	<i>Suta nigriceps</i>	0	0	0	0	1	0	0	0	0	0	0
2813	<i>Suta spectabilis</i>	0	0	0	0	0	0	0	0	0	0	0
3058	<i>Limnodynastes dumerilii</i>	0	0	0	0	0	0	0	0	0	0	0
3085	<i>Neobatrachus pictus</i>	0	0	0	0	0	0	0	0	0	1	1
3086	<i>Neobatrachus sudelli</i>	0	0	0	0	0	0	0	0	0	0	0
3321	<i>Neobatrachus</i> sp.	0	1	0	1	0	0	0	0	0	0	0

Code	Species	66				67				68				69				70			
		Spring 85	Summer 85/86	Winter 86	Spring 86	Summer 86/87	TOTAL	Spring 85	Summer 85/86	Winter 86	Spring 86	Summer 86/87	TOTAL	Spring 85	Summer 85/86	Winter 86	Spring 86	Summer 86/87	TOTAL		
0526	Grey Shrike-thrush					0						0								0	
0553	Chestnut Quail-thrush					0						0								0	
0557	White-browed Babbler					0						0								0	
0777	Grey Butcherbird					0						0								0	
0780	Australian Magpie					0						0								0	
1003	Tachyglossus aculeatus					0						0								0	
1055	Ningau yvonneae					0	1				1	1								0	
1061	Sminthopsis murina					0						0								0	
1151	Cercartetus concinnus					0	1				1	1								0	
1152	Cercartetus lepidus					0	1				1	1								0	
1263	Macropus fuliginosus					0						0								0	
1351	Chalinolobus morio					0						0								0	
1412	Mus musculus					0					1	1								0	
1457	Pseudomys apodemoides					0					1	1								0	
1480	Notomys mitchelli					0						0								0	
1510	Oryctolagus cuniculus					0						0								0	
1531	Canis familiaris					0						0								0	
1532	Vulpes vulpes					0						0								0	
1536	Felis catus					0						0								0	
2059	Diplodactylus intermedius					0						0								0	
2077	Diplodactylus vittatus					3						0								1	
2109	Lucasium damaeum					0						5								1	
2126	Christinus marmoratus					0						0								0	
2138	Underwoodisaurus milii					0						0								0	
2143	Aprasia inaurita					0	3				4	1								0	
2154	Delma australis					0	3				4	1								0	
2912	Delma butleri					2						0								0	
2170	Lialis burtonis					0						0								0	



Code	Species	71					72					73					74					75				
		Spring 85	Summer 85/86	Winter 86	Spring 86	Summer 86/87	TOTAL	Spring 85	Summer 85/86	Winter 86	Spring 86	Summer 86/87	TOTAL	Spring 85	Summer 85/86	Winter 86	Spring 86	Summer 86/87	TOTAL	Spring 85	Summer 85/86	Winter 86	Spring 86	Summer 86/87	TOTAL	
0526	Grey Shrike-thrush						0					0													0	
0553	Chestnut Quail-thrush						0					0													0	
0557	White-browed Babbler						0					0													0	
0777	Grey Butcherbird						0					0													0	
0780	Australian Magpie						0					0													0	
1003	Tachyglossus aculeatus						0					0													0	
1055	Ningau yvonneae					1	1	2			3	0								1					1	
1061	Sminthopsis murina						0				0														0	
1151	Cercartetus concinnus	1					1	2			2	1								1					1	
1152	Cercartetus lepidus					1	1				0		1							1					1	
1263	Macropus fuliginosus						0				0														0	
1351	Chalinolobus morio						0				0														0	
1412	Mus musculus					2	2	1		7	8		1							2					3	
1457	Pseudomys apodemoides						0				0														12	
1480	Notomys mitchelli						0				0														0	
1510	Oryctolagus cuniculus						0				0														0	
1531	Canis familiaris						0				0														0	
1532	Vulpes vulpes						0				0														0	
1536	Felis catus						0				0														0	
2059	Dipodactylus intermedius						1	1	1	1	3		1												1	
2077	Dipodactylus vittatus						0				0									1					0	
2109	Lucasium damaeum						1				0									4					1	
2126	Christinus marmoratus						2				0														0	
2138	Underwoodisaurus milii						0				0														0	
2143	Aprasia inaurita						1	1			1														0	
2154	Delma australis						2	2			0									1					4	
2912	Delma butleri						0	1	1		0														0	
2170	Lialis burtonis						0	1			1														0	

2174	<i>Pygopus lepidopodus</i>	0	0	0	0	0	0	0	0	0	0	0	0
2917	<i>Amphibolurus nobbi</i>	2	1	1	1	1	1	1	1	2	2	1	1
2920	<i>Amphibolurus norrisi</i>	0	0	0	0	0	0	0	0	0	0	0	0
2918	<i>Amphibolurus muricatus</i> GP	0	0	0	0	0	0	0	0	0	0	0	0
2185	<i>Ctenophorus fordi</i>	2	6	1	9	1	1	1	7	4	1	12	3
2199	<i>Ctenophorus pictus</i>	0	0	0	0	0	0	0	0	0	0	0	0
2204	<i>Pogona vitticeps</i>	1	1	1	1	1	2	2	2	2	2	2	0
2271	<i>Varanus gouldii</i>	0	0	0	0	1	1	2	0	0	0	0	0
2933	<i>Ctenotus brooksi</i>	0	0	0	0	0	0	0	2	2	1	3	1
2936	<i>Ctenotus orientalis</i>	0	0	0	0	0	0	0	0	0	0	0	0
2375	<i>Ctenotus robustus</i>	3	1	2	3	2	2	3	2	2	2	2	1
2413	<i>Egernia inornata</i>	0	0	0	0	0	0	0	0	0	0	0	0
2475	<i>Lerista bougainvillii</i>	1	1	2	3	1	0	0	0	0	0	0	0
2499	<i>Lerista punctatovittata</i>	0	0	0	0	0	0	0	0	0	0	0	0
2519	<i>Menetia greyii</i>	2	2	1	5	1	1	3	1	1	1	1	0
2529	<i>Morethia obscura</i>	1	2	1	2	3	1	4	1	1	1	1	2
2579	<i>Tiliqua occipitalis</i>	0	0	0	0	0	0	0	0	0	0	0	0
2583	<i>Trachydosaurus rugosus</i>	0	0	0	0	0	0	0	0	0	0	0	0
2586	<i>Ramphotyphlops australis</i>	0	0	0	0	0	0	0	0	0	0	0	0
2588	<i>Ramphotyphlops bituberculatus</i>	0	0	0	0	0	0	0	0	0	0	0	0
2666	<i>Drysdalia mastersii</i>	0	0	1	1	1	0	0	0	0	0	0	0
2667	<i>Echiopsis curta</i>	0	0	0	0	0	0	0	0	0	0	0	0
2699	<i>Pseudonaja textilis</i>	0	0	0	0	0	0	0	0	0	0	0	0
2976	<i>Pseudonaja sp.</i>	0	0	0	0	0	0	0	0	0	0	0	0
2724	<i>Suta nigriceps</i>	0	0	0	0	0	0	0	0	0	0	0	0
2813	<i>Suta spectabilis</i>	0	0	0	0	0	0	0	0	0	0	0	0
3058	<i>Limnodynastes dumerilii</i>	0	0	0	0	0	0	0	0	0	0	0	0
3085	<i>Neobatrachus pictus</i>	0	0	0	0	0	0	0	0	0	0	0	0
3086	<i>Neobatrachus sudelli</i>	0	0	0	0	0	0	0	0	0	0	0	0
3321	<i>Neobatrachus sp.</i>	0	0	0	0	0	0	0	0	0	0	0	0





**Appendix 2. 2003/04 data from sites 61 to 80 and sites 03/01 to 03/16.**

Note that all data other than from bird census periods are included here.

Code	Species	61 Dec 2003	62 Feb 2004	63 Dec 2003	64 Feb 2004	65 Dec 2003	66 Feb 2004	67 Dec 2003	68 Dec 2003	69 Dec 2003	70 Dec 2003	71 Dec 2003	72 Dec 2003	73 Dec 2003	74 Dec 2003
0526	Grey Shrike-thrush														
0553	Chestnut Quail-thrush														
0557	White-browed Babbler														
0777	Grey Butcherbird														
0780	Australian Magpie														
1003	Tachyglossus aculeatus														
1055	Ningau yvonneae														
1061	Sminthopsis murina				2	3									
1151	Cercartetus concinnus										1	2			
1152	Cercartetus lepidus														
1263	Macropus fuliginosus														
1351	Chalinolobus morio														
1412	Mus musculus	2	2	5	2	3	3			1	1	4			2
1457	Pseudomys apodemoides														4
1480	Notomys mitchelli														1
1510	Oryctolagus cuniculus														
1531	Canis familiaris														
1532	Vulpes vulpes														
1536	Felis catus														
2059	Diplodactylus intermedius			2											
2077	Diplodactylus vittatus														
2109	Lucasium damaeum			4	2	4	1	2	3	10	2	2	4	2	4
2126	Christinus marmoratus														
2138	Underwoodisaurus milii														
2141	Aprasia aurita														
2143	Aprasia inaurita								1	1	2				1
2154	Delma australis				1		1								







Code	Species	03/06		03/07		03/08		03/09		03/10		03/11		03/12		03/13		03/14		03/15		03/16		TOTAL		
		Feb 2004	Dec 2003	Feb 2004	Dec 2003	Feb 2004	Dec 2003	Feb 2004	Dec 2003	Feb 2004	Dec 2003	Feb 2004	Dec 2003	Feb 2004	Dec 2003	Feb 2004	Dec 2003	Feb 2004	Dec 2003	Feb 2004	Dec 2003	Feb 2004	Dec 2003		Total Feb	Total Dec
0526	Grey Shrike-thrush																								0	0
0553	Chestnut Quail-thrush																								0	2
0557	White-browed Babbler																								0	0
0777	Grey Butcherbird																								0	0
0780	Australian Magpie																								0	0
1003	Tachyglossus aculeatus																								1	1
1055	Ningau yyonneae					1																			0	0
1061	Sminthopsis murina									1		1	1	2	1	1							1	1	12	23
1151	Cercartetus concinnus																								0	0
1152	Cercartetus lepidus																								0	0
1263	Macropus fuliginosus																								0	0
1351	Chalinolobus morio																								0	0
1412	Mus musculus	1	1				1		3	6		4			1	6			2		4		4	7	100	107
1457	Pseudomys apodemoides																								0	0
1480	Notomys mitchelli																								0	0
1510	Oryctolagus cuniculus																								0	0
1531	Canis familiaris																								0	0
1532	Vulpes vulpes																								0	0
1536	Felis catus																								0	0
2059	Diplodactylus intermedius																								0	0
2077	Diplodactylus vittatus																								0	0
2109	Lucasium damaeum																								0	0
2126	Christinus marmoratus																								0	0
2138	Underwoodisaurus milii																								0	0
2141	Aprasia aurita																								0	0
2143	Aprasia inaurita	1					1																		1	7
2154	Delma australis	1																							1	10



**Appendix 3. All incidental records from the 2003/04 survey.**

Note that included in this appendix are all observations of vertebrates from incidental observations (at sites and elsewhere), vehicle transects, quadrat raking searches, burrow searches for *Egernia* spp. (at both intensive quadrats and elsewhere) and bird call playback (away from sites).

Species	Easting	Northing	Locality	Date	Obs.	Comments
Brown Falcon	535552	6082047	White's Spring Track	08 Dec 2003	PR	Eating <i>Pogona</i>
<i>Pogona vitticeps</i>	535552	6082047	White's Spring Track	08 Dec 2003	PR	Tail only, being eaten by Brown Falcon
Spotted Nightjar	529028	6069518		08 Dec 2003	PR	
<i>Ctenophorus pictus</i>	529668	6076391	Delisio Track	10 Dec 2003	PR	Male, burnt site
<i>Egernia inornata</i>	532720	6077730	Dune on E side of Mt Ida	10 Dec 2003	PR	Found during burrow search. 6 burrows in 5m <sup>2</sup> , small unburnt patch
<i>Lucasium damaeum</i>	527447	6075939	Delisio Track	10 Dec 2003	PR	Active on track
<i>Pterostylis</i> sp.			Mt Ida	10 Dec 2003	PR	5 seeding stems seen, burnt area
<i>Pygopus lepidopodus</i>	528820	6060042	Murrayville Track. 40m N of Milmed track	10 Dec 2003	PR	On road, 18.30 hrs. 29°C
<i>Varanus</i> sp.			Mt Ida	10 Dec 2003	PR	Tracks seen, burnt area
<i>Ctenopus brooksi</i>	537962	6042295	Chinaman's Well Track	11 Dec 2003	PR	In small burrow
<i>Egernia multiscutata</i>	538449	6042259	Chinaman's Well Track	11 Dec 2003	PR	Burrow, 2 entrances with tracks, Dug out to reveal specimen (released)
<i>Egernia multiscutata</i>	551497	6037352	Chinaman's Well Track ("Egernia Hill")	11 Dec 2003	PR	Skink seen at base of <i>Gyrostemon</i>
Malleefowl	543301	6042636	Chinaman's Well Track	11 Dec 2003	PR	Old disused mound (~10 years?)
<i>Ambibolurus nobbi</i>			Pigeon Springs	12 Dec 2003	PR	
<i>Ctenophorus fordi</i>	531000	6060759	Chinaman's Well Track	12 Dec 2003	PR	Burnt/unburnt 1997 fire, patchy.
<i>Ctenophorus pictus</i>	534279	6041709	Moonlight Tank area	12 Dec 2003	PR	Unburnt site
<i>Pogona vitticeps</i>	531003	6060536	Chinaman's Well Track	12 Dec 2003	PR	Burnt/unburnt 1997 fire, patchy.
<i>Varanus</i> sp.			Johns Bore Track	12 Dec 2003	DE	Tracks seen
<i>Egernia inornata</i>	527586	6075645	Delisio Trk	13 Dec 2003	PR	Dug from burrow, medium dune burnt Dec 2002.
Hooded Robin	544848	6083491	Whites Springs (unburnt)	13 Dec 2003	CES	Male seen
Malleefowl	544264	6089591	Call Playback Site 1. Ross's Spring Tk at Ross's Spring (unburnt)	13 Dec 2003	CES	Tracks noted on the vehicular track and adjacent sandy areas. These were the only Malleefowl tracks seen during the field trip. Nothing called in response to tape.
<i>Pseudonaja textilis</i>	513567	6095994	No 6 Bore Rd South	13 Dec 2003	CES	Roadkill - specimen collected for identification, then discarded.

Regent Parrot	604427	6216568	No 6 Bore Rd South	13 Dec 2003	CES	A male and female seen in the canopy of a roadside mallee (unburnt)
Shy Heathwren	545287	6088727	Call Playback Site 2. Dune crest (unburnt) on Ross's Spring Tk, 0.6 km from White Springs Tk	13 Dec 2003	CES	One called in response to tape.
Cat	513787	6081307	Site 67	18 Feb 2004	PR	Tracks
Delma australis	527022	6080490	White's Spring Track	18 Feb 2004	PR	Four found during rake search - ten 5m x 5m quadrats
Delma australis	529371	6081851	Cowangie/Nhill Track	18 Feb 2004	PR	One found during rake search - five 5m x 5m quadrats/quadrats
Echidna	529371	6081851	Cowangie/Nhill Track	18 Feb 2004	PR	Diggings seen
Egernia inornata	528368	6081159	White's Spring Track	18 Feb 2004	PR	Seen entering burrow on edge of track, burnt pine area
Tiliqua occipitalis	527079	6080143	White's Spring Track	18 Feb 2004	PR	Skull in part burnt area
Ctenophorus pictus	514555	6077897	Dune near site 70	19 Feb 2004	PR	Dug from burrow, partly burnt site
Fox	514425	6081060	Site 68	19 Feb 2004	PR	Tracks
Varanus sp.			Coburns Track, south of Red Gums	19 Feb 2004	PR	Seen on track
Egernia inornata	510467	6076158	Coburn's Track lookout	20 Feb 2004	PR	Dug from burrow near crest of dune - partly burnt site

**Appendix 4. Mammal and reptile pitfall trapping data from the 2003/04 survey according to fire history at each site.**

Note that species for which pitfall trapping does not prove a reliable survey method are not included here.

Site nos.	61	64	65	67	68	69	71	72	73	74	77	78	79	03/01 Dec 2002	03/04 Dec 2002	03/09 Dec 2002	Total burnt Dec 2002	Burnt numbers per 100 trapnights (1600)	03/11 Dec 1997	03/12 Dec 1997	03/13 Dec 1997
Species	Burnt Dec 2002	Burnt Dec 2002	Burnt Dec 2002	Burnt Dec 2002	Burnt Dec 2002	Burnt Dec 2002	Burnt Dec 2002	Burnt Dec 2002	Burnt Dec 2002	Burnt Dec 2002	Burnt Dec 2002	Burnt Dec 2002	Burnt Dec 2002	Burnt Dec 2002	Burnt Dec 2002	Burnt Dec 2002	Burnt Dec 2002	Burnt Dec 2002	Burnt Dec 2002	Burnt Dec 2002	Burnt Dec 2002
<i>Sminthopsis murina</i>	4	5					3	4	1					6	1	3	9	0.56	2	3	1
<i>Mus musculus</i>		4			1	1	8	4	4	2			2				39	2.44	4		6
<i>Pseudomys apodemoides</i>		1								1				1			3	0.19	28		37
<i>Diplodactylus intermedius</i>							1	1	2		1		1				2	0.13		1	
<i>Diplodactylus vittatus</i>			1					1	2				1		2		9	0.56		2	
<i>Lucasium damaeum</i>		8	6	7	6	28	5	6	10	13	9			2	11	1	112	7.00	2	4	4
<i>Christinus marmoratus</i>								1									1	0.06			
<i>Underwoodisaurus millii</i>																					
<i>Aprasia aurita</i>																					
<i>Aprasia inaurita</i>		1			1	1											3	0.19			
<i>Delma australis</i>													1				1	0.06		1	
<i>Delma butleri</i>																					
<i>Lialis burtonis</i>																					1
<i>Amphibolurus nobbi</i>																	2	0.13	3	1	
<i>Amphibolurus norrisi</i>																				2	
<i>Ctenophorus fordi</i>		2				2		1	1	1					3		9	0.56	4	10	14
<i>Ctenophorus pictus</i>												1			2		3	0.19	5	8	
<i>Pogona vitticeps</i>								1	2								3	0.19	3		
<i>Varanus gouldii</i>					6						1			2			2	0.13	2	1	3
<i>Ctenotus brooksi</i>																	7	0.44			2
<i>Ctenotus orientalis</i>																				1	1
<i>Ctenotus robustus</i>																				5	2





Appendix 5. Results of burrow searches for *Egernia* spp.

Search no.	Easting	Northing	Locality	Date	Species recorded	Results/Comments
1			Mt Ida		<i>Varanus</i> sp.	<i>Varanus</i> tracks. Nil <i>Egernia</i> burrows
2	532720	6077730	Dune on E side of Mt Ida	10-Dec-03	<i>E. inornata</i>	Burrow search. 6 <i>Egernia</i> burrows in 5m <sup>2</sup> . Specimen dug from burrow, released
3	537962	6042295	Chinaman's Well Track	11-Dec-03	<i>C. brooksi</i>	In burrow - no <i>Egernia</i> holes on big dune
4	538345	6042287	Chinaman's Well Track	11-Dec-03		6 burrow entrances in 20cm by 20cm - low possibility <i>Egernia</i>
5	538408	6042280	Chinaman's Well Track	11-Dec-03		<i>E. multiscutata</i> type burrows, 9 entrances in 2m x1m area, tracks also. N face of heathy dune, ~5m from top
6	538449	6042259	Chinaman's Well Track	11-Dec-03	<i>E. multiscutata</i>	Burrow, 2 entrances with tracks, dug out to reveal specimen (released)
7			Chinaman's Well Track, 7.2 km E of Moonlight Tank	11-Dec-03		Large dune, potential for future checking for burrows
8	528423	6060044	Murrayville/Nhill Track	12-Dec-03		Nil <i>Egernia</i> burrows. Part burnt Stringybark
	528749	6060101				
9	531000	6060759	Milmed Track	12-Dec-03	<i>C. fordii</i>	Check dune - Nil <i>Egernia</i> burrows. 1997 burn/unburnt patchy.
	531003	6060536			<i>P. vitticeps</i>	
10	536596	6061517	Murrayville/Nhill Track	12-Dec-03		Dune check, burnt 2002 - Nil <i>Egernia</i> burrows

<b>11</b>	530706	6052241	Murrayville/Nhill Track	12-Dec-03		Dune check, burnt 2002 - Nil <i>Egernia</i> burrows
<b>12</b>	532587	6049987	Murrayville/Nhill Track	12-Dec-03		Dune check, unburnt - Nil <i>Egernia</i> burrows
<b>13</b>	534279	6041709	Murrayville/Nhill Track, Moonlight Tank	12-Dec-03	<i>C. pictus</i>	Dune check, unburnt - Nil <i>Egernia</i> burrows
	534791	6041904				
<b>14</b>	527586	6075645	Delisio Track	13-Dec-03	<i>E. inornata</i>	Dug from burrow, 40 from dune crest. Medium dune, burnt Dec 2002
			White Springs	14-Dec-03		Large Dune S of Whites Spring - Nil <i>Egernia</i> burrows
<b>16</b>	514555	6077897	200m W of Site 70, Cactus Bore Track	19-Feb-04	<i>C. pictus</i>	Burrow check, three potential <i>Egernia</i> burrows
	510603	6076135	Lookout Hill, on Coburn's track	19-Feb-04		Dune check. Potential <i>Egernia</i> burrows
<b>17</b>	510504	6076145		19-Feb-04		Potential <i>Egernia</i> burrows
	510467	6076158		19-Feb-04		Potential <i>Egernia</i> burrows
	510467	6076158		20-Feb-04	<i>E. inornata</i>	Dug from burrow, at above site

**Appendix 6. Results of *Egernia multiscutata* burrow assessments in quadrats.**

<b>Easting</b>	<b>Northing</b>	<b>Burrow/warren details</b>
Within quadrat at 'Egernia Hill'		
551505	6037346	one entrance, unused
551507	6037349	one entrance, used
551506	6037349	one entrance, used
551502	6037371	one entrance, unused
551505	6037366	one entrance, unused
551507	6037377	one entrance, used
551503	6037371	two entrances, used (light)
551502	6037359	one entrance, unused
551501	6037353	two entrances, used
551502	6037349	three entrances, 1 used, 2 unused
551502	6037345	one entrance, unused
551497	6037352	two entrances, used (skink seen at base of <i>Gyrostemon</i> )
551493	6037356	three entrances, used
551496	6037350	three entrances, 1 used, 2 unused
551492	6037354	one entrance, used
551490	6037350	one entrance, used
551490	6037356	one entrance, unused
551490	6037358	two entrances, 1 used , 1 unused
551486	6037363	six entrances, 3 used, 3 unused
551486	6037364	two entrances, 1 used, 1 unused
551478	6037380	four entrances, not used (under root, was used Oct 2002)
551475	6037365	two entrances, 1 used, 1 unused
551478	6037364	one entrance, unused
551482	6037348	one entrance, used
551480	6037345	one entrance, used
Outside quadrat at 'Egernia Hill'		
551465	6037356	one entrance, unused
551479	6037380	one entrance, unused
551451	6037386	two entrances, 1 used, 1 unused
551454	6037401	one entrance, used
551475	6037386	one entrance, unused
551472	6037405	two entrances, unused
551433	6037428	one entrance, used
551421	6037409	one entrance, unused
551428	6037435	one entrance, used
551430	6037434	one entrance, unused
551493	6037335	one entrance, unused
551493	6037338	one entrance, used
551492	6037328	three entrances, unused
551543	6037351	one entrance, used

551542	6037350	ten entrances, 8 used, 2 unused
551528	6037360	one entrance, unused
551537	6037371	one entrance, used
551512	6037356	one entrance, used
551507	6037355	five entrances, 3 used, 2 unused
Within quadrat at 'Trig Point Hill'		
549294	6040665	three entrances, 1 used, 2 unused
549279	6040686	two entrances, unused
549278	6040684	two entrances, used
549279	6040676	two entrances, used
549279	6040674	seven entrances, used
549289	6040668	two entrances, used
549276	6040683	sixteen entrances, used
549280	6040682	two entrances, used
549280	6040683	two entrances, used
549266	6040667	one entrance, used
549276	6040669	one entrance, used
549282	6040665	one entrance, used