ACKNOWLEDGEMENTS

The information contained in this report results from the generosity and support of a large number of individuals, groups and government bodies. Sincere thanks are extended to the many people who have contributed to the success of the project.

Special thanks go to:

- The landholders across NE Victoria and Corowa shire who took part in the monitoring and beetle release program. Fortnightly trapping over a nine-month period requires considerable time and dedication. It is your results that form the bulk of this report
- All of the Groups, Landcare Networks and organisations for supporting the project application.
- The Landcare facilitators, Simon Feillafe, Sue Leavold, Klaus Boelke and Geoff McKernan for preparing and submitting the successful funding application. Your ongoing assistance with collecting and distributing beetles, attendance at meetings and workshops was especially appreciated.
- The Kiewa Catchment Landcare Group for managing the project, and for your willingness to support such a large-scale project.
- Tom Croft and Suzanne Johnstone from the North East Catchment Management Authority, for assisting with mapping software, data collation, project planning and the rolling out of mapping training (e-Farmer) to landholders.
- The Lucyvale Better Beef Group and previous dung beetle projects in the North East for planting the seeds of enthusiasm. We are indebted to the Lucyvale Better Beef Group and in particular, Chips Boucher for his ongoing enthusiasm and assistance in leading the way with tent and soil cores trials in our area.
- The dedicated members of the steering committee: Chips Boucher (Lucyvale), Delwyn Clifton (Corowa), Jim de Hennin (Talgarno), Bob Gough (Kiewa Catchment), Phil Horner (Ovens Network), David Laverty (Lucyvale), Jos McAlister (Bruarong), Alby McIntosh (Springhurst/Byawatha) James Neary (Murmungee), Stephen Routledge (Mudgegonga) and Col Sedgman (Benambra). Your assistance in helping the project to meet it's goals has been invaluable. The support of Department of Primary Industry staff members, Kristy Youman (Soil Health) and Geoff Holloway (Mapping) is gratefully acknowledged.
- The Queensland Dung Beetle Project (2001-2002) for developing the model and reporting template on which this project is based. Thank-you all for leading the way.
- Dr Penny Edwards for supporting the project and your ongoing assistance with beetle identifications. We also would like to acknowledge the technical advice generously provided by Dr Bernard Doube (Dung Beetle Solutions Australia), Dr Chris Reid (Australian Museum) and Dr Tom Weir (CSIRO Entomology).
- And last, but certainly not least, the Federal Government's "Caring for our Country" program for their financial support.

TABLE OF CONTENTS

INTRODUCTION

i) Background to project

The "*Do it with Dung: from the Mountains to the Murray*" project is modelled on the 2001-02 Queensland Dung beetle project. The vision of the Queensland project was;

"*The whole community growing in knowledge and support of the value of dung beetles as improvers of landscape health, sustainable land stewardship, and people's environment*" (Edwards, 2002).

The vision of the Queensland Project team is one shared by many landholders and groups in NE Victoria and Corowa shire. Various small-scale dung beetle projects have operated in parts of NE Victoria. These include:

- 2001 Burgoigee Ck Landcare Group: Beetle survey & release
- 2002 Greta Valley and Oxley/Milawa Landcare Groups: Beetle releases
- 2006-09 Lucyvale Better Beef Group: Beetle releases, monitoring, species trials and the development and distribution of the Dung Beetle Resource Package
- 2007-08 Kiewa Catchment Landcare Groups: Beetle releases
- 2008 Tallangatta Valley Landcare Group: Beetle releases
- 2008-09 Mudgegonga & District Landcare Group: Beetle releases

The current project largely stems from the interest in dung beetles generated by previous projects, and in particular, the impetus developed by the Lucyvale Better Beef Group. In 2004-2005, beef farmers from the remote Upper Murray community of Lucyvale witnessed unprecedented summer dung beetle activity. The dung was disappearing overnight, and was accompanied by a huge reduction in the number of flies. Summer beetles had been released by the CSIRO Dung beetle project and Dairy Victoria in the 1970's and 1980's. The Group's interest in dung beetles was further stimulated by several informative presentations made by dung beetle specialist, John Feehan. In 2006, the Beef Group received funding for beetle releases, monitoring and species trials. In a bid to spread the positive message about dung beetles, the group compiled and launched the "Dung Beetle Resource Package" in 2008.

The resource package generated considerable interest from Landcare Groups across the region, and with the assistance of the North East CMA and regional Landcare Facilitators, the Kiewa Catchment Landcare Group secured funding from the Department of Agriculture, Fisheries and Forestry's "Caring for our Country" program for the current project.

ii) Outline of project

The "Do it with Dung: from the Mountains to the Murray" project had four main objectives:

- To survey and monitor the current distribution and abundance of dung beetle species in sheep and cattle dung in North East Victoria and Corowa shire
- To train landholders in dung beetle identification, biology, and dung beetle friendly management practices, and to highlight the agricultural and environmental benefits of dung beetles
- To release dung beetle species to areas with low dung beetle activity
- To trial a number of dung beetle species in different climatic zones to determine their seasonal activity period and climatic suitability

iii) Project structure

The project was overseen by a voluntary steering committee made up of representatives from regional Landcare Groups & Networks, Industry Groups, North East CMA and Department of Primary Industries Victoria. Belinda Pearce was employed to manage the project.

The project aimed to establish 80 monitoring sites across NE Victoria and Corowa shire. Landholders were invited to participate in a series of "Dung Beetle Identification and Monitoring Workshops" held across the region. Volunteer monitors were recruited from these workshops.

iv) Survey methods

Each volunteer received a portable above ground trap and a monitoring kit (Appendix A).

The trap consisted of a rectangular plastic container and a piece of mesh (25mm square – 2mm gauge) (Figure 1). This trap type was chosen for ease of use and portability. The traps were set by wrapping a sheet of damp newspaper around the mesh, and baiting the trap with fresh dung (Figure 2). The traps were set in the late afternoon and left out for 24 hours. Monitoring weeks commenced on the second and fourth week of each month. Monitors could choose their own day to set traps within each monitoring week.

Figure 1: *Trap components*

Figure 2: *Baited trap*

The monitoring kit consisted of:

- Dung Beetle Resource Package – Lucyvale Better Beef Group (2008)
- Dung Beetle Dictionary – Dung Beetles for Landcare Farming (2008)
- *Dung Beetle Monitoring Guidelines
- *Laminated Dung Beetle Identification Chart
- *Keeping a sample instruction sheet
- *Consider your Dung Beetles when using Parasiticides brochure - Agforce (2003)
- Sample boxes and return envelopes
- Monitoring diary
- 10x folding magnifier

Items marked with a * are included in Appendix A

In addition to sending in trap results to the Project Manager, monitors were requested to send in a sample of each species trapped to confirm identifications (Figure 3). If the identity of the species was unclear or unknown, further assistance was sought from Dr Penny Edwards and Dr Tom Weir (Introduced species), and Dr Chris Reid (Native species).

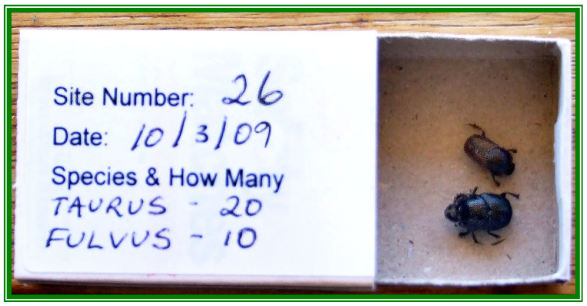


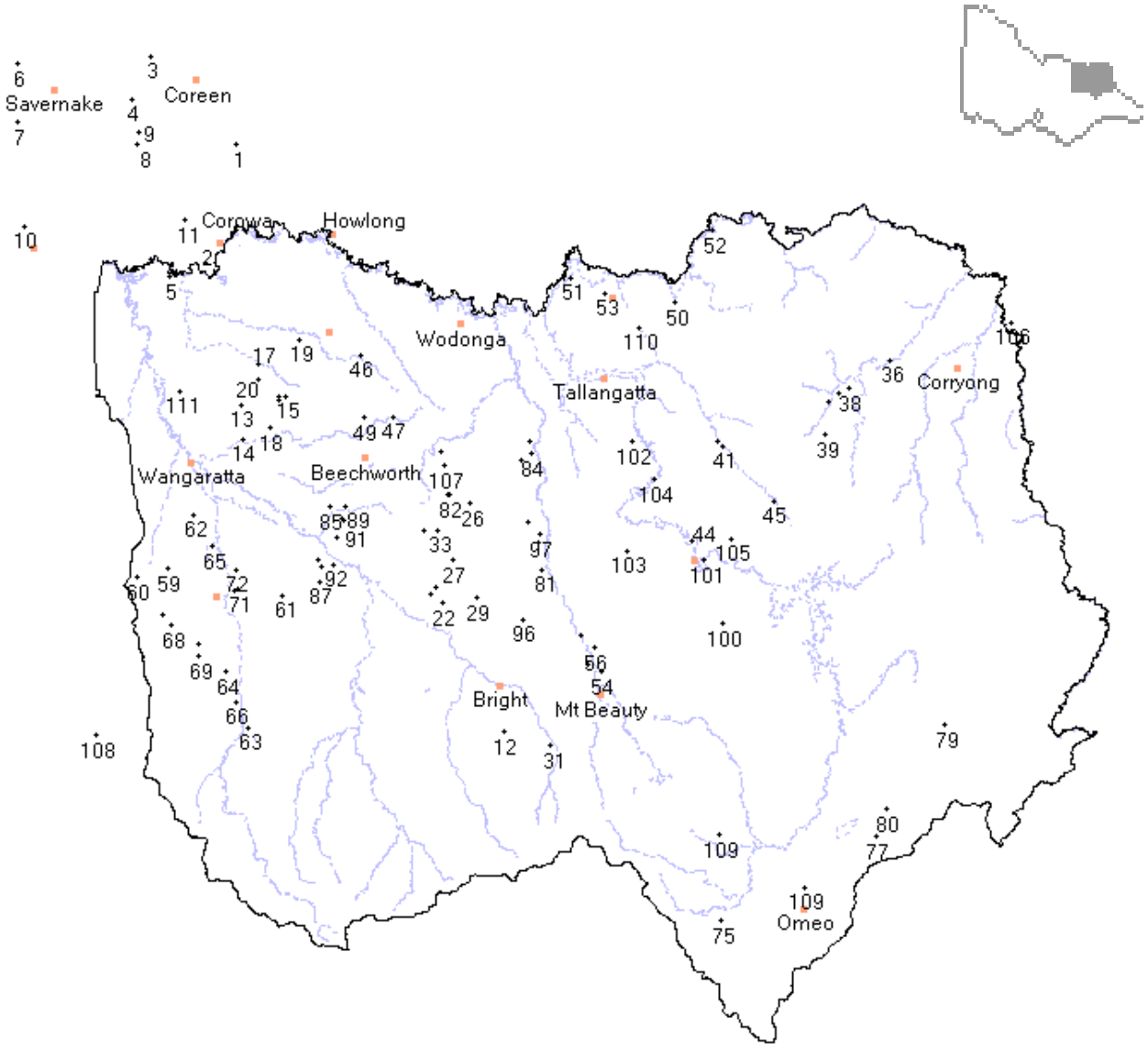
Figure 3: *Sample boxes*

v) Trapping sites

Over 100 Landholders registered to be part of the monitoring program and trapping results were received from 87 monitoring sites. In February 2009 (two days after the Mudgegonga Identification and Monitoring workshop), a significant number of monitoring sites in the Mudgegonga area were directly impacted by the Black Saturday bushfires, resulting in extensive property and stock losses. After the fires, many of the surviving stock were either sold or agisted out. The primary focus of landholders following the fires was on bushfire recovery.

The location of monitoring sites is shown at Figure 4. Each site has been allocated a number. Where there is number of sites in close proximity, not all site numbers are shown. Only sites that have returned results are included. Monitoring results were also received from a site at Windellama NSW (approx. 100km north east of Canberra - site 35 – not shown on map).

Figure 4: *Dung Beetle Monitoring Sites – North East Victoria & Corowa shire NSW**



Legend: North East Catchment Management Authority (NECMA) boundary
Streams and waterways within NECMA boundary

*Sites 1 to 11 are situated in Corowa Shire NSW (outside of NECMA boundary).

Figure 4a shows the location of Corowa shire (Local Government Area) within NSW.

Figure 4a: *Location of Corowa shire within NSW*

vi) Climatic averages at trapping sites

Figures 5 and 6 show the average annual rainfall for NSW and Victoria based on standard 30-year climatology (1961-1990). Monitoring sites were located in the 500 to 1000mm rainfall range.

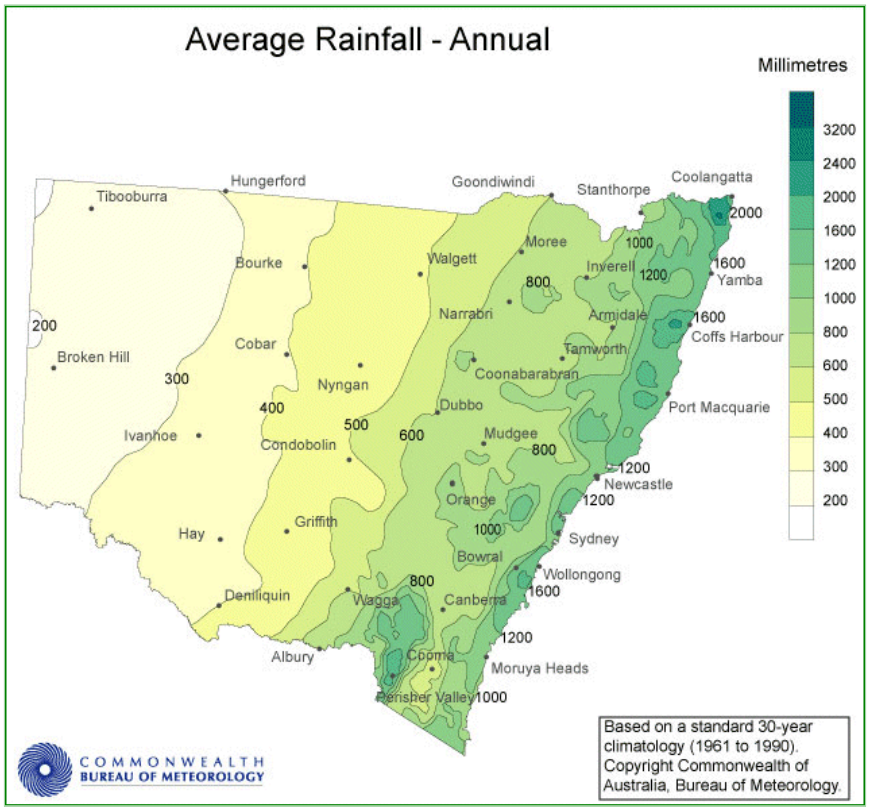


Figure 5:
Average annual rainfall for NSW

Map source:
www.bom.gov.au

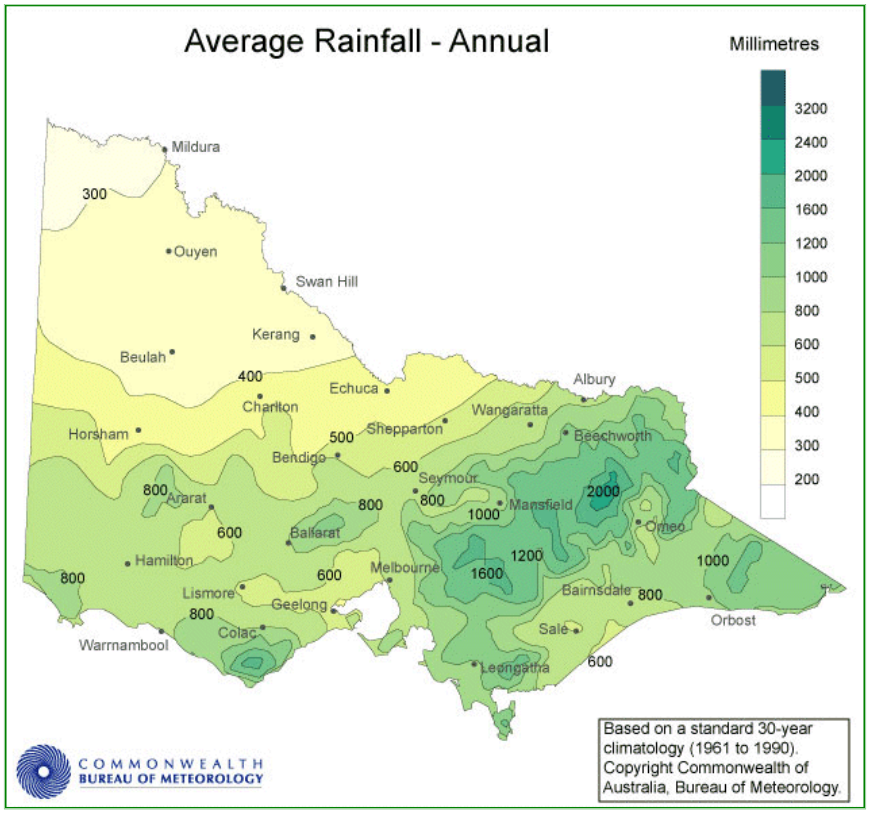


Figure 6:
Average annual rainfall for Victoria

Map source:
www.bom.gov.au

Figures 7 and 8 show the average annual maximum temperature for NSW and Victoria based on standard 30-year climatology (1961-1990).

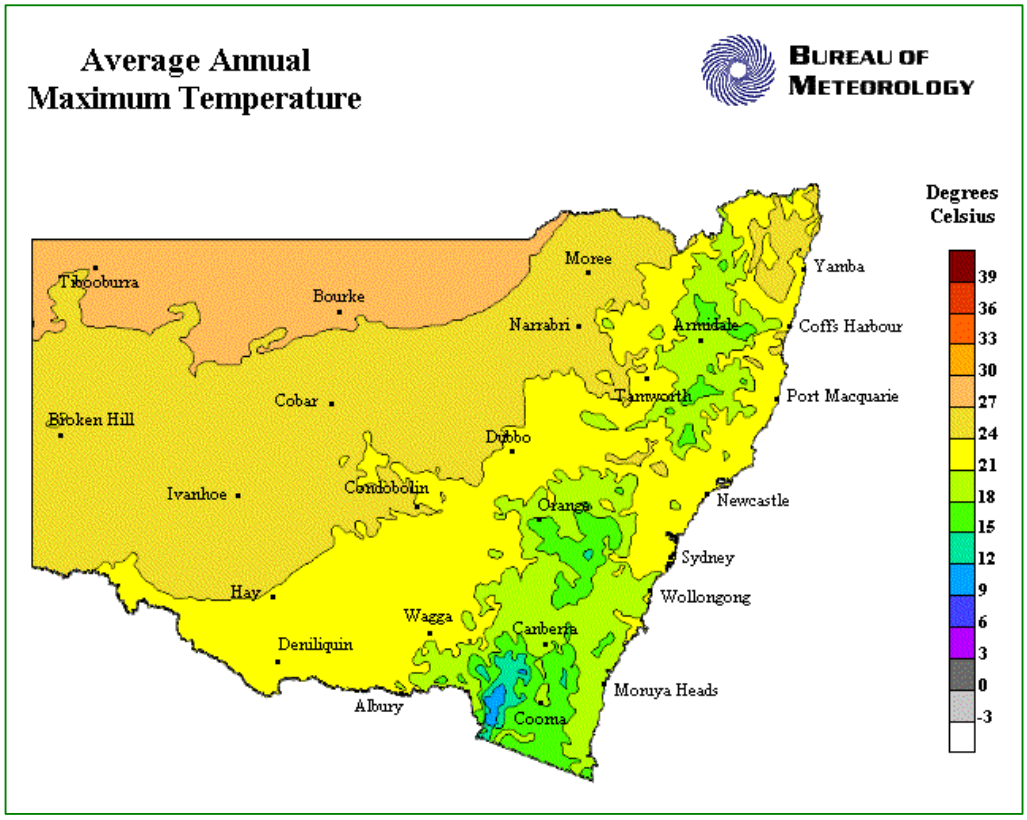


Figure 7: Average annual maximum temperature for NSW

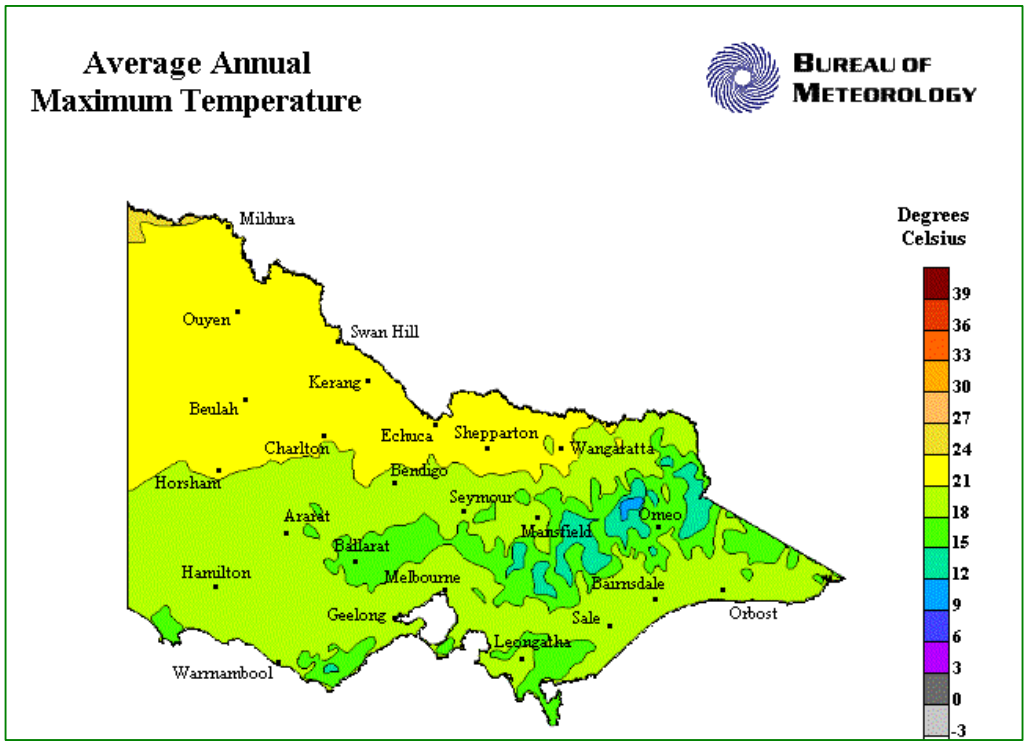


Figure 8: Annual average maximum temperature for Victoria

Map source: www.bom.gov.au

Mean maximum and minimum temperatures at selected region

1. Omeo Vic

Statistics	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Years	
Temperature															
Mean maximum temperature (°C)	26.1	25.7	23.0	18.6	14.2	10.8	10.2	12.0	15.1	18.3	21.5	24.2	18.3	129	1879 2009
Mean minimum temperature (°C)	9.6	9.6	7.8	4.9	2.4	0.9	-0.1	0.7	2.7	4.6	6.5	8.3	4.8	129	1879 2009

2. Corryong Vic

Statistics	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Years	
Temperature															
Mean maximum temperature (°C)	30.7	30.5	27.3	21.7	16.3	11.9	11.4	13.8	17.2	20.9	24.6	28.1	21.2	32	1972 2006
Mean minimum temperature (°C)	13.6	13.6	10.6	7.0	4.4	2.4	1.8	2.7	4.8	6.8	9.3	11.6	7.4	32	1972 2006

3. Mt Beauty Vic

Statistics	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Years	
Temperature															
Mean maximum temperature (°C)	28.8	29.0	25.7	20.2	15.5	12.5	11.3	12.7	16.0	19.4	22.5	26.3	20.0	33	1948 1994
Mean minimum temperature (°C)	12.5	13.1	10.8	7.5	4.9	2.7	2.1	3.0	4.6	6.9	8.6	11.0	7.3	33	1948 1994

4. Myrtleford Vic

Statistics	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Years	
Temperature															
Mean maximum temperature (°C)	30.8	30.0	27.3	21.8	17.0	13.5	12.6	14.5	17.9	20.9	24.5	28.5	21.6	27	1927 1969
Mean minimum temperature (°C)	11.7	11.8	9.3	6.0	4.1	2.4	2.1	2.8	3.8	6.0	8.0	10.1	6.5	27	1927 1969

5. Wangaratta Vic

Statistics	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Years	
Temperature															
Mean maximum temperature (°C)	31.0	30.7	27.3	22.0	17.3	13.7	12.7	14.6	17.5	21.1	25.4	28.8	21.8	85	1901 1987
Mean minimum temperature (°C)	15.0	15.0	12.3	8.3	5.5	3.7	3.1	4.1	5.8	8.2	10.7	13.3	8.8	85	1901 1987

6. Corowa NSW

Statistics	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Years	
Temperature															
Mean maximum temperature (°C)	31.9	31.3	28.0	22.5	17.8	13.8	13.0	15.0	18.5	22.2	26.5	30.1	22.6	85	1907 2009
Mean minimum temperature (°C)	15.6	15.7	12.7	8.6	5.7	3.6	2.8	3.7	5.7	8.1	11.0	13.6	8.9	84	1907 2009

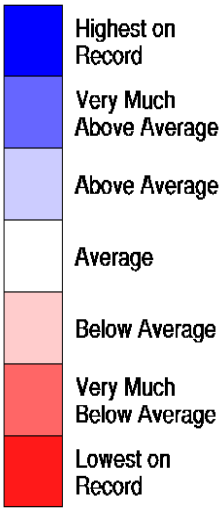
Information source: http://www.bom.gov.au/climate/averages/index.shtml

2. RESULTS OF DUNG BEETLE SURVEY

i) Weather conditions during the project

Monitoring commenced in February 2009 and this report includes trapping results up to and including October 2009. Both NE Victoria and Corowa shire have been EC (Exceptional Circumstances) declared due to ongoing low rainfall. Figures 9 to 17 show the deviation from normal rainfall for each month. Map source: www.bom.gov.au

Figures 9 -17: *Deviation from normal rainfall February 2009 to May 2010*



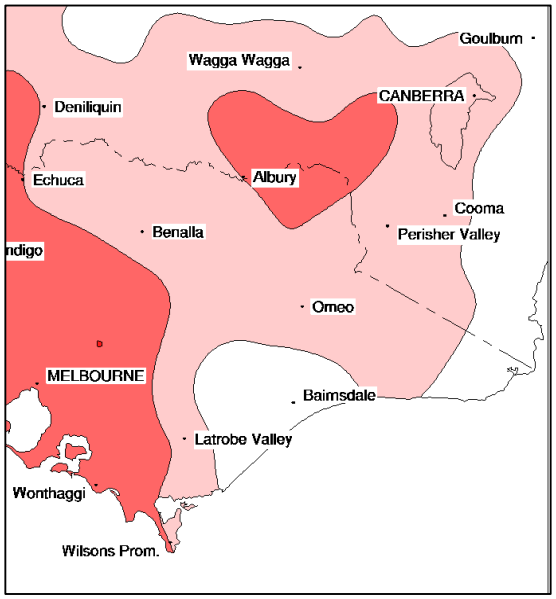


Figure 9*: February 2009*

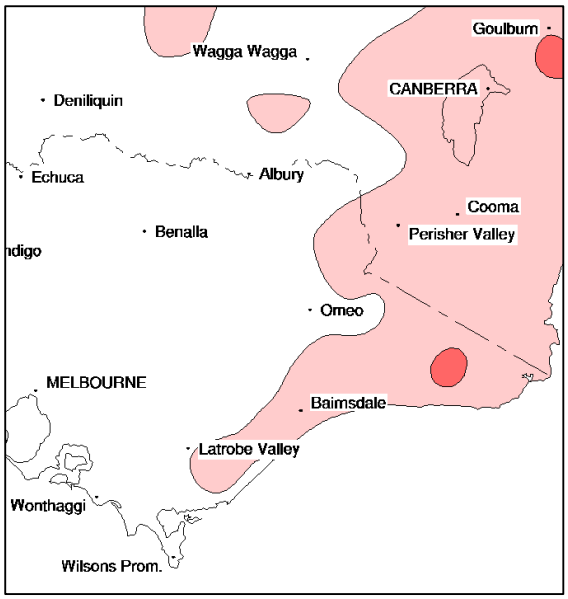


Figure 10: *March 2009*

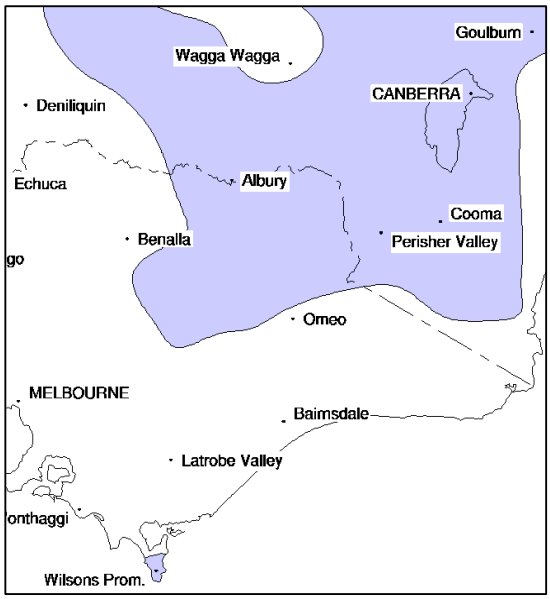


Figure 11*: April 2009*

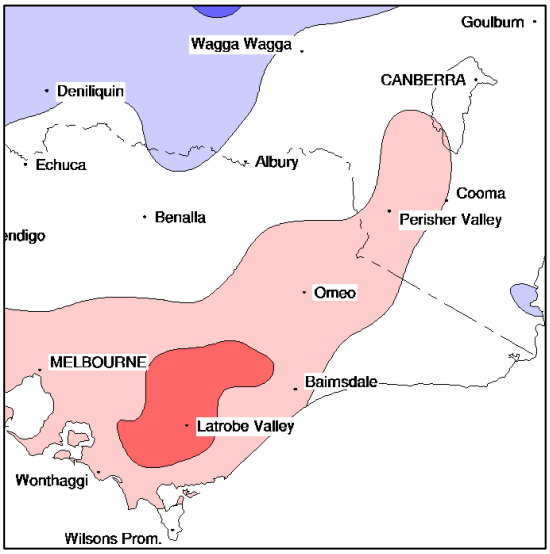


Figure 12: *May 2009*

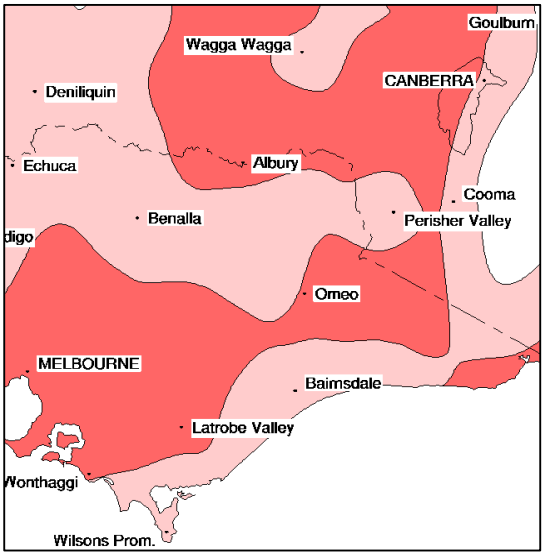


Figure 13: *June 2009*

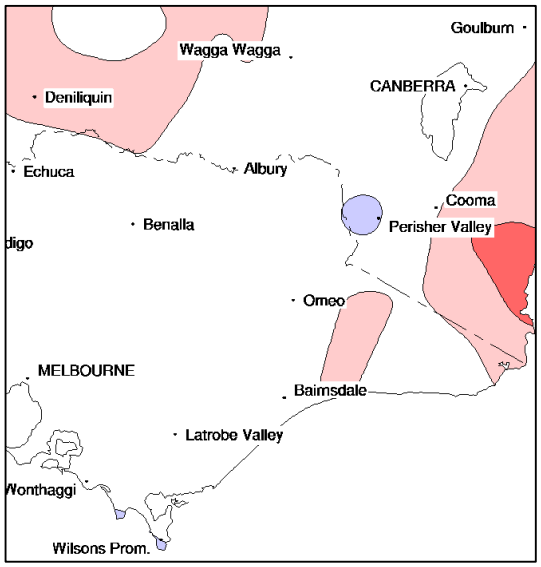


Figure 14*: July 2009*

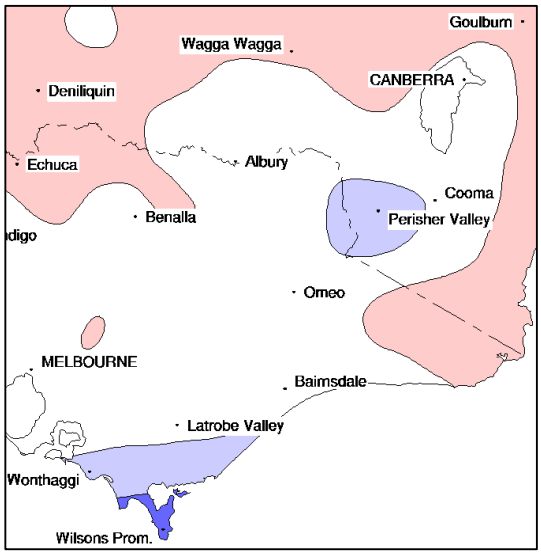


Figure 15: *August 2009*

Figure 16: *September 2009*

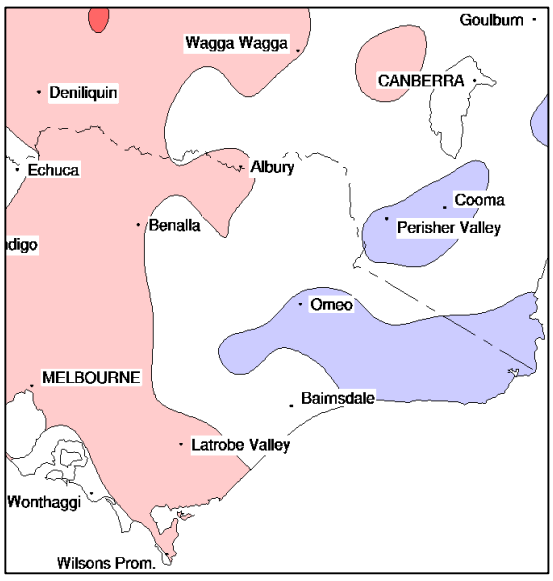


Figure 17*: October 2009*

ii) Summary of results

Over 46,000 beetles were trapped between February 2009 and May 2010. The most abundant species was *Onthophagus taurus*, which was trapped at 58 sites.

Number of introduced species trapped during project:	9 species
Number of native species trapped during project:	4 species
Total number of introduced beetles trapped	46071 beetles
Total number of native beetles trapped	412 beetles

Table 1 provides a summary of trap results and the number of sites where the species were trapped.

Table 1: Summary of overall trap results (Black = introduced, Blue = native species)

Species	**No. of beetles trapped**	**No. of sites with species**
O.taurus	28894	58
E.fulvus	11439	51
B.bison	3411	48
O.binodis	1062	23
O.alexis	732	49
O.aygulus	454	29
E.pallipes	336	18
G.spiniger	34	14
E.africanus	22	2
O.australis	386	27
O.pentacanthus	18	7
O.victoriensis	6	2
O.pexatus	2	2

3. INTRODUCED DUNG BEETLES

i) Species of introduced dung beetles collected during the survey

Between February and October 2009, 9171 introduced beetles were trapped, consisting of nine species. The most abundant species was *Onthophagus taurus* (3495), followed by *Bubas bison* (2826) and *Euoniticellus fulvus* (1866) (Table 1 and Figure 18).

O.taurus, *B.bison* and *E.fulvus* made up the bulk of trap results (89%). The combined total number of the remaining six species (*Onitis. alexis, Onitis. aygulus, Onthophagus binodis, Euoniticellus .pallipes, Geotrupes. spiniger, Euoniticellus .africanus),* was 984 beetles, or 11% of the total number of beetles trapped.

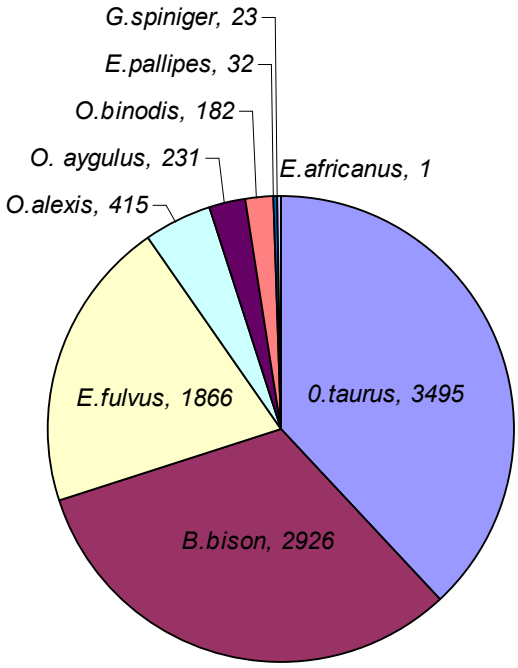


Figure 18: *Number of introduced species trapped*

Results on the distribution, abundance and seasonality of each introduced species are presented in alphabetical order on the following pages (Figures 19 – 27). The results are presented using a format similar to that developed by the Queensland Dung Beetle Project.

A distribution map is presented for each species. Coloured circles indicate sites where the species was trapped, black circles indicate sites where the species was not found. The large coloured circles represent single trappings of 50 or more beetles. The monitoring site map (Figure 4, page 6) indicates location of site numbers.

Information is also provided on the biggest trap catches for each species, site number, approximate location (by nearest town), number of beetles and the date trapped.

A graph is presented to indicate the seasonality of each species. These graphs were derived by dividing the total number of beetles trapped each fortnight, by the total number of sites who had trapped the species throughout the course of the project. For example, *Bubas bison* was trapped at 45 sites. In the period 1st May to 15th May, 1039 beetles were trapped, giving an average trapping of 23.1 beetles.

Bubas bison: *Distribution, abundance & seasonality*

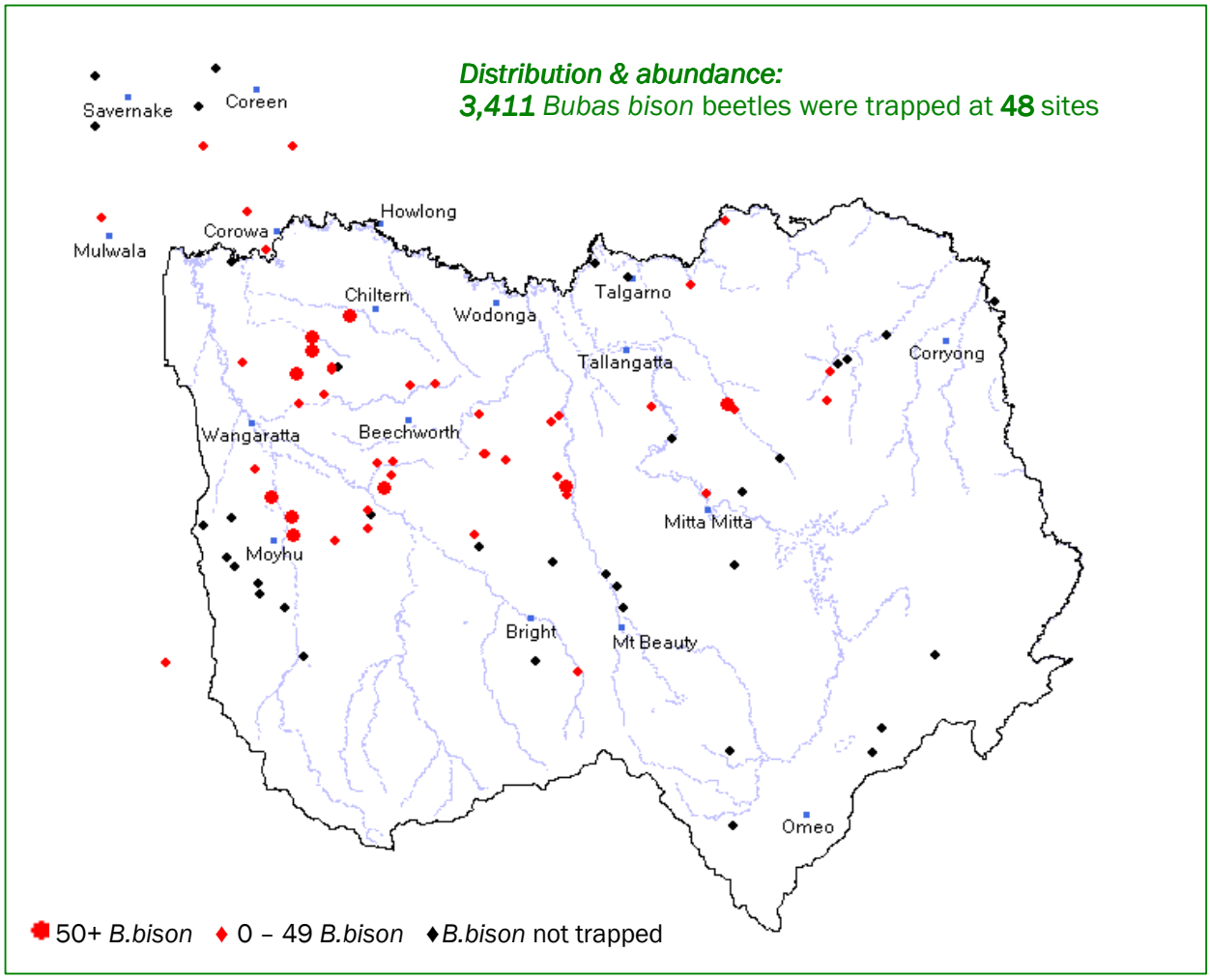


Figure 19: Bubas bison *trapping results including largest single trappings (50+)*

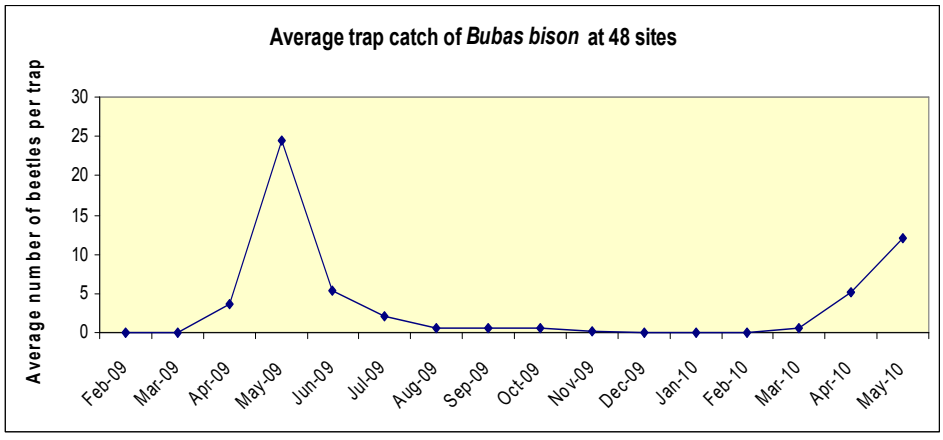


Figure 19a: *Seasonality graph of* Bubas bison

TOP 5 CATCHES

Site 42
Tallangatta Valley:
350 on 1/5/09

Site 13
Byawatha
197 on 27/5/09

Site 17
Springhurst
162 on 24/5/09

Site 19
Chiltern Valley
144 on 13/5/09

Site 72
Meadow Ck.
135 on 27/5/09

Euoniticellus africanus: *Distribution, abundance & seasonality*

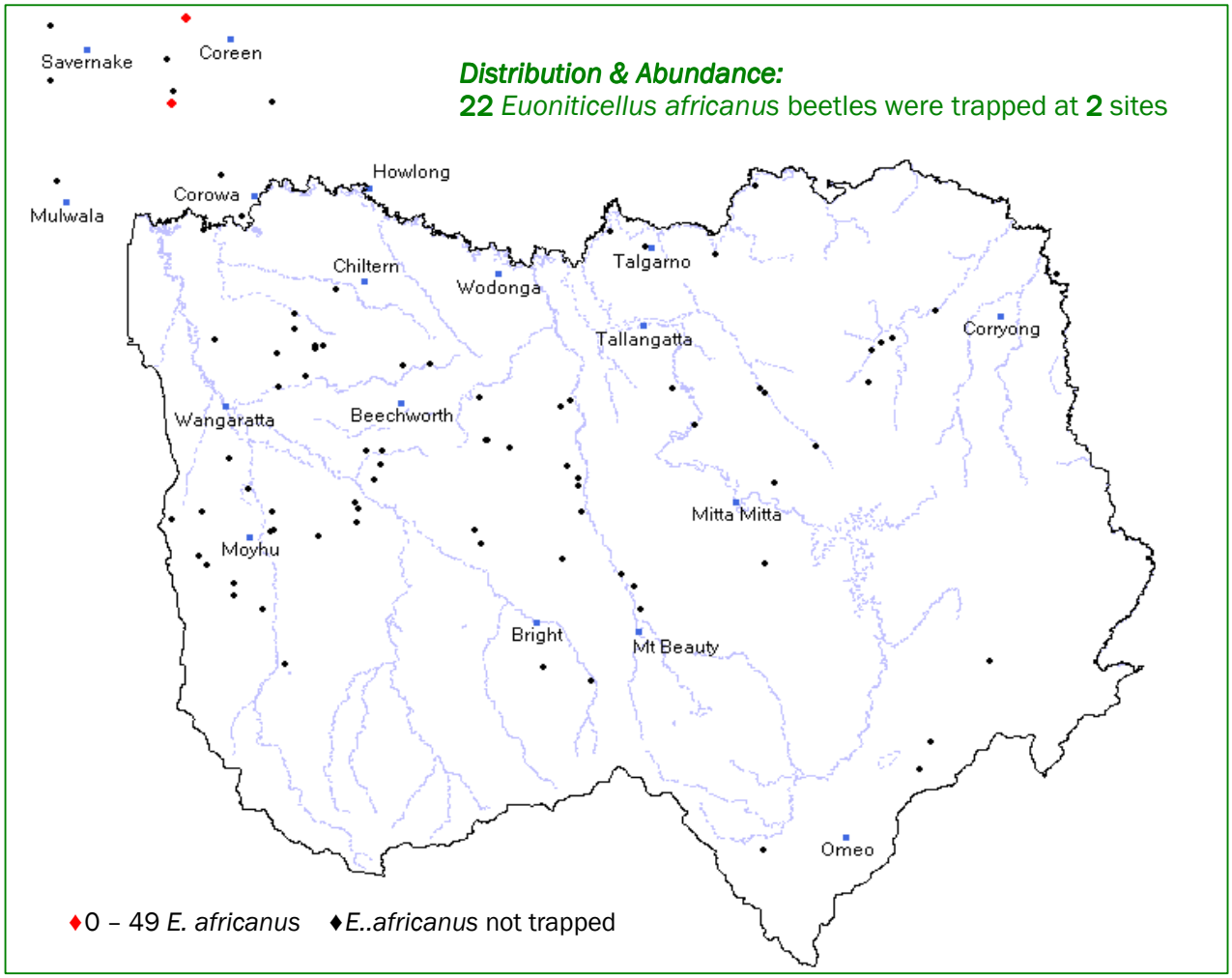
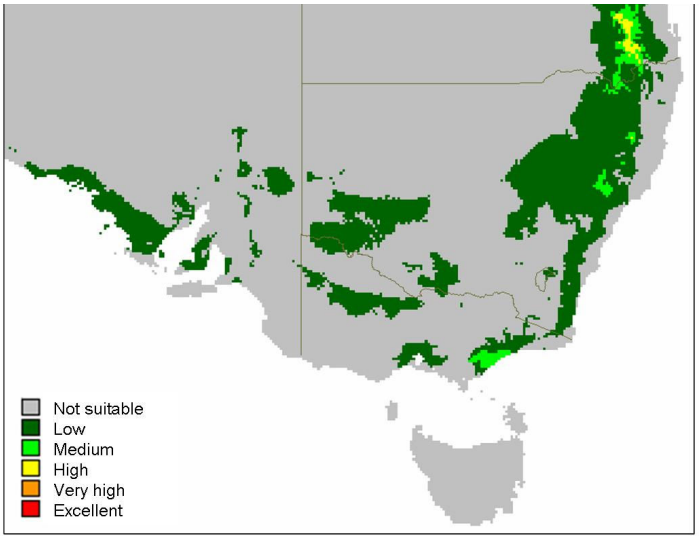


Figure 20: Euoniticellus africanus *trapping results*



Specimens were trapped on 28/2/09 (Site 3) and on 5/2/10 (Site 8). Both sites were located in Corowa shire area, NSW. This species was trapped outside of the predicted distribution range (see Figure 20a). . The single specimen from site 3 was a small specimen. It was sent to Dr Penny Edwards and Dr Tom Weir to confirm identification.

Figure 20a: *Potential distribution of* Euonitcellus.africanus
(Map created by Penny Edwards)

Euoniticellus fulvus: *Distribution, abundance & seasonality*

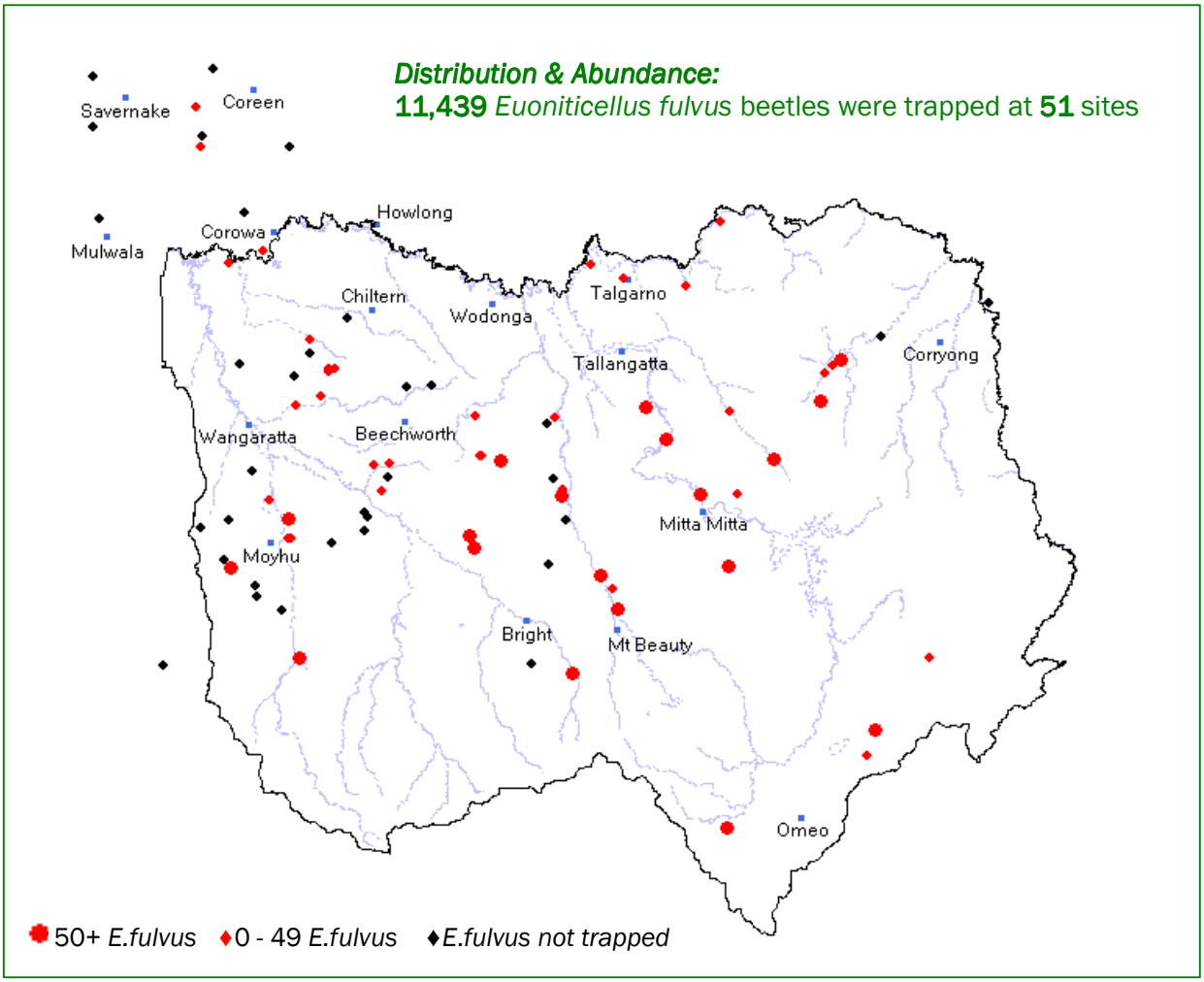


Figure 21: Euoniticellus fulvus *trapping results including largest single trappings (50+)*

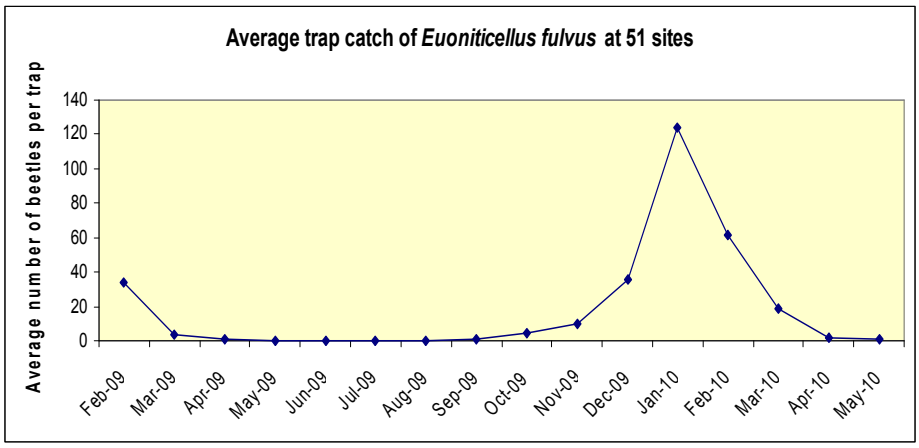


Figure 21a: *Seasonality graph of* Euoniticellus fulvus

TOP 5 CATCHES

Site 39
Lucyvale
2080 on 29/1/10

Site 44
Mitta Mitta
2000 on 3/1/10

Site 54
Tawonga Sth
1000 on 11/1/10

Site 72
Meadow Creek
746 on 22/1/10

Site 38
Berringama
450 on 2/1/10

Euoniticellus pallipes: *Distribution, abundance & seasonality*

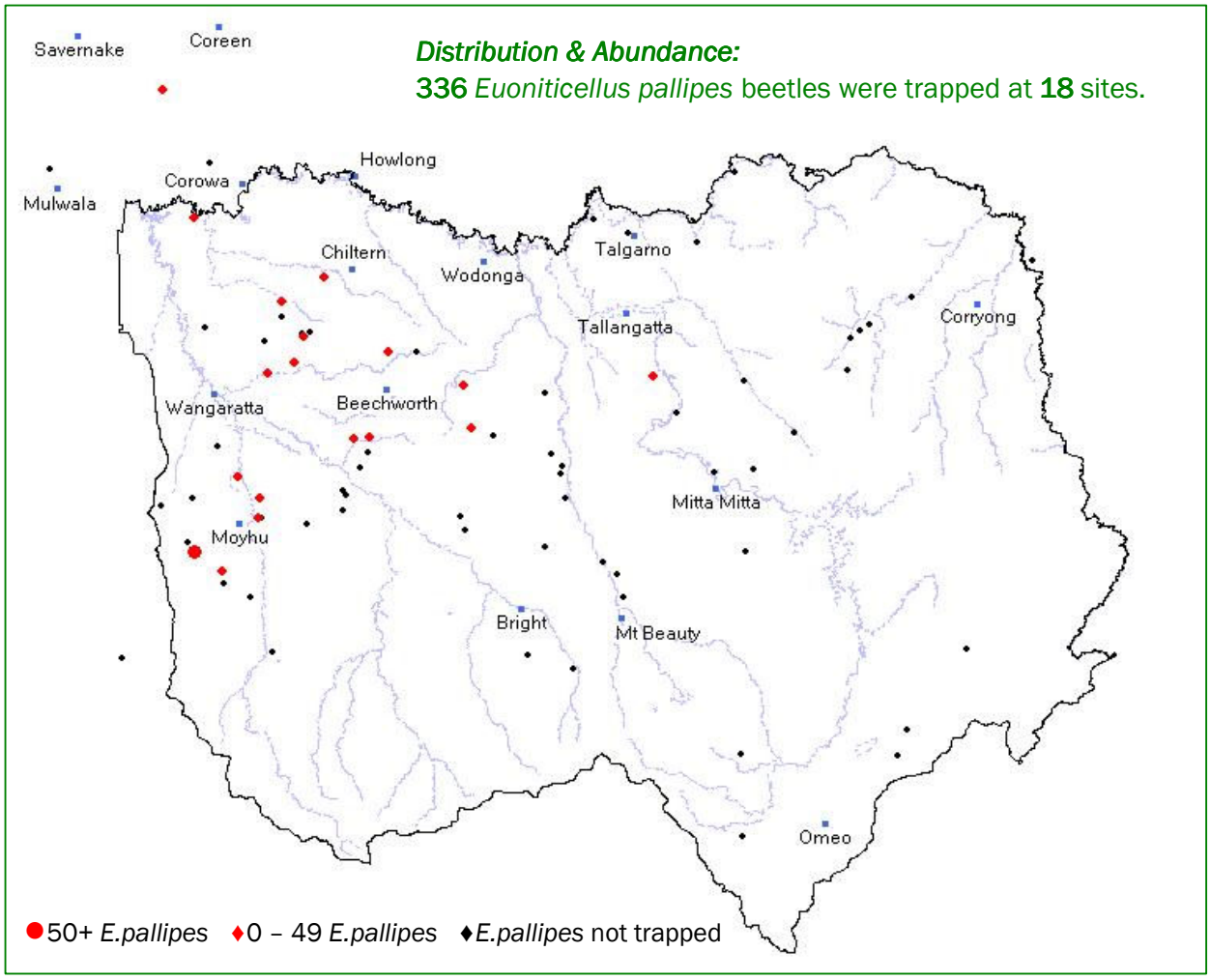


Figure 22: Euoniticellus pallipes *trapping results*

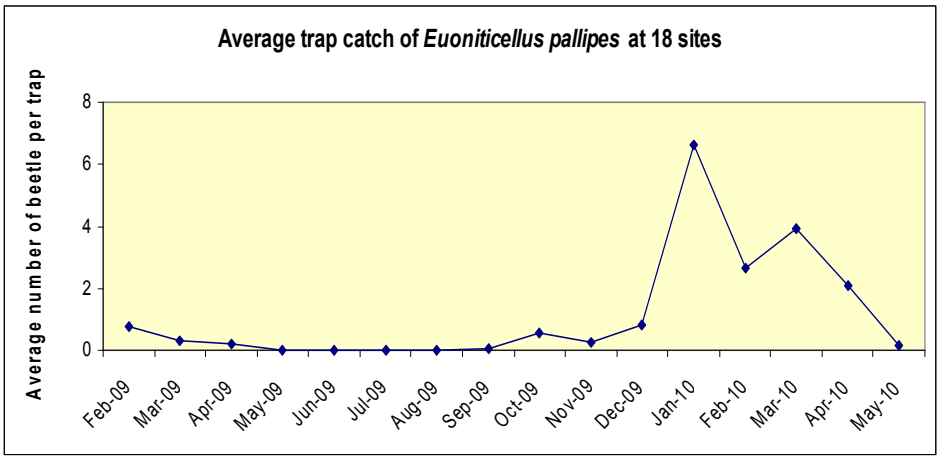


Figure 22a: *Seasonality graph of* Euoniticellus pallipes

TOP 5 CATCHES

Site 68
Hansonville
50 on 5/1/10

Site 14
Byawatha
42 on 25/1/10

Site 8
Corowa shire
30 on 24/4/10

Site 17
Springhurst
14 on 25/3/10

Site 85
Bowmans Forest
10 on 2/1/10

Geotrupes spiniger: *Distribution, abundance & seasonality*

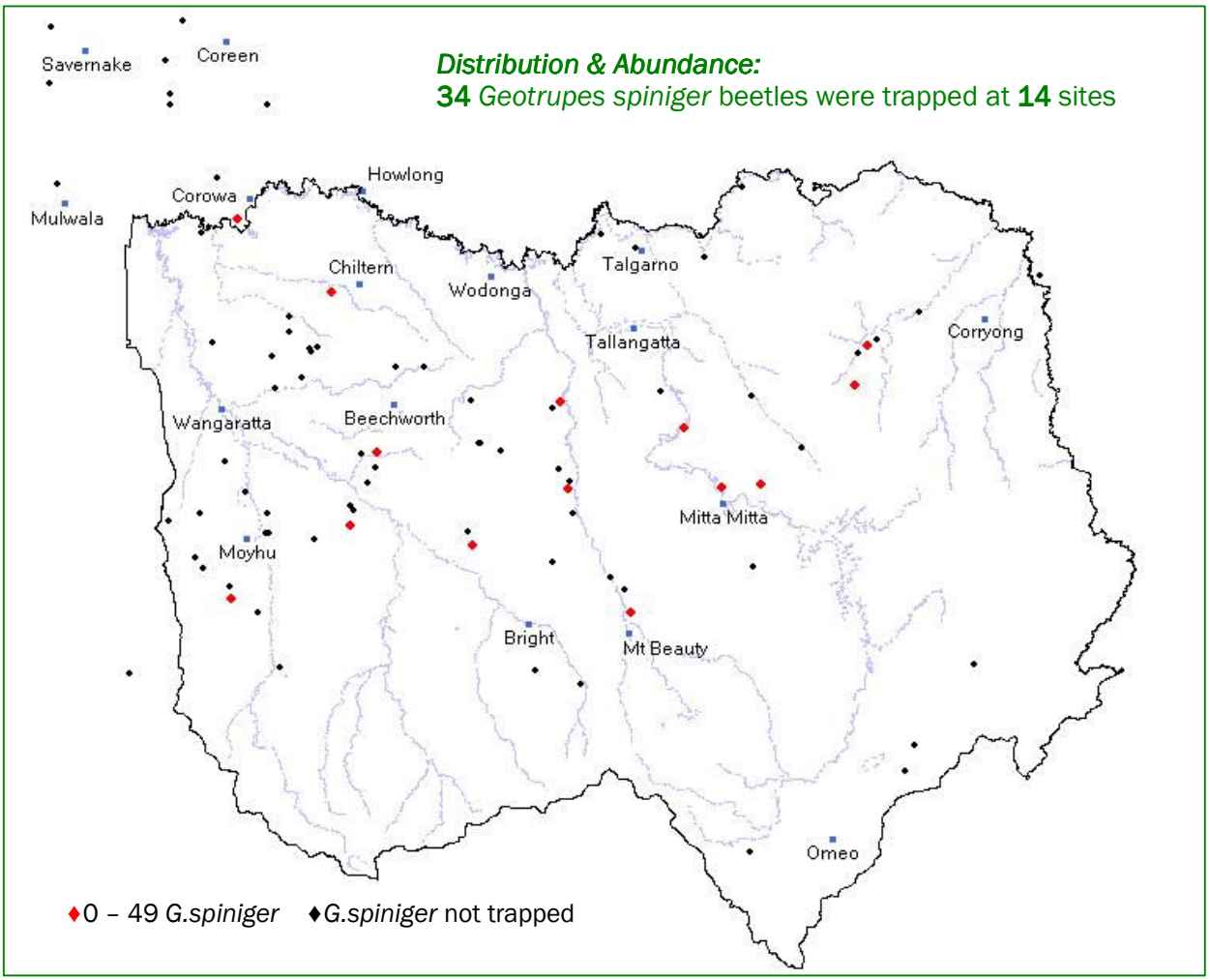


Figure 23: Geotrupes spiniger *trapping results*

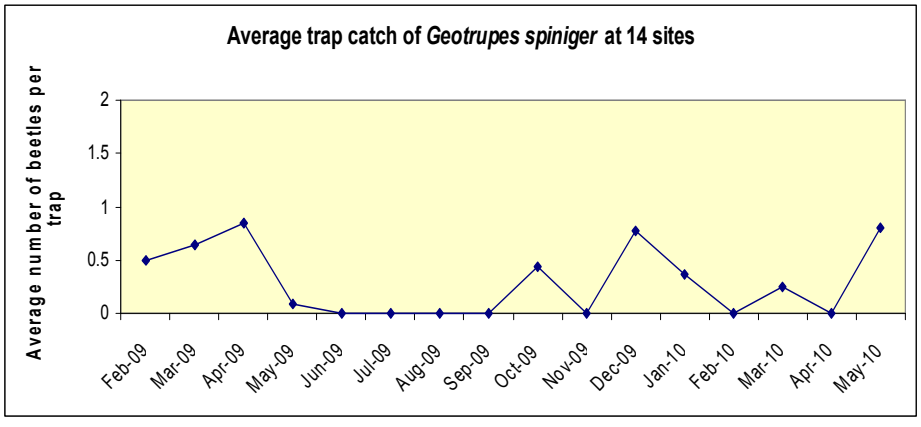


Figure 23a: *Seasonality graph of* Geotrupes spiniger

TOP 5 CATCHES

Site 104
Tallangatta Sth
4 on 30/10/09

Site 39
Lucyvale
3 on 16/1/10

Site 2
Corowa shire NSW
3 on 12/4/09

Site 44
Mitta Mitta
2 on 5/4/09

Site 84
Kergunyah
2 on 25/5/09

Onitis alexis: *Distribution, abundance & seasonality*

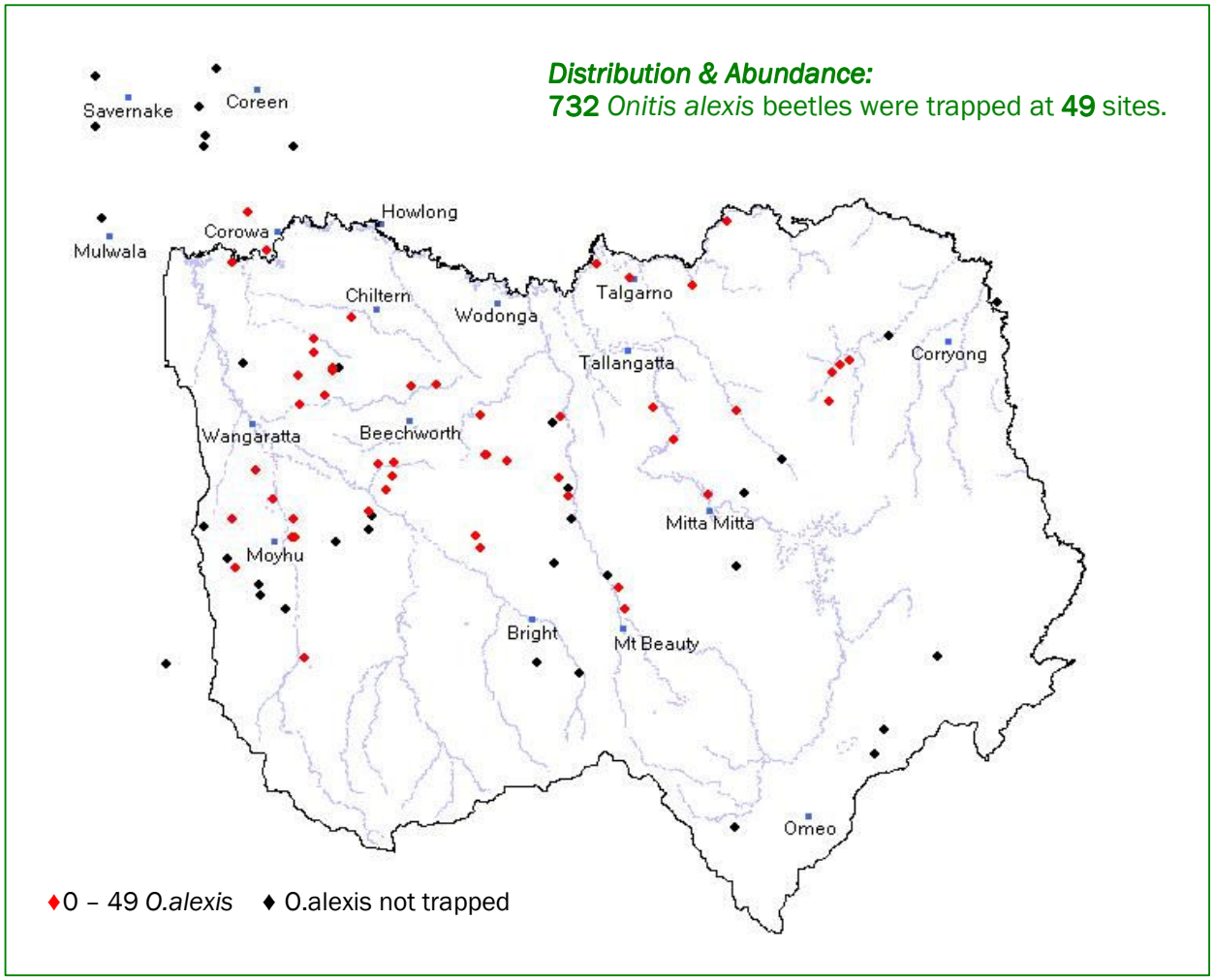


Figure 24: Onitis alexis *trapping results including largest single trappings (50+)*

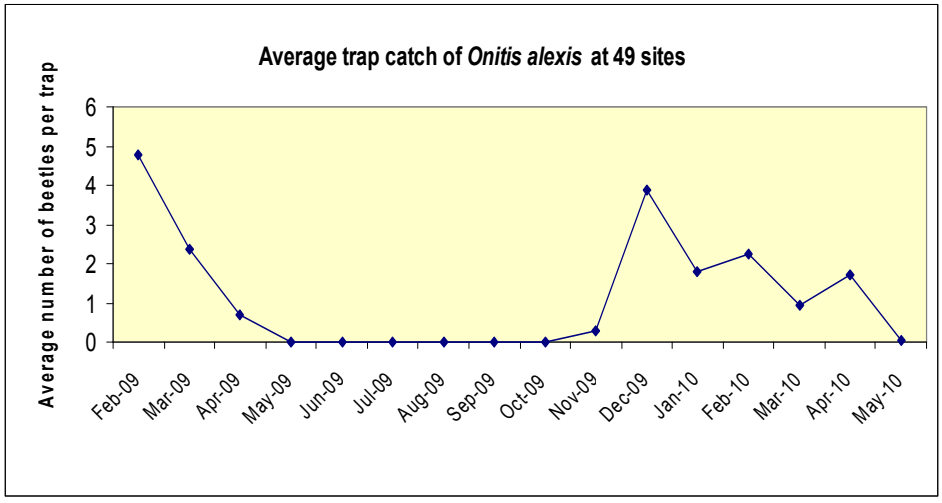


Figure 24a: *Seasonality graph of* Onitis alexis

TOP 5 CATCHES

Site 49
Wooragee
38 on 25/2/09

Site 51
Talgarno
38 on 14/3/09

Site 16
Springhurst
32 on 9/2/09

Site 19
Chiltern Valley
32 on 16/12/09

Site 13
Byawatha
26 on 25/3/09

Onitis aygulus: *Distribution, abundance & seasonality*

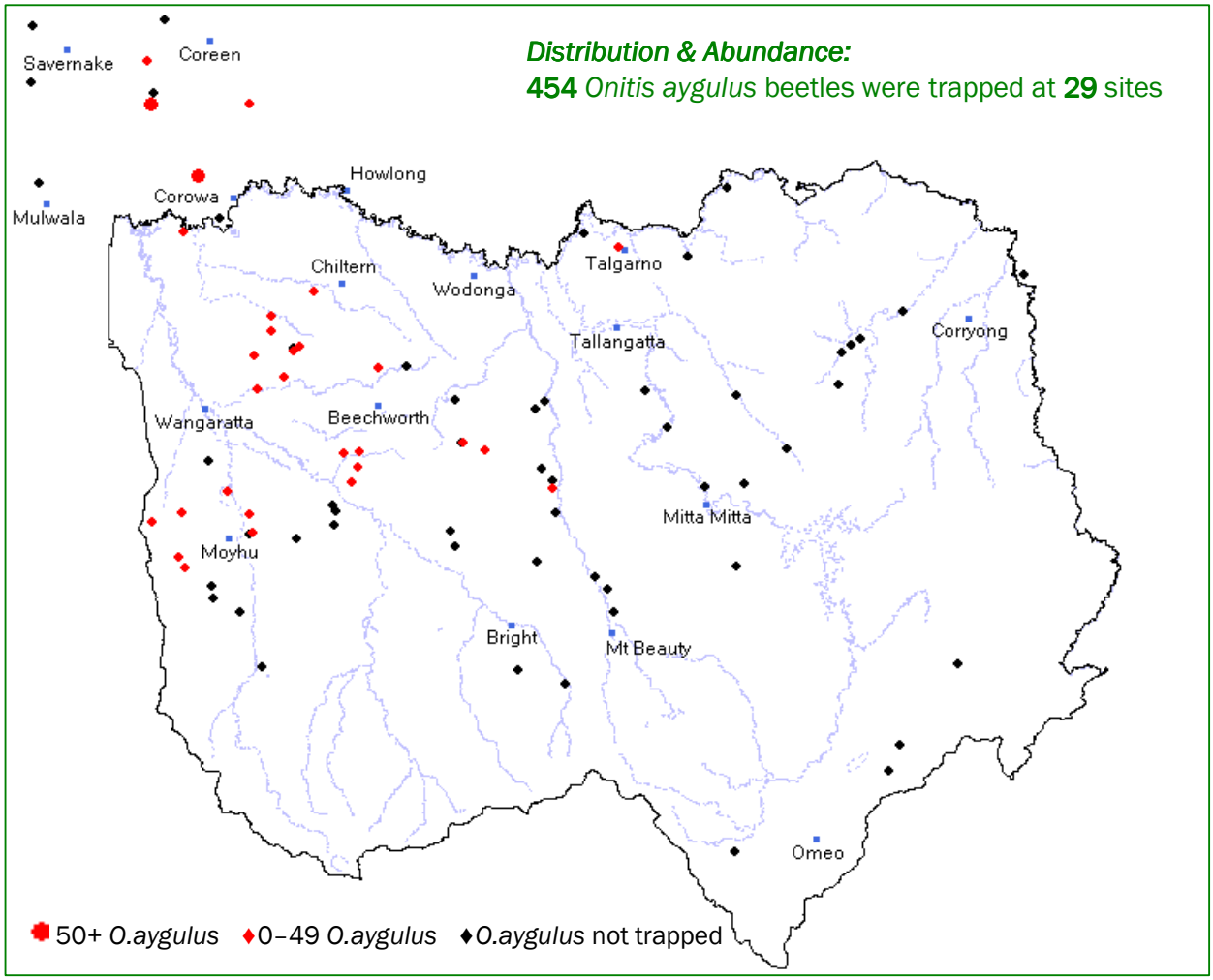


Figure 25: Onitis aygulus *trapping results including largest single trappings (50+)*

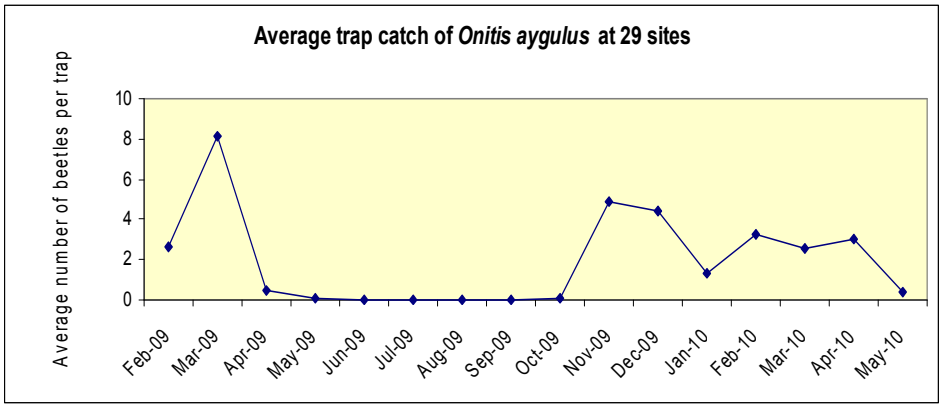


Figure 25a: *Seasonality graph of* Onitis aygulus

TOP 5 CATCHES

Site 11
Corowa shire NSW
53 on 9/3/09

Site 8
Corowa shire NSW
24 on 27/11/09

Site 19
Chiltern Valley
42 on 16/12/09

Site 67
Hansonville
24 on 28/3/09

Site 49
Wooragee
18 on 12/3/09

Onthophagus binodis: *Distribution, abundance & seasonality*

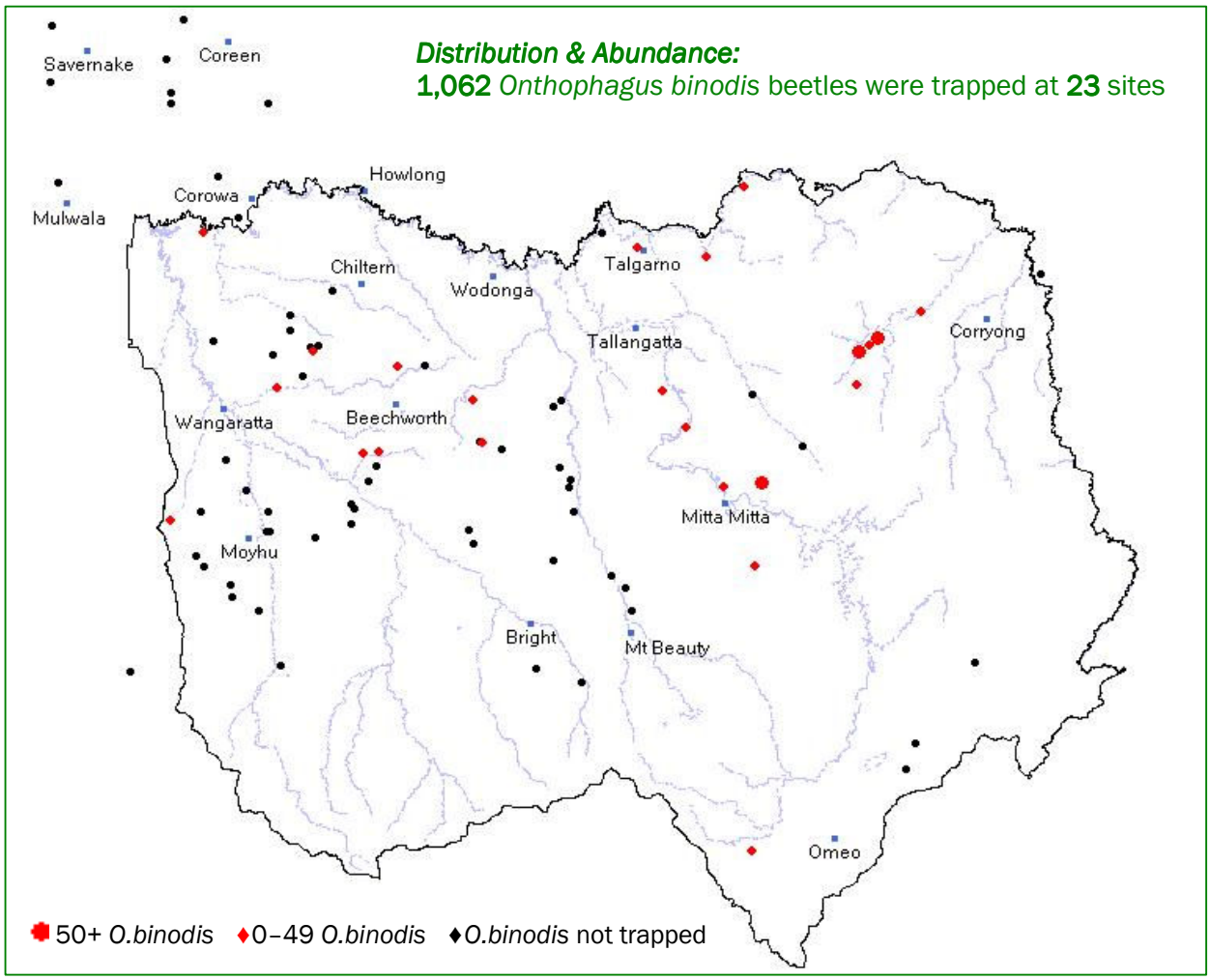


Figure 26: Onthophagus binodis *trapping results including largest single trappings (50+)*

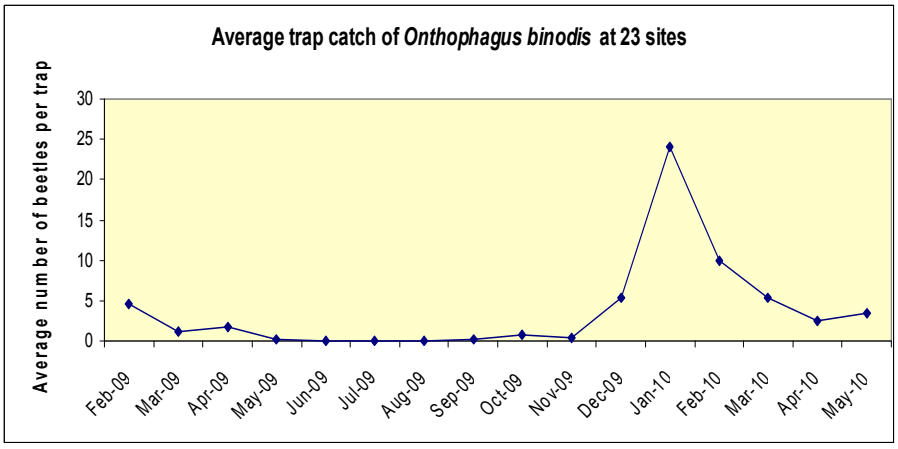


Figure 26a: *Seasonality graph of* Onthophagus binodis

TOP 4 CATCHES

Site 105
Mitta Mitta
200 on 12/1/10

Site 38
Berringama
175 on 2/1/10

Site 37
Lucyvale
50 on 1/1/10

Site 39
Lucyvale
38 on 29/1/10

Onthophagus taurus: *Distribution, abundance & seasonality*

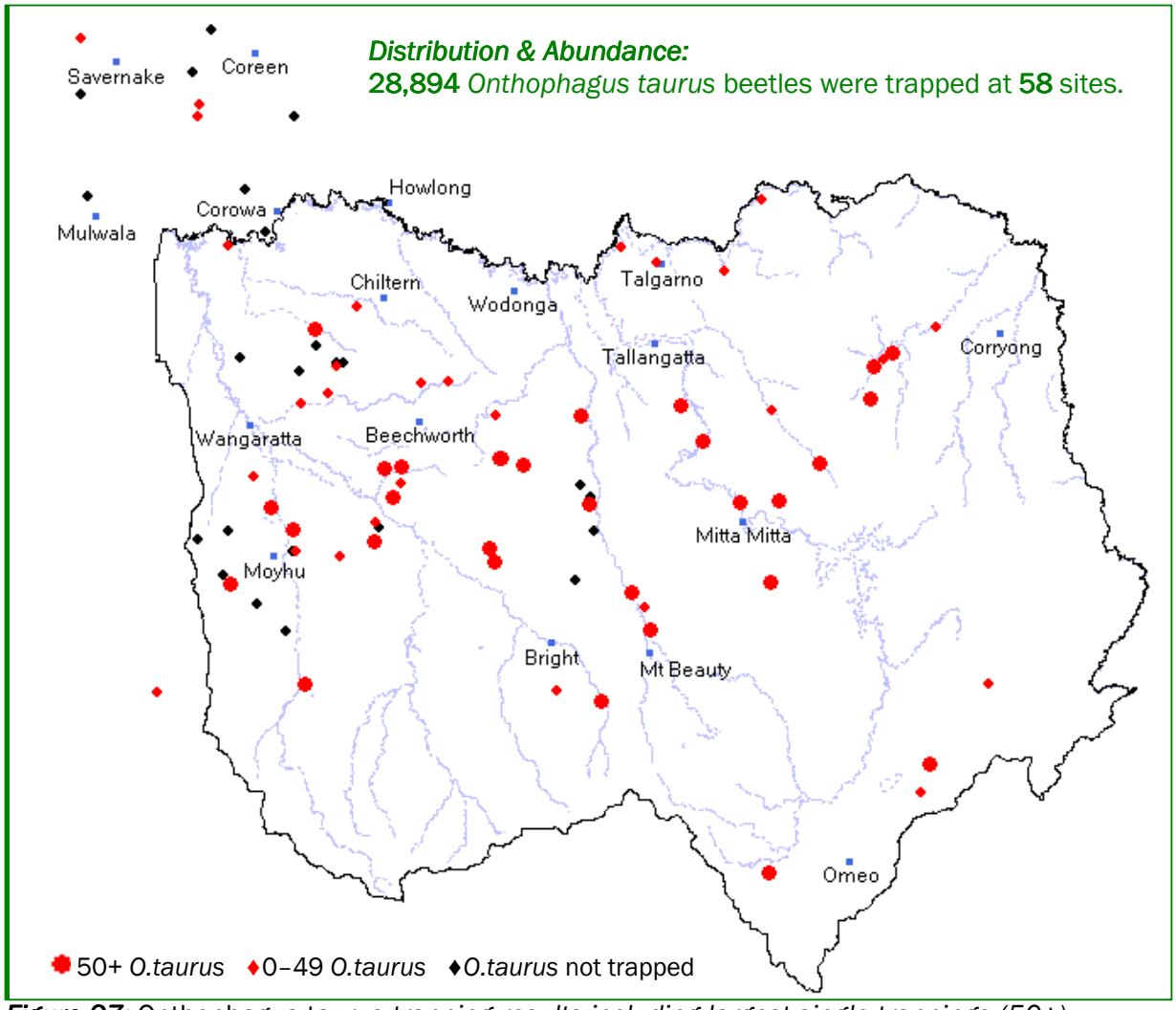


Figure 27: Onthophagus taurus *trapping results including largest single trappings (50+)*

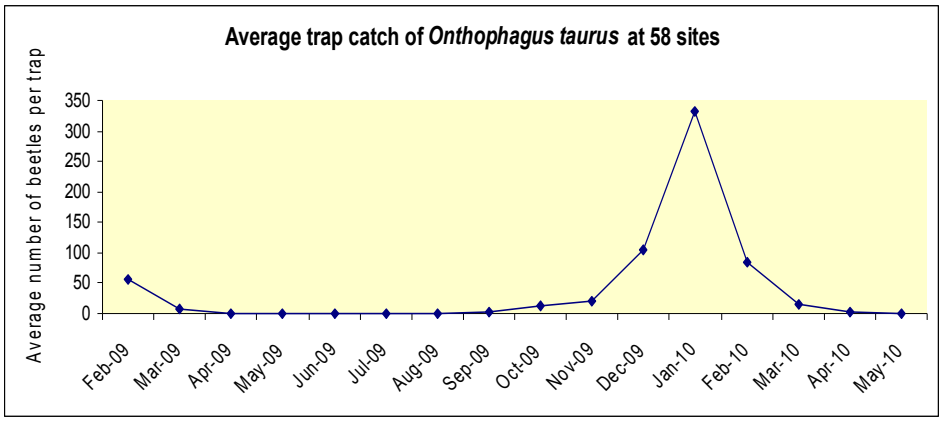


Figure 27a: *Seasonality graph of* Onthophagus taurus

TOP 5 CATCHES

Site 44
Mitta Mitta
~3000 on 3/1/10

Site 39
Lucyvale
~2440 on 16/1/10

Site 54
Tawonga Sth
~2000 on 11/1/10

Site 38
Berringama
1127 on 23/1/10

Site 102
Tallangatta Sth
~800 on 25/1/10