

# Dung Down Under in Southern Gippsland Project



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## Executive Summary

In 2021 SGLN received a Victorian Landcare Grant to deliver the 'Dung Down Under in Southern Gippsland - Dung Beetles to Improve Waterways and Soil Fertility' project.

Dung beetles are beneficial because they dig tunnels in the soil underneath cow pats and line these tunnels with dung, removing it from the surface. This prevents the dung's high levels of nitrogen and phosphorus from washing into surface waters and polluting dams, waterways and marine environments.

While dung beetles are present in Southern Gippsland over summer and autumn, it was generally thought they were absent during winter and spring, however we had no data to know if this was true.

The goal of this project was to train landholders in how to trap and monitor dung beetles on their properties over a 12 month period, to see what beetles were present and when they were active. This has been achieved, with twenty six monitoring sites established. One training day, two online training sessions and a final online results session have been held with project participants.

The overall combined results of all species show there are dung beetles present in reasonable numbers during spring, summer and autumn, but there is little activity in May, almost none in June and July, and little activity again in August. This confirms our suspicion that there are few or no dung beetles active in winter in our region, however they are active in spring.

Attempts to establish the winter active *Bubus bison* appear to have been largely ineffective thus far, both via paddock releases 10 years ago and via nurseries and on-farm shadecloth nursery releases over the last two years. The wet years may have contributed to this, or it may just be that our climate is too wet and cold for this species.

Another species, *Geotrupes spiniger*, has been found to be active from summer to early winter (in other locations) and may be suitable to help fill the winter activity gap. Further monitoring and nursery work is required to see if it is possible to increase the numbers and geographic spread of this species across Southern Gippsland.

# 1. Introduction

In 2021 SGLN received a Victorian Landcare Grant to deliver the 'Dung Down Under in Southern Gippsland - Dung Beetles to Improve Waterways and Soil Fertility' project.

The project description in the grant application stated: The waterways of Southern Gippsland have been assessed by government authorities as being in poor condition and not meeting Victorian water quality standards due to high levels of agricultural nutrients. High nutrient and sediment loads threaten our sensitive marine environments and their outstanding environmental values.

Dung beetles dig tunnels in the soil underneath cow pats and line these tunnels with dung, removing it from the surface. This prevents the dung's high levels of nitrogen and phosphorus from washing into surface waters and polluting dams, waterways and marine environments.

Summer active dung beetles are well established in most parts of Australia including South Gippsland. However, winter-active and spring-active dung beetles are not, meaning at these times of the year the dung is not buried and causes pollution.

This 12-month citizen science dung beetle monitoring project will train local farmers to monitor dung beetles, to determine what species are currently established in the region and when they are active. It will identify the gaps in dung beetle distribution and activity filling those gaps by releasing dung beetles bred in SGLN and BCLN's current dung beetle breeding nurseries onto local farms.

## 2. Method

### 2.1 Recruiting landholders to participate in citizen science

Both South Gippsland Landcare Network (SGLN) and Bass Coast Landcare Network (BCLN) put out an expression of interest calling for landholders who were interested in monitoring the dung beetles present on their properties. We mapped the locations of the initial 13 expressions of interest received on a GIS layer, and then deliberately targeted additional landholders to ensure an even spread of monitoring sites across Bass Coast and South Gippsland. This was very successful and we commenced the project with 31 landholders participating in dung beetle monitoring.



Figure 1. Landholders participating in project

## 2.2 Participant training sessions

The initial project information and training day was held on 3 March 2022 at the Buffalo Hall in South Gippsland. The session introduced the project and explained the monitoring process. Dr Russ Barrow and Graeme Heath from the Dung Beetle Ecosystem Engineers project delivered a presentation about the benefits of dung beetles, their biology and how to identify the species that are likely to be found in this region.

A follow up online meeting was held two weeks later for those who couldn't attend the face to face training day. This zoom session was recorded, and the link sent to all the project participants.

The participants then picked up their beetle monitoring kits and commenced monitoring in March 2022.

A third online meeting was held in September 2022, to bring participants together to compare notes and learnings, and to provide a refresher training in how to identify 10 beetle species. The beetle numbers had been low over winter (as expected), and it was important to remind participants how to identify the species that were going to become active over spring and summer.

A final online meeting was held in May 2023 to share the results with the participants.



Figure 2. First training day at Buffalo

## 2.3 Beetle monitoring method

Participants were given a monitoring kit with the following components:

- plastic tub (to be filled with water up to approximately 1 inch deep)
- wire mesh to sit on top of the tub, and tent pegs to hold it down if necessary
- a cloth mesh bag, to place fresh dung inside, and to sit on top of the mesh
- a strainer to scoop beetles out of the water, two containers to put beetles into until they can be identified, and a hand lens to magnify beetles
- laminated identification sheets with photos of most common beetles in our area
- 12 months' worth of data sheets to fill in



Figure 3. Monitoring kit

Participants were instructed to place the tub in the same location on their property, approximately once a month (during a good weather window) for twelve months, and to fill with water up to 1 inch deep. They would then come back and check the trap 24 hours later (or earlier if it was a really hot day). The beetles were scooped into the plastic containers and taken into a dark space to be identified and counted, before being released outside.

The data sheet (see Appendix 1) recorded the date, weather conditions, the different beetle species present, and the approximate number of beetles within set ranges.

Participants then send the data sheets through to the project managers for collation. The project managers also undertook beetle monitoring on a monthly basis to help fill the gaps between participant monitoring sites.

## 2.4 Online support group

All participants were invited to join an online group using the program Slack. Twenty-three people joined the Slack group, where they shared photographs of beetles trapped, asked questions and supported each other with beetle identification.

## 2.5 Data management

Once participants emailed their data sheets in, the project managers saved these on file and recorded this via a shared spreadsheet. The data was then entered into the spreadsheet and then into the QGIS program. Graphs showing the monthly abundance of each species were created, as well as maps for the presence of each species across the region.

## 2.6 Concurrent dung beetle releases

SGLN and BCLN have also recently undertaken projects to set up dung beetle nurseries at Fish Creek and at Bass, with 1 *Bubus bison* and 1 *Onthofagus vacca* nursery at each location. The nurseries were stocked in April (*B. bison*) and September (*O. vacca*) 2021. It had been hoped that if the nurseries were successful we would have been able to trap surplus beetles and then release them on farms. Unfortunately only a small number of beetles re-emerged in the nurseries, and there was no surplus available for releases. The nurseries are continuing to be monitored over the following season.

In addition, the Dung Beetle Ecosystem Engineers project supplied 9 batches of 200 *Bubus bison* (a winter active species). These were released on farms across South Gippsland and Bass Coast in July 2022, under shadecloth nurseries. We ensured that the locations were at least 2-3kms away from any of our monitoring sites to avoid compromising the data monitoring project.

Landholders were provided with a piece of shadecloth approximately 2m wide x 10m long. They lifted it up off the ground with bricks and weighed the edges down with sleepers, put dung pads underneath and released the beetles before covering it up again. They were asked to feed the beetles 1-2 times/week for 2-3 months until the beetle activity stopped when they went dormant. Participants were asked to place the shadecloth down again in March/April the following year, and to feed and monitor for 2-3 months.

Feedback from the participants indicated the beetles were feeding initially after release, with holes in dung, and the dung being buried. The landholders commented that they seemed to be working away but slowly, and that the weather had been extremely cold and wet. The landholders were reminded in February 2023 that it was nearly time to put the shadecloth back down and start feeding and monitoring.

Responses in May 2023 largely indicated no activity at the shadecloth nurseries. It was hoped that the beetles had dug tunnel and buried brood balls after their initial release, and that their young would emerge in winter 2023. At this stage it seems this has not occurred, although not every landholder has replaced their shadecloth and monitored. It may be that the cold and wet winter of 2022 proved too cold for this species to survive in South Gippsland.

### 3. Results

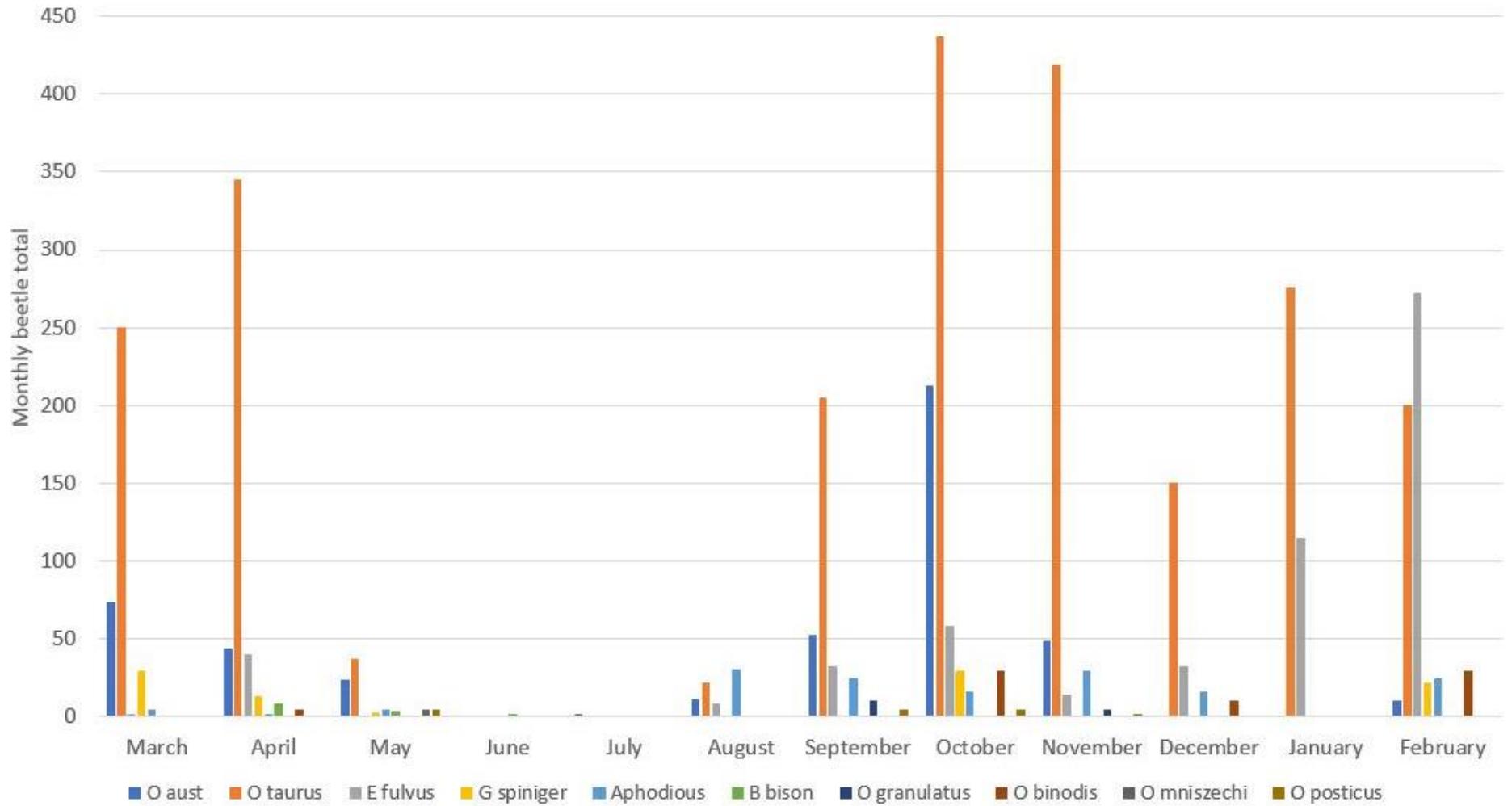
Participants began trapping beetles and sending in their data sheets in March or April 2022, and trapped until February or March 2023. There was significant beetle activity when the monitoring began in March and April 2023, however as the weather grew colder the amount of beetle activity has dropped to almost no activity at most sites. The beetle activity picked up again in August and September and continued over the summer.

The graph below (section 3.1) shows the total number of beetles (for all properties combined) per month, with each column representing a different beetle species.

The following maps (section 3.2 to 3.7) show the geographic distribution of beetles trapped. The circles represent the number of that species trapped over the full 12 months, the bigger and darker the circle, the higher the number of beetles trapped. It is important to keep in mind that some participants didn't trap every single month, for various reasons. This means that if a location has a lower number of beetles, it could be because there weren't many of that species present, or it could be because they didn't trap many times.

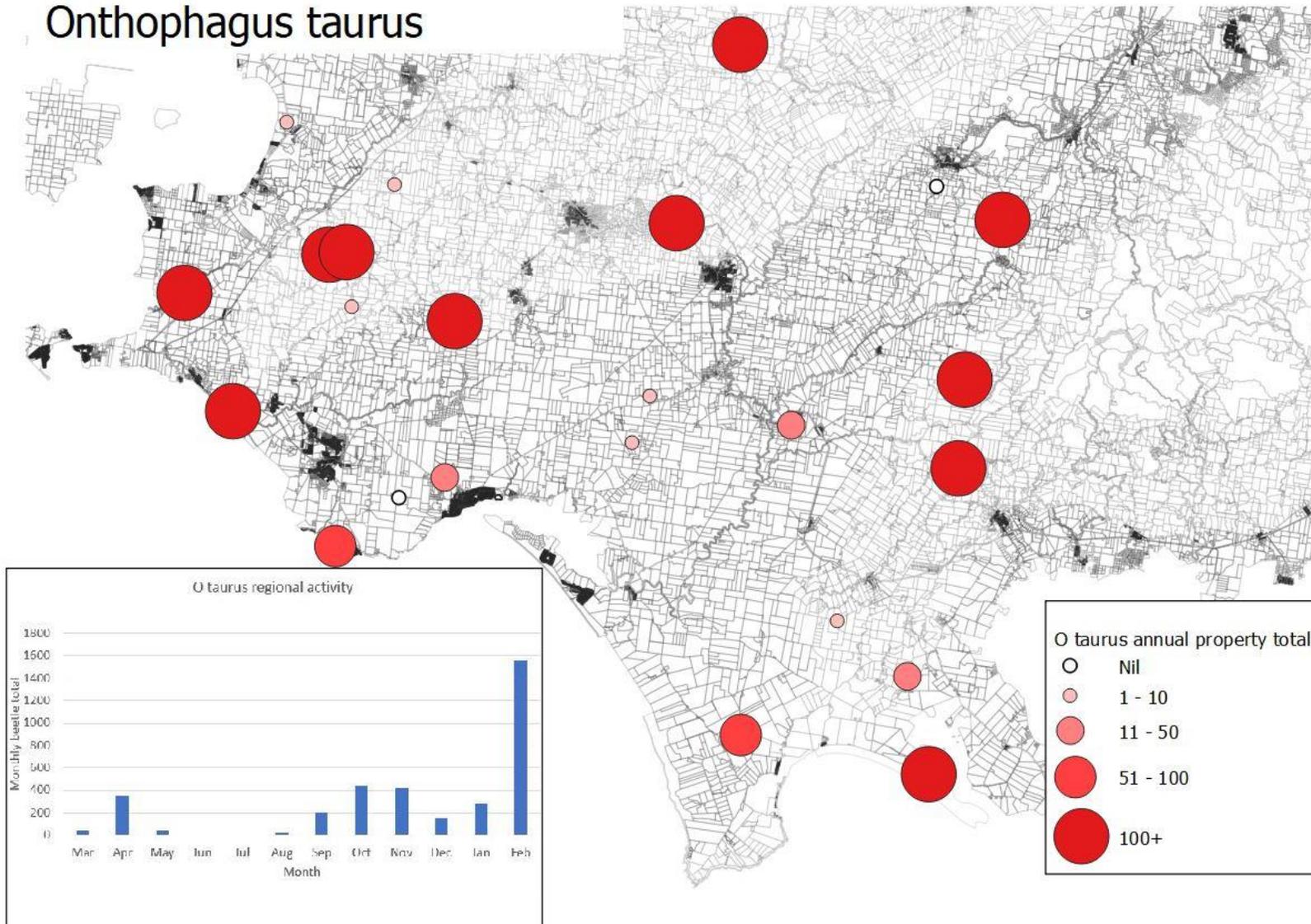
Also, not everyone who expressed interest at the start ended up trapping beetles, hence some locations on the initial map (Figure 1) are represented in the results.

### 3.1 Southern Gippsland Dung Beetle Activity over 12 months 2022-2023



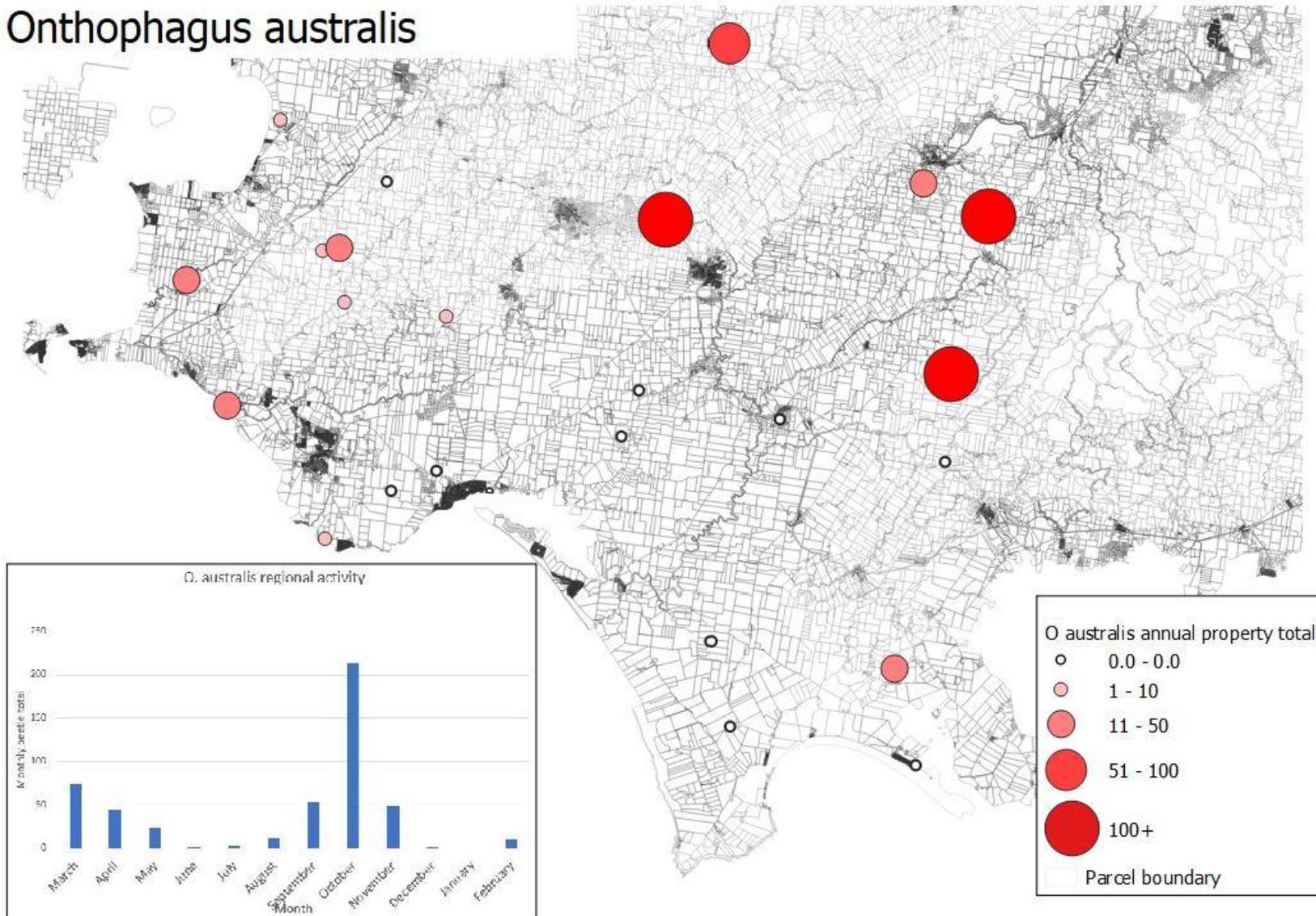
### 3.2 *Onthophagus taurus*

## *Onthophagus taurus*



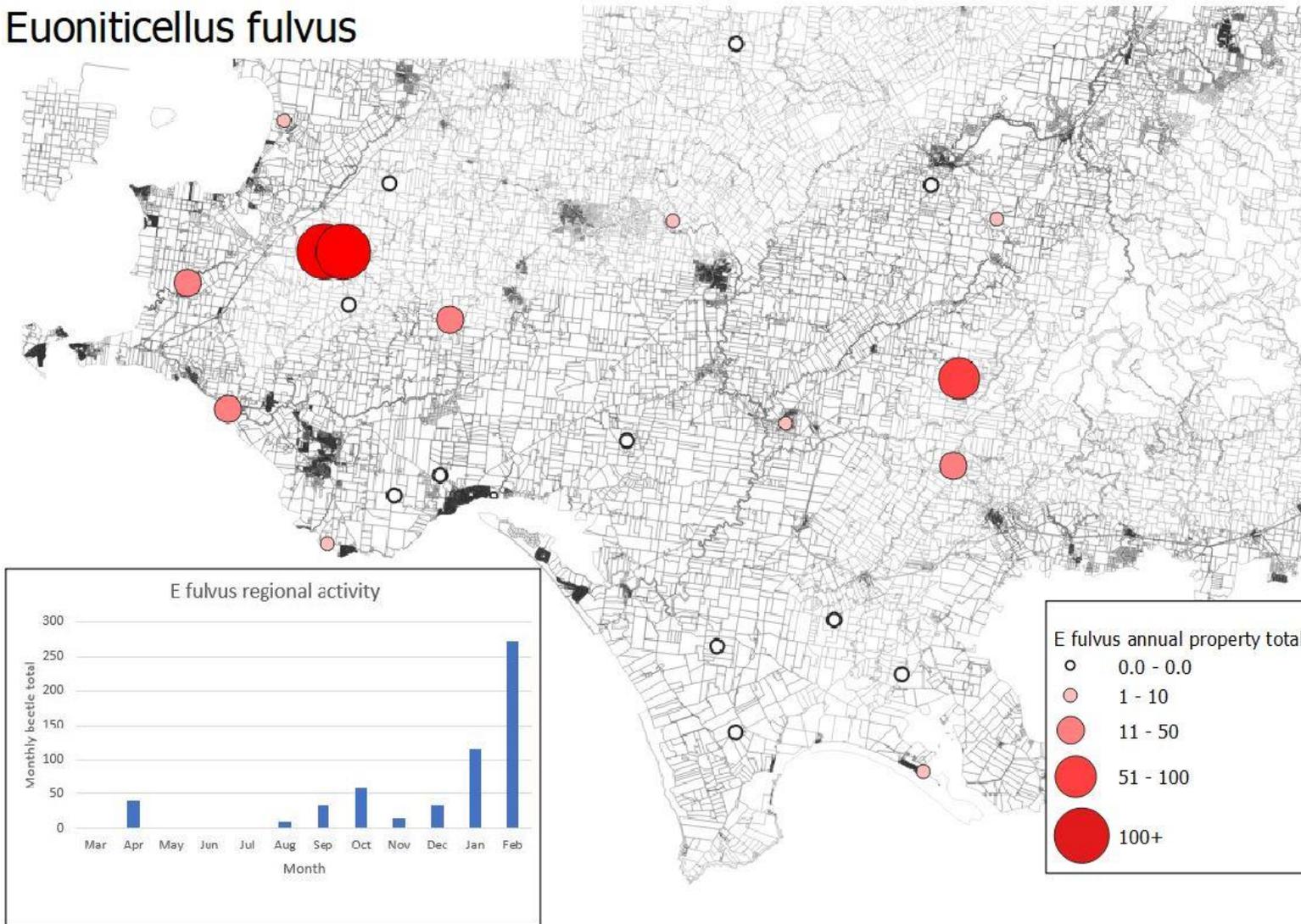
### 3.3 *Onthophagus australis*

## Onthophagus australis



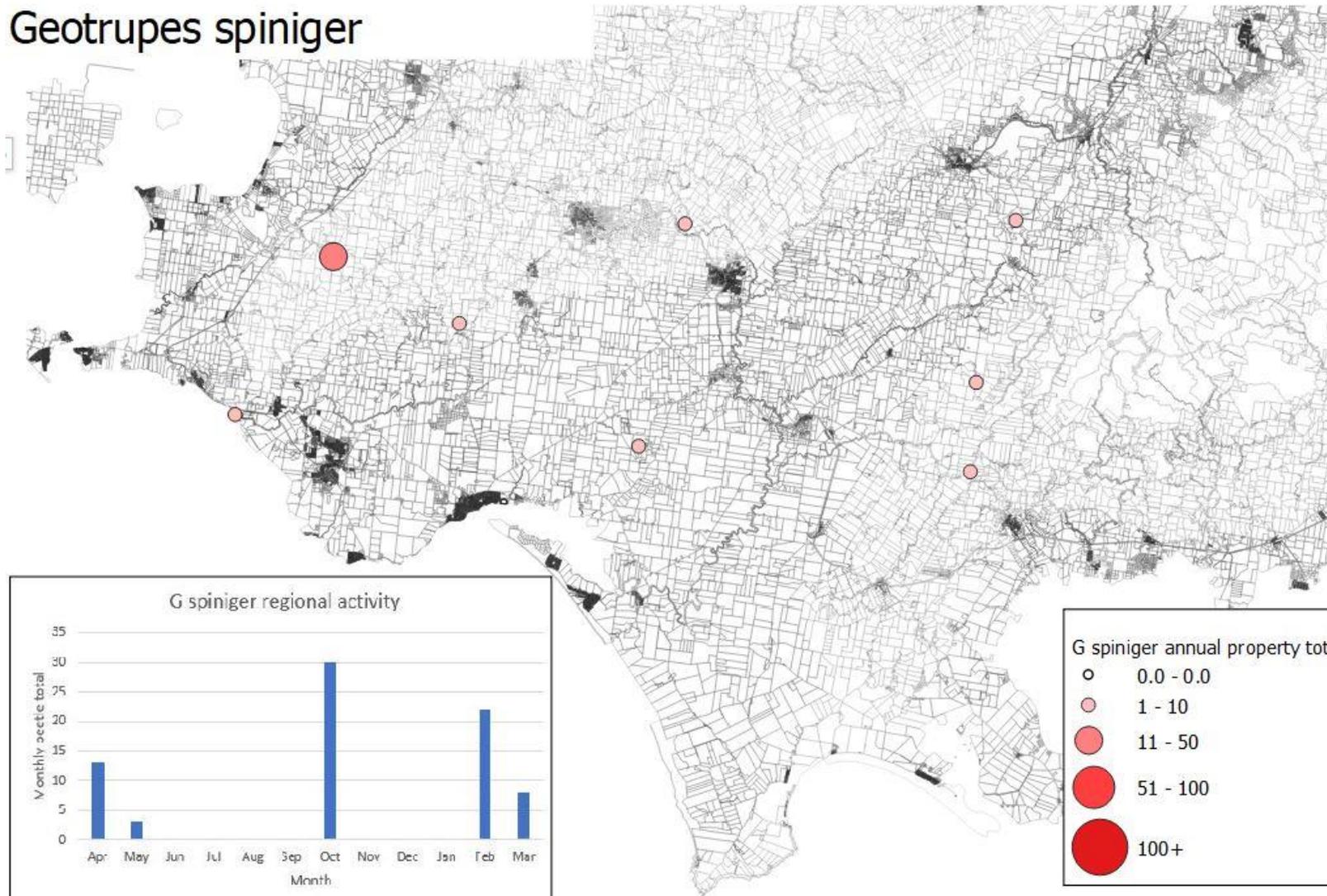
### 3.4 *Euoniticellus fulvus*

## *Euoniticellus fulvus*



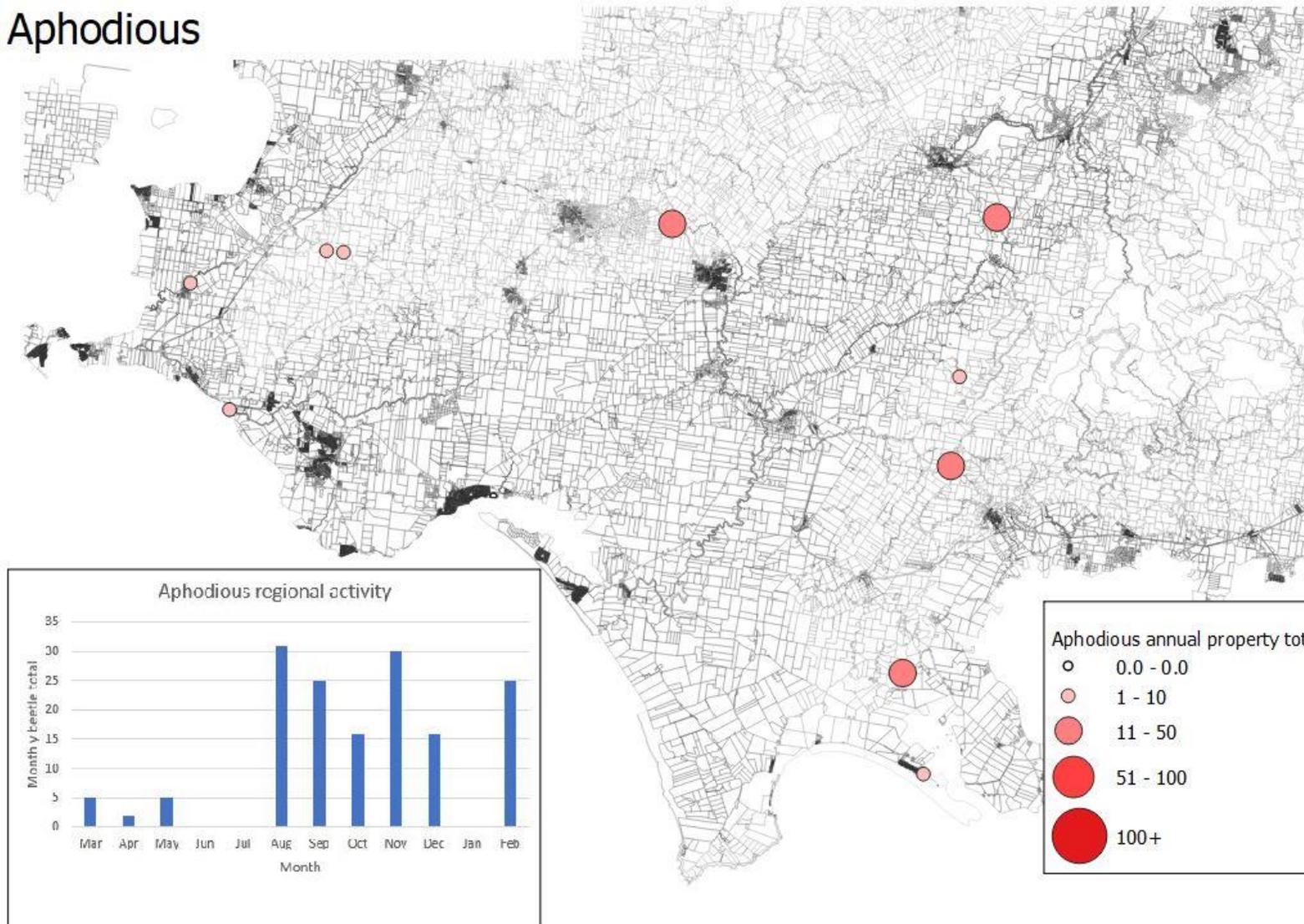
### 3.5 *Geotrupes spiniger*

## *Geotrupes spiniger*



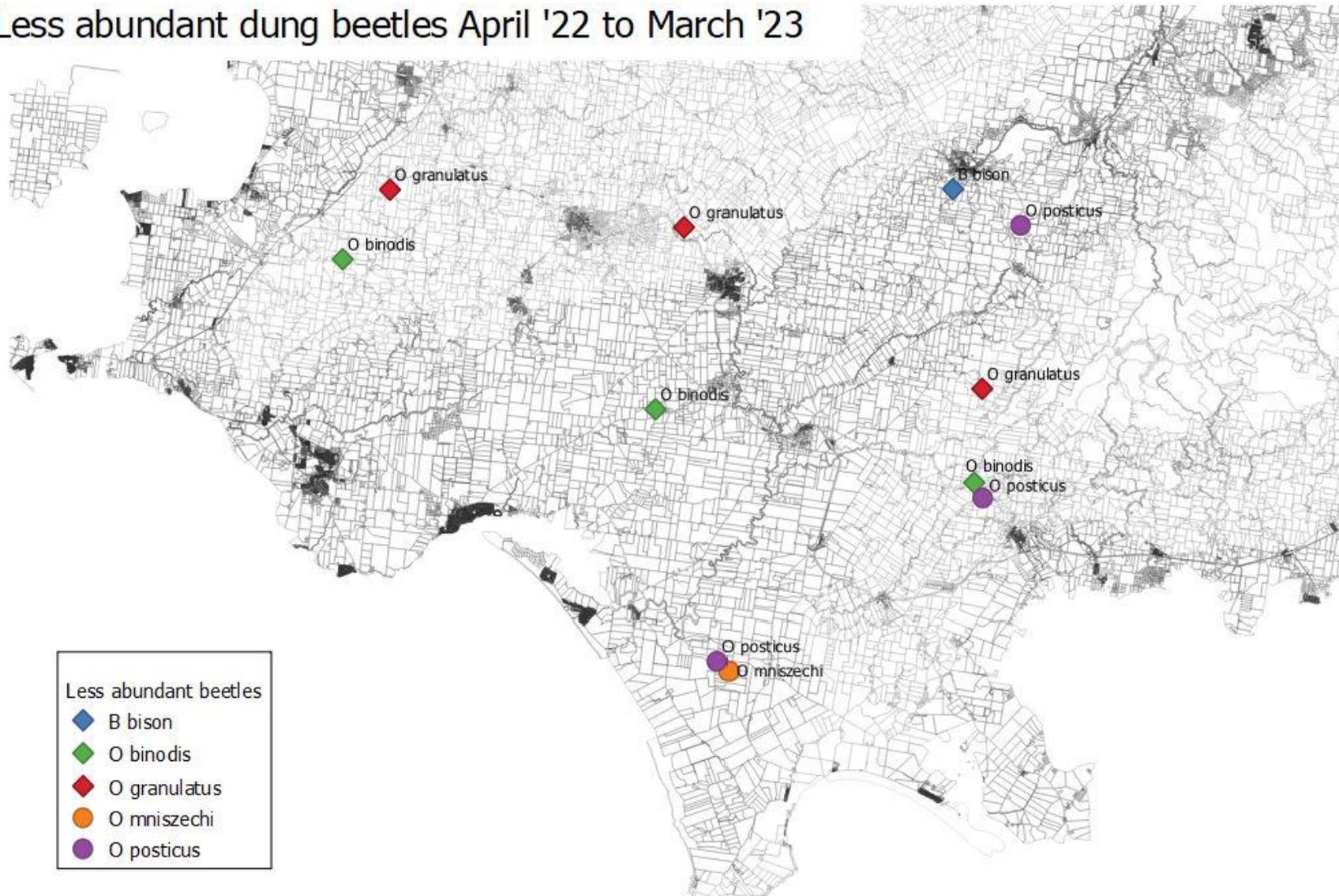
### 3.6 *Aphodius* species

## Aphodious



### 3.7 Remaining less abundant species

#### Less abundant dung beetles April '22 to March '23



## 4. Discussion and conclusion

It is important to note that these results are a snapshot, rather than part of a long-term study. The winter of 2022 was very cold and wet, it is possible if we had carried out the project on a drier warmer year the results could have been different. The results would also have varied due to the weather on the trapping days, and while participants tried to choose the best weather conditions this wasn't always possible.

There are other factors that can affect dung beetles, including drenches used by participants or their neighbours. In addition, the results of what ended up in the trap seemed to vary at times from what landholders observed in dung pats in their paddocks. Sometimes the dung pats seemed to be crawling with lots of beetles, but then only a small number were present in the trap.

The overall combined results of all species (see section 3.1) show there are dung beetles present in reasonable numbers during spring, summer and autumn, but there is little activity in May, almost none in July and August, and little activity again in August. This confirms our suspicion that there are few or no dung beetles active in winter in our region, however they are active earlier in spring than expected.

Despite Landcare carrying out widespread releases of the winter active *Bubus bison* approximately 10 years ago, there seems to be little evidence of this species establishing in the area. One exemption to this is the single participant's property near Mirboo North where they were released 10 years ago, and *B. bison* were trapped during this project. Anecdotal evidence by the landholder states that they are active however not in high numbers, and not burying all the dung present.

Another species that is active from summer into early winter is *Geotrupes spiniger*, a large beetle which is shiny and black on the upper side, and iridescent purple underneath. Our results showed it was trapped from February through to May, and was spread across the region, although in low numbers. More information is needed to determine if it occurs or can survive in June or July in our region. If so, it may be possible to obtain and breed this species in either nurseries or shade cloth nurseries on farms, to try and increase its abundance and geographic spread.

## 5. Acknowledgements

Thank you to the following people for use of photographs: Tash Coleman, Kate McCombie, David Basset, Henry Garcia, Rob Gray and Russ Barrow. We are grateful to Dr Russ Barrow and Graeme Heath from the Dung Beetle Ecosystem Engineers project for their training day presentation, and ongoing support and advice. Thanks also to Greg Dalton for his support with our nurseries and Bernard Daube, John Feehan and Adam Tran for initial discussions about dung beetles.

## 6. References

Dung Beetle Ecosystem Engineers Project website <https://www.dungbeetles.com.au/>

## Appendix 1. Data sheet

Name:					 				
Farm address:									
Date trap put out:			Date trap pulled in:						
Weather last 24hrs	Temp. min:	Temp. max.:	Rain last 24hrs:	Av. wind direction and strength:					
Drenched this month	Yes	No	Drench type:						
Livestock proximity	Adjacent	50-150m	150m+	Dung type:	Cattle	Sheep	Horse	Pig	Other:
ID resource: <a href="http://www.dungbeetles.com.au/species">www.dungbeetles.com.au/species</a>									
Species	Number				M:F	ID confidence			Comments
<i>Eg. Onthophagus taurus</i>	1-10	10-50	50-100	100+	1:6	Certain	Confident	Unsure	<i>eg. 40 / 60 Minor male to major male</i>
	1-10	11-50	51-100	100+		Certain	Confident	Unsure	
	1-10	11-50	51-100	100+		Certain	Confident	Unsure	
	1-10	11-50	51-100	100+		Certain	Confident	Unsure	
	1-10	11-50	51-100	100+		Certain	Confident	Unsure	
	1-10	11-50	51-100	100+		Certain	Confident	Unsure	
	1-10	11-50	51-100	100+		Certain	Confident	Unsure	
	1-10	11-50	51-100	100+		Certain	Confident	Unsure	
	1-10	11-50	51-100	100+		Certain	Confident	Unsure	
	1-10	11-50	51-100	100+		Certain	Confident	Unsure	
	1-10	11-50	51-100	100+		Certain	Confident	Unsure	

Photograph data sheet and email to: [robbie.gray@basscoastlandcare.org.au](mailto:robbie.gray@basscoastlandcare.org.au)  
 Or text photo to Rob 0448 386 724

If unsure about ID, please take photos and send them through to the Slack group or to Rob