



# Slug Management Project - October Update

## GRDC Funded Project

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2024-10-21

### Introduction

Thank you for your help in collecting the data for the GRDC funded National Slug Management project. The purpose of this document is to share slug population monitoring data that is being collected for this project. If you have any questions, please feel free to contact Dr. Kate Muirhead (lead researcher - SARDI), Dr. Thomas Heddle (University of Adelaide), Dr. Kym Perry (University of Adelaide) or Dr. David Logan (University of Adelaide).

This document plots slug population counts and weights for the common agricultural slug species collected at monthly intervals from numerous sites ( $n \sim 30$ ) across nine regions of Australia. Please feel free to share this within your grower group.

### Results to Date

A total of 5,534 slugs have been collected under slug mats across all sites (Table 1). Slugs have been captured in some locations, however the numbers have varied considerably among regions. Given the dry season in parts of Australia, it is not surprising that low slug numbers have been captured in some regions.

*Table 1: Mean slugs captured per mat as a total across the sampling period to date, and the total slug abundance per organisation*

Organisation	Mean	Total
Birchip CG	1.90	1784
Combined Ag Serv.	0.14	62
Elders Albury	0.27	140
MA Nash	2.49	2539
Nutrien Cummins	1.72	516
Riverine Plains	0.73	414
SARDI	0.07	79

## Monthly change in slug population

In Southwest VIC, Wimmera VIC and WA, slugs peaked in June and July, while slug numbers peaked in Riverina Albury NSW, Eyre Peninsula SA and Southeast and SA Mid North in late July/August. We look forward to seeing how the slug population changes across the year and throughout the life of the project.

The Australian threshold for the Grey field slug is 1 slug per mat. If you wish to read the threshold paper written by Nash et al.(2007), please feel free to ask us as we have a PDF version available for distribution.

The figures below show the slug numbers for each species by regions. The y-axis for mean count is different per region, depending on slug number found within the region. Solid lines represent adult slugs and juveniles are represented by dotted lines.

### Black Keeled Slug

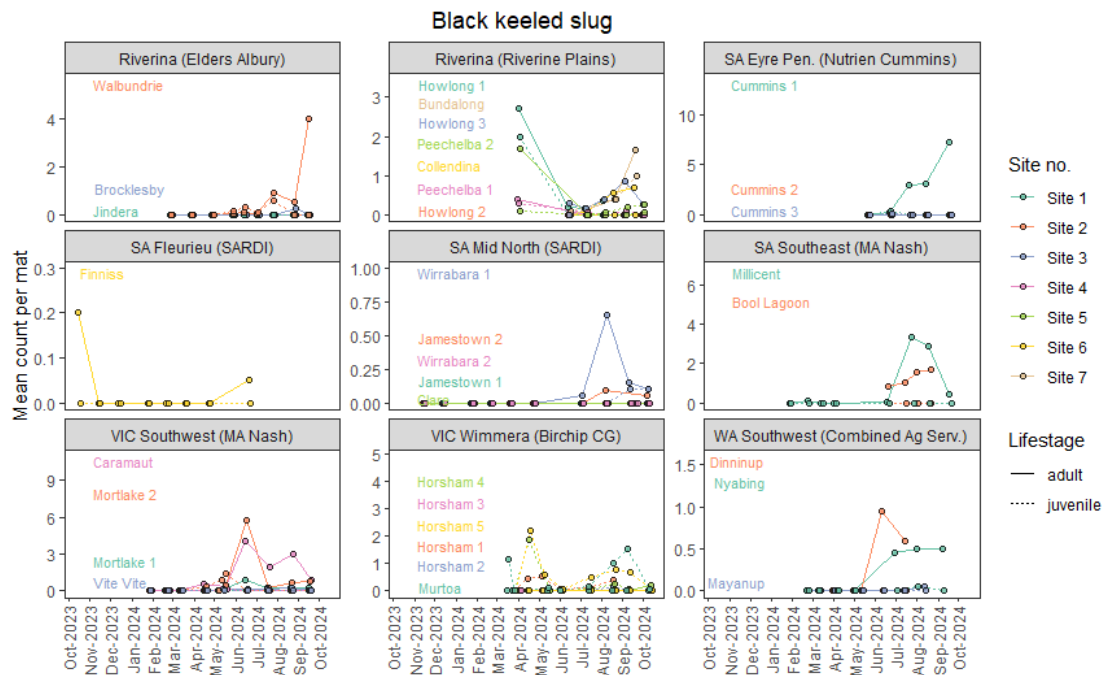


Figure 1: Average Black keeled slug population under mats across all sites.

A total of 1750 black keeled slugs have been caught across all sites. Black keeled slug numbers (Figure 1) have increased across all sites with the highest abundance observed at Eyre Peninsula SA (Figure 1). Subsequent decreases in populations have been in VIC SW, SA Mid North, and the VIC Wimmera after the peaks.

## Grey Field Slug

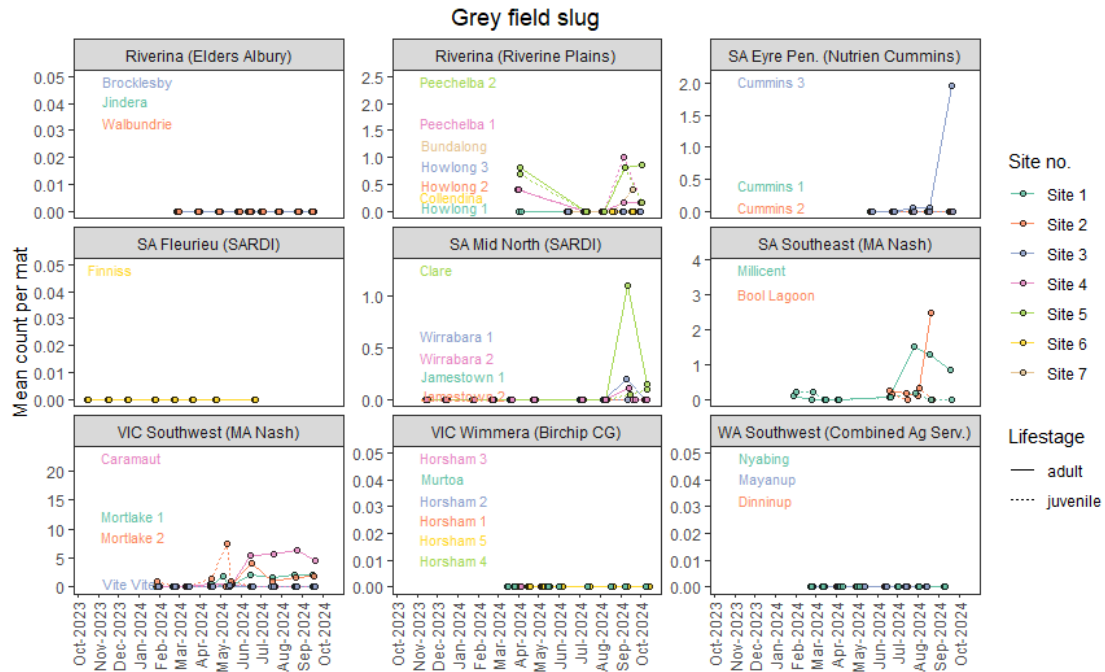


Figure 2: Average Grey field slug population under mats across Australia

A total of 1462 grey field slugs have been caught, with no captures recorded at Elders Albury, SA Fleurieu, VIC Wimmera or in WA. Grey field slugs have increased in SW VIC, SA Eyre Pen., and SA Southeast (Figure 2). Subsequent decreases in populations have been recorded in Riverina and SA Mid North.

## Brown Field Slug

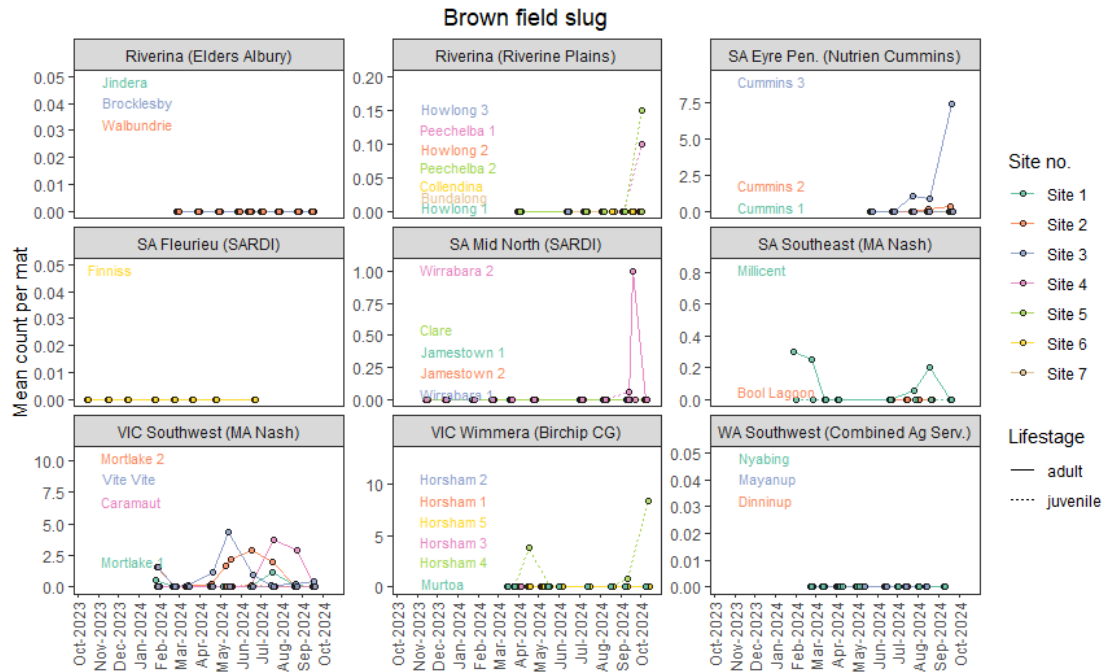


Figure 3: Average Brown field slug population under mats across Australia

A total of 1046 brown field slugs were recorded across the sites (Figure 3). However, this species was not found in the Riverina (Albury), SA Fleurieu, or WA. Brown field slugs were recorded early in the year in SA Southeast and VIC Wimmera before declining over winter (Figure 3). In the VIC Southwest, brown field slug numbers increased over the winter months before decreasing. Increases of this species have been recorded in VIC Wimmera, SA Eyre Pen., Riverine Plains and SA Southeast, with subsequent decreases recorded in the SA Mid North.

## Striped Field Slug

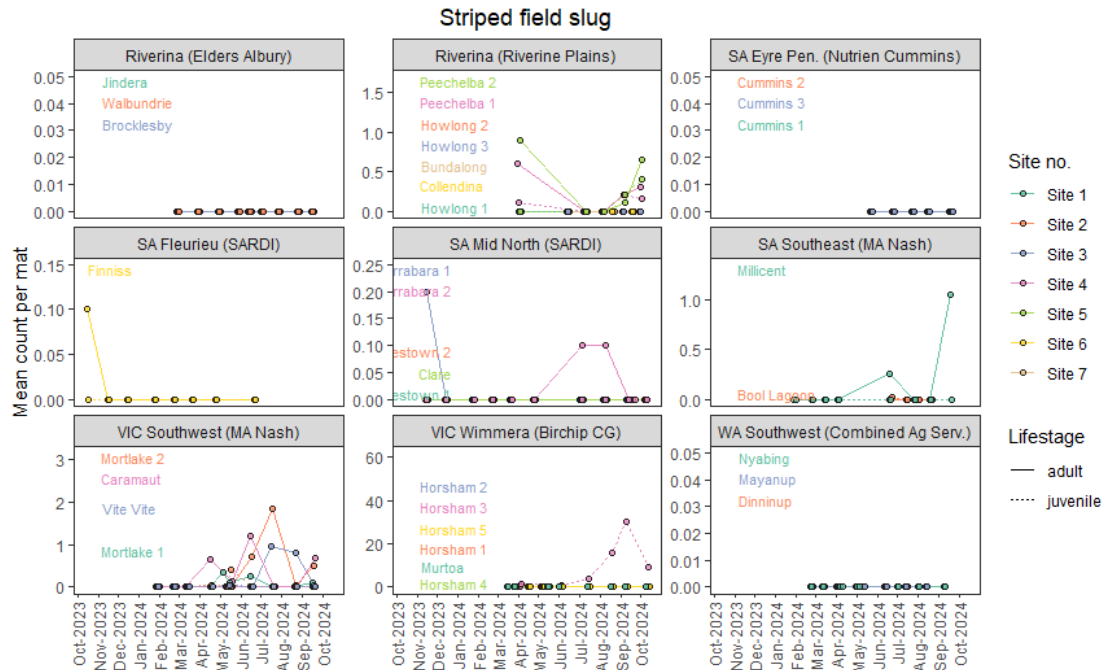


Figure 4: Average Striped field slug population under mats across Australia

A total of 1537 striped field slugs were found across the sites, except in the Riverina Albury, SA Eyre Pen. and WA. Striped field slugs have increased intermittently in SW Victoria, SA Southeast, SA Midnorth, Riverina (Riverine Plains) and the VIC Wimmera. Subsequent declines in species abundances have been recorded in VIC Southwest, VIC Wimmera, and SA Midnorth. The largest increase of striped field slugs was recorded at the VIC Wimmera sites with an average of 37 striped field slugs per mat.

## Average slug weight

Slug weights over time will give us an indication of the reproduction status of the slugs at a given point in time. The summary graph below shows the weights of slugs from all sites. There is a general increase in slug weight for black keeled slugs and grey field slugs, indicating that juvenile slugs are growing into adults. For the striped field slug, the weight has been steady, if not slightly decreasing. The brown field slugs have had a lot of juvenile slugs present in fields with very few adults being recorded.

Table 2: Mean slug weight (mg) per species and total sample size per species

Species	Mean (mg)	Sample Size
Black keeled slug	581.65	978
Brown field slug	167.58	403
Grey field slug	350.25	765
Striped field slug	629.78	506

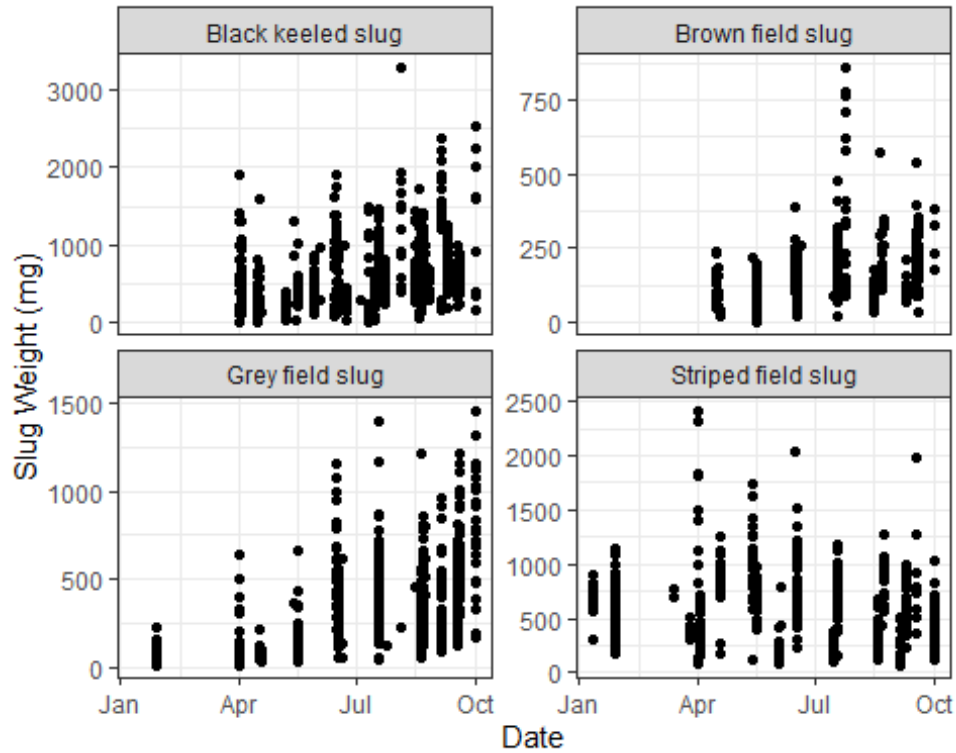


Figure 5: Mean slug weight (mg) per species across all regions

### Interesting Finds

There have been a few interesting finds under slug mats recently. These include biological agents which attack and feed on slugs (and other invertebrates).



The pictures above were taken at the Waite Institute (Adelaide) from under slug mats and during crop walks. This blue/black species of flatworm has been observed feeding on slaters, millipedes and slugs.



This picture of a flatworm comes from Angus at Nutrien Cummins which was found under a slug mat.

Additionally, during the recent spring baiting trials at Yankallila SA, many grey field slugs were observed to have been impacted by microorganisms called ciliates. These ciliates have helped reduce the slug population at this site. Below is a picture from “Infection of Slugs with Theronts of the Ciliate Protozoan, *Tetrahymena rostrata*” by Haites et al. 2021. This picture shows some of the impacts these ciliates have on slugs before the slugs die. Note that the mantle of the slug when it has been infected with ciliates also becomes enlarged and swollen.



**Figure 6.** Slugs exposed to theronts displaying superior tentacle impairment: healthy slug not exposed to theronts; mild, moderate and severely impaired slugs after exposure to theronts.



Additionally, there have been lots of predatory ground beetles being observed under mats in SW Victoria which are associated with lower slug numbers (MA Nash).

If you come across anything interesting, please feel free to send them through to be included in the newsletter.

### **Other Projects**

There are several other research questions currently being addressed at the University of Adelaide and SARDI around slugs. Thomas Heddle is currently working out how to culture black keeled slugs for experimental use and investigating the influence of temperature of slug survival and growth rates. Some of these experiments will help determine the influence of temperature and soil moisture on slug reproduction and activity. Further to this, Thomas is investigating the vertical and horizontal movement of slugs within paddocks.

Spring baiting trials have commenced and will be conducted over the next two years in SA, NSW and VIC in collaboration with Riverine Plains and Birchip Cropping Group.

We will use this space to update you on how these trials progress.

Signing off,

The Slug Team

### **Funding Acknowledgement**

The National Slug Management project is funded by GRDC (DAS000000)



## Useful References

GRDC "Slugs in Crops. The back pocket guide"

[https://grdc.com.au/\\_data/assets/pdf\\_file/0030/578127/240513-Slugs-in-crops-the-back-pocket-guide.pdf](https://grdc.com.au/_data/assets/pdf_file/0030/578127/240513-Slugs-in-crops-the-back-pocket-guide.pdf)

Nash, M. A., Thomson, L. J., & Hoffmann, A. A. (2007). Slug control in Australian canola: monitoring, molluscicidal baits and economic thresholds. *Pest Management Science: formerly Pesticide Science*, 63(9), 851-859.

<https://scijournals.onlinelibrary.wiley.com/doi/pdf/10.1002/ps.1411>