

# THE SITUATION WITH MICE

WHAT'S HAPPENING AND WHAT CAN WE DO ABOUT IT?



**GRDC**  
GRAINS RESEARCH  
& DEVELOPMENT  
CORPORATION



# OUTLINE

- The current situation
- Mouse facts
- Critical considerations in the lead up to sowing
- Creating a mouse un-friendly environment
- Latest research:
  - Baits and their effectiveness
  - Development of remote monitoring
  - Crop Management and mice
  - Population genomics in Australian farming systems



# NUMBERS AND EXTENT

- Central QLD, Darling Downs: high numbers
  - Reports from outside the cropping zone in western QLD
- Northern NSW: Summer crops and cotton being hit hard
- Central NSW: quite patchy but higher than usual numbers cause for concern
- Riverina: high numbers again leading to serious concern
  - Summer crops – supporting high numbers
- Wimmera: many reports of high numbers for this time of the year, but patchy
- SA mallee: high numbers, elsewhere only patchy reports of high numbers
- WA: Ravensthorpe reporting higher than usual numbers

# MOUSE FACTS

- House mouse, *Mus musculus domesticus*, are introduced
- Start breeding when they are six weeks old
- Litters of six to ten pups every 19 to 21 days
- Breeding starts in spring and can continue through to autumn
- Mice need food, shelter (and moisture) to thrive
- If conditions are favourable the rate of increase is dramatic



# SOME UGLY TRUTHS

## Do predators control mice?

- Anecdotal reports of raptors (both nocturnal and diurnal), foxes, cats and snakes controlling mice
- No! The presence of any of these species will not prevent the onset of a mouse outbreak!

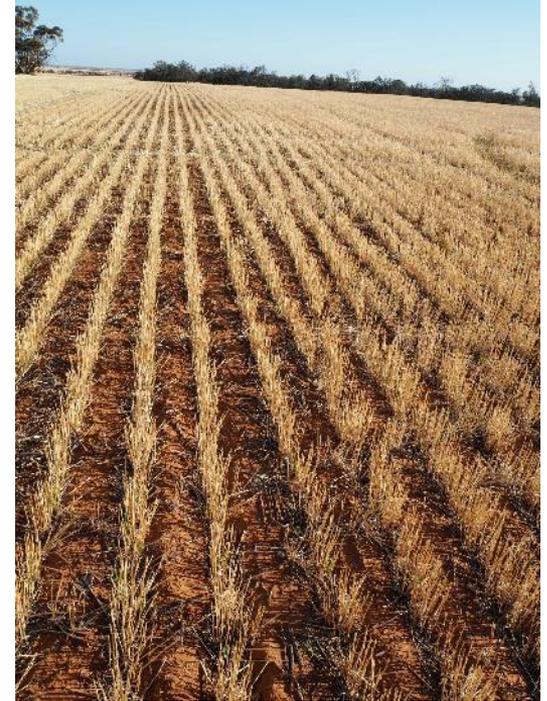
## And while we're at it

- No! There is no '*calicivirus*' for mice



# THINGS TO CONSIDER PRIOR TO SOWING

- Do you know what is happening in your stubbles?
- Are your stubbles all the same?
- How many mice are there?
- Will they still be there when you sow the crop?



# CREATING A MOUSE UN-FRIENDLY ENVIRONMENT

- Residual food – why is it a problem?
- Mice eat 3 grams of food per day
- 22 grains in a gram – therefore a mouse needs 66 grains/day
- 22,000 grains in a kg
- There are frequent reports of significant grain loss
- If harvest loss is 1 tonne/ha that equates to 2200 grains/square metre
- Reduce food for mice in stubbles

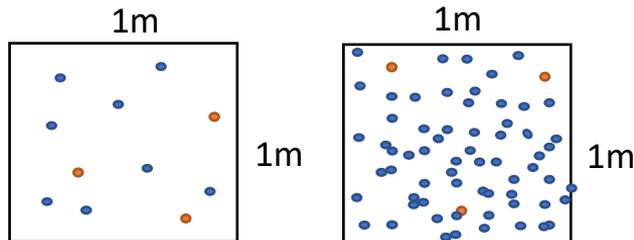


# REDUCING FOOD

- If you have sheep, use them, while conserving cover
- Spray out germinations
- High numbers of mice might reduce food ahead of sowing

## Why is reducing food important?

- Remember 1 tonne/ha equals 2200 grains/square metre
- Zinc phosphide bait is spread at 1 kg/ha or  $\sim 3$  grains/square metre



Bait 1 kg/ha. 2200g/m<sup>2</sup>

# EFFECT OF CROP MANAGEMENT PRACTICES ON MOUSE POPULATIONS

- Conservation tillage results in higher yields, less soil disturbance and continuous cover in paddocks
- Mice live in the paddock all year round and do not move to non-cropped areas as a result of disturbance
- Food (grain) is available both before and after harvest.... But how much?

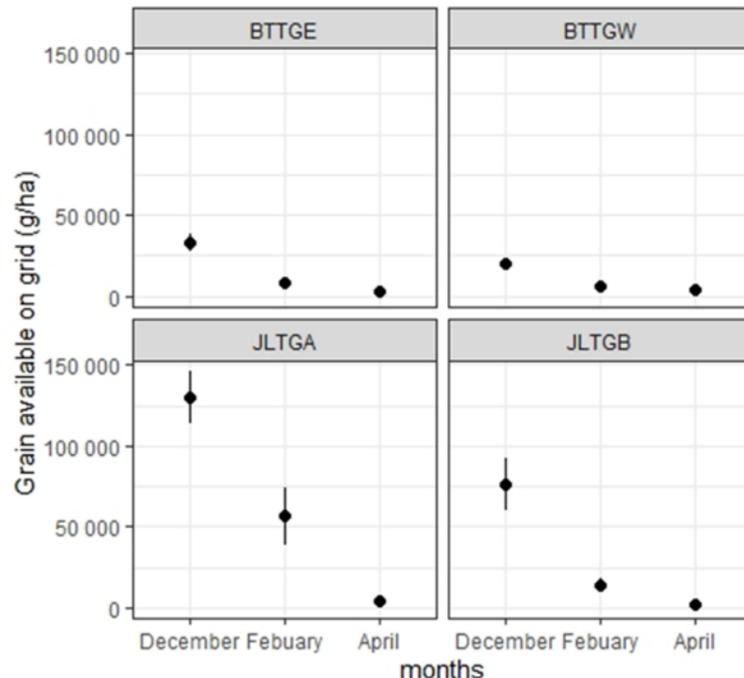


# RESIDUAL GRAIN AVAILABLE TO MICE FOLLOWING HARVEST

We measured up to 150 kg/ha wheat grain left on trial paddocks post harvest



150 kg/ha Mice need ~ 3g per day...  
= 50,000 mouse days of food



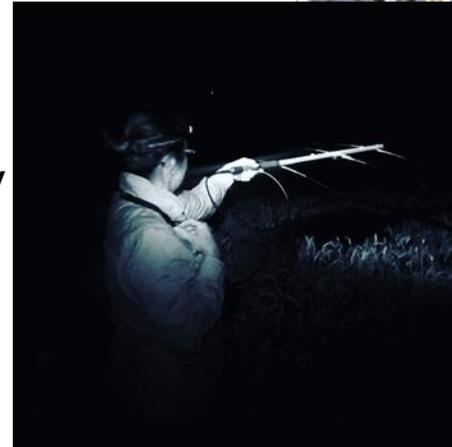
# BAIT RESEARCH IN THE LAB

- If mice are hungry, they are more likely to eat a lethal dose
- Aversion is rapid
- Reduce residual food to give mice the best chance to discover the bait



# DO ANIMALS REMAIN IN PADDOCKS POST HARVEST?

- 26 animals radio-collared and released prior to harvest (November 2020)
- Two weeks post harvest determined if animals were still present and residing in the same locations (December 2020)
- $\geq 90\%$  of animals with transmitters remained resident following harvest
- Several were re-trapped in January and February
- And populations are increasing...



# REMOTE MONITORING DEVICES

- Current monitoring efforts are labour intensive, limited scale; not good enough
- Plan to use devices to monitor changes in mouse activity on a broad scale, year round
- Potential for cost effective real-time monitoring across all cropping regions



# MOUSE POPULATION GENOMICS IN AUSTRALIAN AGROECOSYSTEMS

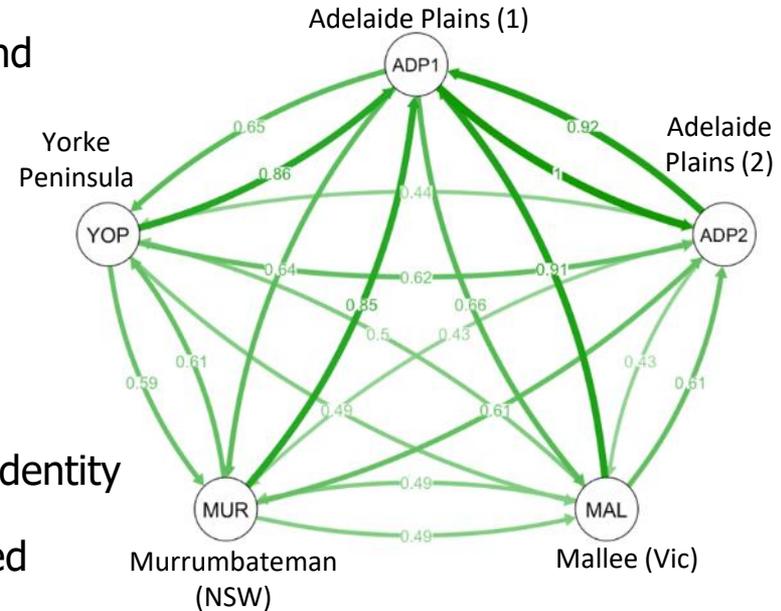
Developing next generation DNA tools to support management decisions

We aim to better understand:

- the geographic extent of mouse populations
- the impact of different land cover on gene flow within and between regions
- how to identify sources of new mouse outbreaks
- kin structure effects on population stability (PhD project)
- predicting feasibility of new conventional/biocontrol tools

# EFFORTS TO DATE

- Designed sampling scheme using 'rapid assessment' and benchmark monitoring sites
- Completed pilot study to evaluate GigaMUGA genotyping array (>141K genomic positions)
- Inferred relative migration rates between 5 sampling sites in NSW, VIC, and SA
- Confirmed predominant *M. m. domesticus* subspecies identity
- Known resistance alleles for anticoagulants not detected



# THE FUTURE

## To achieve more strategic control of mice

- Pen trials of bait uptake against different levels of residual food
- Damage assessment at sowing
- Understanding the impact of different cropping practices:
  - Straw removal
  - Seed destroyers



# SUMMARY

- Monitor your stubbles for mice
- Reduce residual food
- Be prepared to bait
- Bait is most effective when there are low levels of residual food
  
- There is a suite of GRDC investments underway aimed at minimising the impact of mice in crops

# ACKNOWLEDGEMENTS

The GRDC for their investment in this intractable problem

- Mouse management group
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- Collaborators - Central West team; Birchip Cropping Group
- Farmers who have allowed us to access their paddocks for research on mice

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