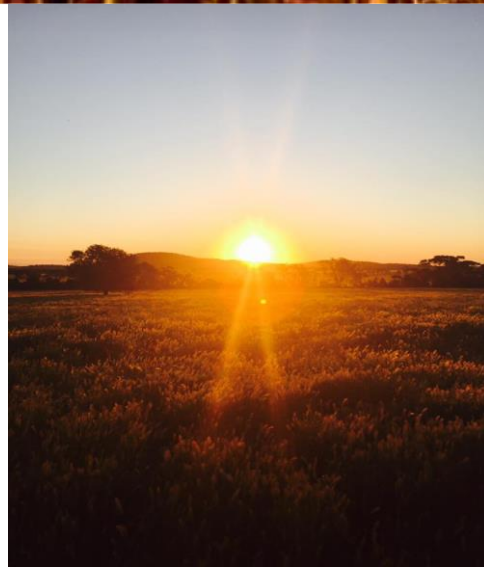


Reconnecting Fragmented Agricultural Landscapes Project

May 2016; Issue 2

Fenner School of Environment and Society, Australian National University & the Central Tablelands Local Land Services



Thank you everyone, for an amazing field and lab season!

As most of you would know, field and lab work has finally wrapped up for the respective projects!

We cannot thank you enough for your hospitality and assistance throughout the project, and we very much look forward to sharing our results in the coming months.



REPTILES ON THE MOVE!

DISCOVERING MOVEMENT PATTERNS IN RESPONSES TO
CHANGES IN LAND MANAGEMENT

PROJECT UPDATE FROM NICOLE HANSEN (nicole.hansen@anu.edu.au)



GECKO STATS:

- *G. VARIEGATA* LIVES AT 8 SITES OUT OF 11 SITES
- 109 GECKOS TRACKED (AROUND 50 RADIOTRACKED) BEFORE AND AFTER HARVEST
- 784 PLASTICINE MODELS USED FOR CAMERA/PREDATION EXPERIMENT
- MORE THEN 30,000 HRS OF FOOTAGE

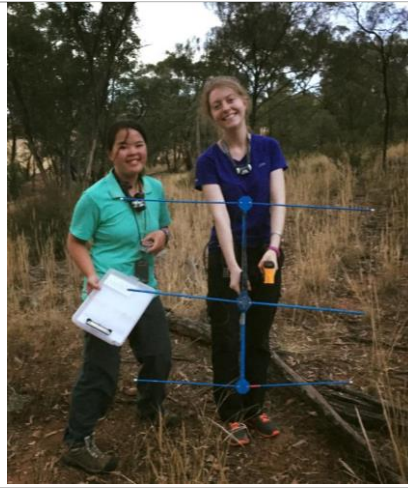
To recap, my first season (2014/2015) of broad-scale surveys examined how different land management effects the distribution/abundance of reptiles, frogs and small mammals. My second field season (2015/2016) focussed on the movement behaviour of a gecko species, that likes very specific habitat features, and I wanted to understand how they respond to changing conditions brought about by agricultural land-use.

To understand movement patterns the species of choice was *Gehyra variegata*, or Tree Dtella, a widespread, arboreal gecko that likes native vegetation and is highly territorial. From my fieldwork in the first season, I knew they occasionally ventured into the matrix (or the non –habitat areas) so they were the perfect candidate to test the influence of the “edge” on behaviour.

Two methods were used to understand movement: radio-tracking and fluorescent powder tracking.



Transmitter placed on an adult gecko. Note these transmitters are temporary and fall off when the animal sheds its skin



Volunteers showing the radio-tracking gear to track geckos



A fluorescent powder coated gecko under UV light.

Animals move around the landscape for a variety of reasons, for shelter, food, to find mates or to avoid being eaten. The risk of death, particularly predation, affects the willingness of an individual to move and the likelihood of reaching a new patch. There are a number of potential predators at the field sites including foxes, cats, house mice, snakes, other lizards, raptors, and other birds. Using plasticine replica models of my gecko species, and cameras to identify predators, I examined whether the risk of predation changes among the different land management types.



Camera set-up in pasture, with gecko models on the left



Close-up of gecko models



Camera shot of a fox having a snack on a gecko model



BEETLE UPDATES FROM THE LAB

ANALYSING A HUGE DATA SET FROM THE FIELD

PROJECT UPDATE FROM KAT NG (katherina.ng@anu.edu.au)




I'm pleased to report I've finished processing my beetle data earlier this year, after a year of peering through the microscope. This was achieved with valuable help from a few volunteers (which I'm extremely grateful for), support from the CSIRO Australian National Insect Collection (ANIC), and lots of patience!

A total of 11360 individual beetles was collected, which comprised 495 species from 53 families. The majority of species caught were detritivorous scarab beetle (Scarabaeidae, 70 species), predatory ground beetle (Carabidae, 63) and rove beetle

BEETLE STATS:

- 11360 INDIVIDUALS COUNTED
- 495 SPECIES FROM 53 FAMILIES
- DISCOVERED 2 NEW MILLIPEDE SPECIES, IN THE PROCESS!
- BEETLES ARE MOVING THROUGH ENTIRE LANDSCAPE
- DATA WILL INFORM FARM & BIODIVERSITY MANAGEMENT

(Staphylinidae, 57), followed by herbivorous weevils (Curculionidae, 53) and darkling beetle (Tenebrionidae, 36) family groups. These numbers represent one of the largest studies of its kind, and will contribute to one of the largest collections from the Lachlan region. I am now very excited about analysing this comprehensive dataset after the intense lab work.

		
<p>Vials of collection of beetle voucher specimens, preserved in 70% ethanol.</p>	<p>Magnified rear view of a new millipede species/genus. The reproductive structure of the mature male shown here is important for distinguishing a species (photo by R Mesibov).</p>	<p>Display of pin-mounted and labelled beetle specimens that were demonstrated at the YLAD Biodiversity Field Day.</p>

While being sidetracked in the lab, I've discovered that I've caught three new and undescribed species of millipedes from the native remnant and revegetated sites (Barellan, Ardlethan, Wombat) (Family Polydesmida: Paradoxosomatidae). Two species have not been seen before and one of those looks like a new genus according to taxonomists Dr Bob Mesibov and Dr Cathy Car. These specimens have been sent to the Queen Victoria Museum and Art Gallery, Launceston, Tasmania. This is exciting news, but not unexpected given how little we know about the ecology and distribution of many invertebrates in Australia.

As for the data, beetle species richness varied between 0 and 26, and total abundance between 0 and 236, across the 440 sampled areas. Preliminary findings, for a subset of traps at 200 metres inside each habitat, show that species richness was generally higher in plantings and farmed areas compared to the remnant patch, with revegetated areas having higher numbers in summer than in spring. Beetle abundance was more constant in the remnant patch and plantings, compared with the crop and fallow habitats. After harvest in summer, abundance was much lower in the crop, and slightly higher in fallow paddocks.

The devil will be in the details. I will need to analyse differences in the community structure and movement patterns between these habitats. In particular, is the composition of beetles between the remnant patch and farmland different (likely)? Which species or traits (e.g. shape, size, dispersal ability, feeding ecology) are exclusive to a particular habitat, are colonising the mulch or plantings, and which are dependent on the remnant vegetation? I will also determine what aspects of the habitats (vegetation, microclimate, etc.) might be influencing their movement across the habitat boundaries.

So far, my results suggest that for beetle biodiversity, we need to look at the whole landscape because many species may be frequently moving across different habitats. It's not just specific areas of woodlands and plantings that are important – how we manage the surrounding farmland can also have an impact on both beneficial and pest species as well as native patch-dependent invertebrates. Pesticide spraying at certain times, for example, can be detrimental for native species and natural enemies of crop pests. For example, the bigger, predatory and non-flying carabids I've found appear to be foraging in the crop in spring, but may need shelter in adjacent native vegetation over summer.

The next stage of my project is to conduct formal analysis of the huge beetle data set to try to discover detailed movement patterns (e.g. are beetles moving to and from the remnant native vegetation or biodiversity plantings at certain times?) and unravel the ecological mechanisms that may be driving these patterns. I look forward to sharing my findings later this year.



Some macrophotography shots of predatory carabid species from the Lachlan catchment. Left: Green carabid beetle (*Calosoma schayeri*); Right: *Scaraphites* sp. Carabids are effective in the biological control of many invertebrate pests such as caterpillars and slugs. They are fast-moving nocturnal predators with excellent vision and strong jaws. Carabids are often used as environmental indicators of undisturbed habitats.

COMMUNICATING OUR WORK

On October 2015, Kat gave her first “paddock talk” at the YLAD Biodiversity Field Day in Young, attended by over 100 farmers and producers. She was able to show them a collection of some of the pest and beneficial beetles that were caught, as well as the location of one of our field sites.

Photo right: Kat speaking at the YLAD Biodiversity Field Day in a field site in Young.



HOW DOES MATRIX MANAGEMENT INFLUENCE CONNECTIVITY FOR HERPETOFAUNA?



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LITTLE LEFT TO LOSE...

- To maintain biodiversity in agricultural landscapes, millions of dollars are expended annually on habitat restoration and corridor establishment.
- These expensive conservation actions hinges on **unconfirmed assumptions** about how animals move through landscapes.
- With growing pressure to increase agricultural production, it's a national



EXPERIMENTAL DESIGN

STEP 1: Reveal sites (orange line) - Fresh Young, Orerford and Kings, NSW

PRELIMINARY FINDINGS

- Significant decline in reptile abundance and diversity on the cropping treatment, post-harvest (Fig 1 a & b).
- Planting contain higher abundance of herpetofauna compared to woody and rested post-harvest (Fig 1 a, b & c).
- No significant differences in frog richness (Fig 1 c).

(a) T1

Nicole presented a poster (*photo of poster on the left*) at the Biodiversity Dreaming conference in Bathurst on November 2015, summarising her results from a very preliminary analysis of her first season data.

WHAT'S NEXT...?

- ❖ Substantial analysis of the field data, which will take a number of months
- ❖ Findings will be written up and presented when available
- ❖ Contact Nicole or Kat if you have any queries in the meantime (emails above)

SPECIAL THANKS TO OUR RESEARCH PARTNERS:



Local Land
Services
Central Tablelands

