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## Avon Biodiversity in Grain & Graze

There are 47 farms from 9 mixed farming regions across Australia participating in the Biodiversity in Grain and Graze project (BiGG) project. The Avon is one region in WA, with 6 farms in the BiGG project. Each farm has 4 paddocks monitored in autumn and spring for 2006 and 2007. Each paddock has a different level of disturbance or treatment; crop, pasture (rotation), perennial pasture (grazed) and remnant vegetation.

The Biodiversity in Grain and Graze project (BiGG) aims to answer three key questions on the relationship between agriculture and biodiversity in the mixed farming zones.

1. The extent to which farm scale measures of biodiversity are related to agricultural production.
2. The influence of the type and intensity of agricultural management on native biodiversity on farms.
3. The relative influence of site and system features on selected measures of biodiversity.



*"Biodiversity is the variety of life, its composition, structure and function at a range of scales"*

*Freudenberger and Harvey (2003).*

## 2006 Results

Twelve months into the BiGG projects we are starting to see some of the foundation data emerge. We now have a list of birds, ants, beetles and spiders occurring in each paddock for all six farms. The cotton strips have been tested for biological activity in the soil. At each site the vegetation was assessed for its composition and percentage cover.

But the relationships between species are yet to be made. We hope to be able to answer the questions like; how healthy is my farm? What do I need to do to maintain biodiversity on my farm? The answer to these questions should provide us with Best Management Practice recommendations.

## Insects

Pitfall trapping has been used to quantitatively survey ants, beetles and spiders for each paddock across all six farms and to compare the invertebrate communities at different sites or in different habitats. This method is a reliable and well-established for collecting ground dwelling invertebrates because of its simplicity and ease of operation.

A total of 240 invertebrate samples (40 per farm) are sent across to University of Tasmania for identification after each monitoring period. In the autumn 2006 samples the Avon had 180 different invertebrate species identified, more than any other region in the project (table 1). Because there are more insects in the Avon it doesn't tell us how many are pest, native or beneficial.

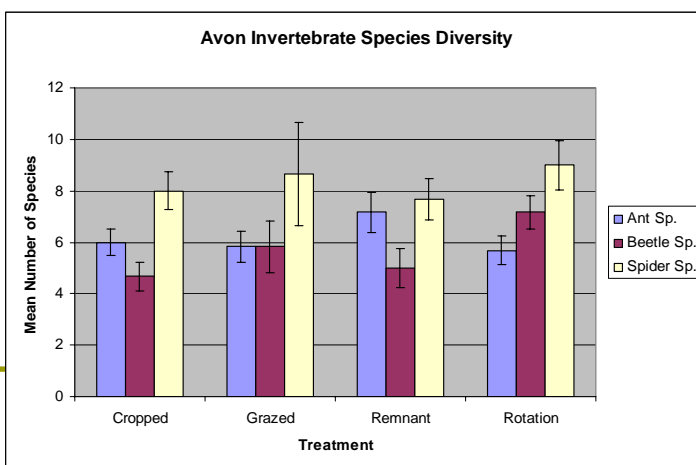
What influence does agricultural management have on the insects on the farm?

*Just because there are more insects in the Avon it doesn't tell us how many are pest, native or beneficial.*

Table 1. Diversity of invertebrate species across all regions participating in the BiGG project.

| Region               | # farms | # different invertebrate species |
|----------------------|---------|----------------------------------|
| Avon                 | 6       | 180                              |
| Eyre Peninsula       | 10      | 150                              |
| Northern Ag Region   | 5       | 93                               |
| Murrumbidgee         | 5       | 71                               |
| Mallee               | 4       | 68                               |
| Border Rivers        | 5       | 67                               |
| Corangamite          | 5       | 51                               |
| Lachlan/Central West | 2       | 49                               |

## Beetles, Ants & Spiders



The ground surface active invertebrates identified by University of Tasmania include beetles, ants and spiders (figure 1). The autumn 2006 species counts showed there was no difference in the spiders, more ants in the remnant vegetation and more beetles in the rotation (annual pasture).

The beetles can be broken into 3 functional groups; predators (insect eating), herbivores (plant eating) and detritivores (litter feeding). Both native and introduced species have occurred in the sites with the Order Coleoptera (Beetles) being the most diverse of all insects.

Figure 1. Avon invertebrate species diversity autumn 2006.

## Birds

Each site is surveyed for birds using the Birds Australia Atlas technique during the year; autumn, winter, spring and summer. This involves searching a 2 hectare area for 20 minutes, recording all birds that are seen in the area. This is undertaken for each paddock treatment either early in the morning or late evening by a consulting ecologist. The remnant has the most sightings in both autumn and winter of 2006 (figure 2).

The most commonly sighted birds were Ringneck, Yellow-throated Miner, Crested Pigeon, Raven and Magpie (table 2). There are 8 priority species that could be lost from the landscape if nothing is done to protect and enhance their habitat. We now need to find out what each bird is doing in each of the paddocks (eating or nesting)?

This will then define their relationship with the insects, soil biology and vegetation being monitored and how agricultural practices influence bird sightings.

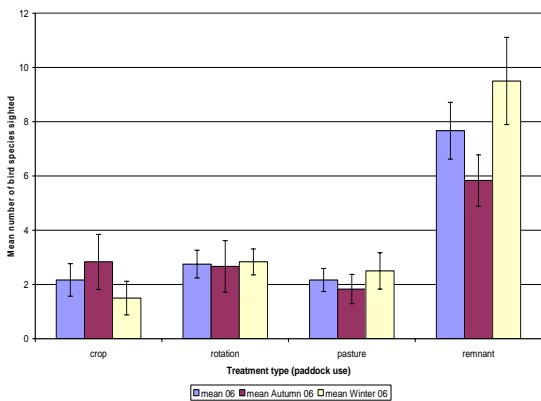


Figure 2. Mean number of bird found in paddocks of different land use in the Avon region 2006.

## Fungi

Some of the cotton strips from each paddock were tested for the presence of fungi. The fungi spores were grown out in the lab so that decomposer fungi can be identified and any differences between paddocks, farm and regions can be identified (figure 3). This will give us an indication of the soil biological activity.

What does this mean for production and biodiversity?

Table 2. Frequency of birds sighted across all paddocks for all farms in the Avon region (autumn and winter 2006)

| Birds                     | # sighted | Conservation Status |
|---------------------------|-----------|---------------------|
| Australian Magpie         | 10        | Farmland            |
| Australian Raven          | 10        | Farmland            |
| Australian Ringneck       | 22        | Farmland            |
| Australian Shelduck       | 4         | Farmland            |
| Australian Wood Duck      | 1         | Farmland            |
| Banded Lapwing            | 2         |                     |
| Black-faced Woodswallow   | 3         |                     |
| Black-shouldered Kite     | 1         |                     |
| Brown Honeyeater          | 3         | Priority            |
| Chestnut-rumped Thornbill | 2         | Priority            |
| Common Bronzewing         | 2         | Remnant dependant   |
| Crested Pigeon            | 10        | Farmland            |
| Elegant Parrot            | 4         | Farmland            |
| Galah                     | 7         | Farmland            |
| Grey Butcherbird          | 4         | Remnant dependant   |
| Grey Fantail              | 3         | Remnant dependant   |
| Grey Shrike-thrush        | 3         | Priority            |
| Horsfield's Bronze Cuckoo | 1         | Priority            |
| Magpie-lark               | 7         | Farmland            |
| Nankeen Kestrel           | 4         | Farmland            |
| Painted Button-quail      | 2         | Farmland            |
| Pallid Cuckoo             | 1         |                     |
| Peregrine Falcon          | 1         |                     |
| Pied Butcherbird          | 1         | Farmland            |
| Red Wattlebird            | 2         | Remnant Dependant   |
| Red-capped Robin          | 3         | Priority            |
| Regent Parrot             | 3         | Priority            |
| Richard's Pipit           | 7         | Farmland            |
| Rock Dove                 | 1         |                     |
| Shining Bronze-Cuckoo     | 1         |                     |
| Singing Honeyeater        | 4         | Remnant Dependant   |
| Spiny-cheeked Honeyeater  | 2         | Priority            |
| Striated Pardalote        | 3         | Priority            |
| Tree Martin               | 4         | Farmland            |
| Weebill                   | 2         | Remnant Dependant   |
| Welcome Swallow           | 2         | Farmland            |
| Western Gerygone          | 3         | Remnant dependant   |
| White-browed Babbler      | 1         | Remnant dependant   |
| White-gaped Honeyeater    | 1         |                     |
| White-fronted Chat        | 7         | Farmland            |
| White-winged Fairy-wren   | 3         | Remnant Dependant   |
| Willie Wagtail            | 5         | Farmland            |
| Yellow-rumped Thornbill   | 2         | Remnant Dependant   |
| Yellow-throated Miner     | 11        | Farmland            |
| Zebra Finch               | 2         |                     |



Figure 3. Fungi grown out from cotton strips.

## Soil Biological Activity

To understand how biologically active soils are can be a costly and time-consuming activity. There are however several simple tests that can be undertaken to estimate and compare soil biological activity between sites and regions. The decomposition rate of cellulose in soil is one such surrogate measurement of biological activity. The method of measuring decomposition used here consists of vertically inserting pieces of cotton fabric into the soil and leaving them to degrade over a two week period. The amount of decomposition can be measured in three ways:

1. A visual inspection of the cloth to establish the extent of discoloration and degradation;
2. By pulling the fabric apart, the loss of tensile strength from the strip fibres can be measured;
3. By measuring the amount of cellulose remaining.

If the cotton strip takes little force to break then the cellulose eating organisms are working harder and the cotton strip has begun to decay. If the cotton strips takes the same amount of force as a non buried one then the cellulose eating organisms haven't done anything. The higher the force the less biological activity has taken place. It would appear that the cropped sites have more biological activity in the soil than the remnants (figure 4).

How does paddock treatment relate to diversity of these cellulose eating organisms?

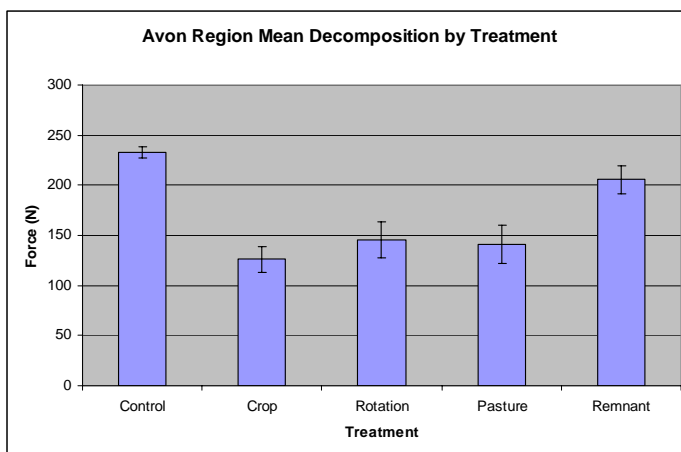


Figure 4. Mean decomposition of cellulose for the Avon region, autumn 2006.



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