

Monitoring Dung Beetles on Gippsland Beef and Livestock Farms

Cannibal Landcare Group 2018



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Summary

The aim of this three-year demonstration was to monitor dung beetle survival rates and activity after being introduced to beef, sheep and horse properties managed by Cannibal Landcare Group members. The group also wanted to improve the sustainability and profitability of their farms, and their neighbours' farms, through the introduction of dung beetles.

The farms in this study included cattle, vealer and dairy heifers, and mixed cattle and sheep enterprises.

A colony of *Bubas Bison* (winter active) dung beetles were introduced to six properties in early winter 2015 and again in June 2017. The original intention was to introduce a colony of winter active beetles and spring active beetles on each of the participating properties to improve dung breakdown during a period with little dung beetle activity. However, due to adverse seasonal conditions in other parts of Australia, the spring active beetles were not available in sufficient quantities to collect and then distribute.

The Landcare Group members constructed special dung beetle traps at a group event, and the traps were monitored on each of the properties that introduced beetles on a seasonal basis (four times annually) over the course of the three-year demonstration. This was designed to be a useful exercise for both monitoring the activity of dung beetles and as an educational exercise in identifying and understanding their life cycle. Each participant received a dung beetle identification booklet and dung beetle recording sheets to assist them with monitoring.



Figure 1 Constructing dung beetle trap

Introduction

Australia has more than 500 species of native dung beetles and 23 species of dung beetles introduced from Hawaii, Africa and southern Europe. Although Australia has native dung beetles they are less efficient in dealing with the large dung deposits that large introduced livestock such as cattle and horses supply (Dr Bernard Doube, Dung Beetle Solutions Australia).

Introduced dung beetles are now well established across most of Australia's agricultural areas. Their effectiveness in dealing with large volumes of cattle dung is now well established along with demonstrated benefits to soil fertility, pasture production, water infiltration and storage, improvement in parasite control and control of bush fly (McKay, 1976).

Cannibal Landcare members involved in this trial indicated that although monitoring was one of the key objectives of the demonstration, they were also keen to demonstrate that improved manure cycling due to the dung beetle activity would increase soil fertility and perhaps reduce fertiliser use. The increased cycling of the manure and the tunnelling activity by the beetles would also reduce manure washing into nearby creeks.

The educational aspect of building dung beetle traps and the supply of booklets describing dung beetles life cycles and how to identify them, proved to be a very effective part of the demonstration. The monitoring of beetle numbers completed what was a worthwhile exercise.



Figure 2 Monitoring program instructions

Species Name	Total Number Found

Figure 3 Recording sheet

Trial design and set-up

The farms in this study included:

- Property 1. Limousin cattle and fat lamb enterprise, Iona.
- Property 2. Beef stud and horse property, Garfield South
- Property 3. Beef property, Garfield North
- Property 4. Vealer and dairy heifers, Tynong North
- Property 5. Beef fattening enterprise, and
- Property 6. Vealer production enterprise, Officer

The simple traps were made from plastic buckets with some chicken wire and a small wooden frame. Hay was placed on top of the trap and a good quantity of fresh manure was placed over the surface. The dung beetles were attracted to the manure and burrowed through the manure and fell into the bucket. The beetles were then identified, counted and recorded.



Figure 4 Dung beetles actively at work

Site selection and beetle release

Well-drained patches of pasture grazed by livestock with fresh dung pads were chosen for the release sites. Beetles will only fly to fresh dung pads (1–4 days old), and will continue to bury dung from the pad until the pad is exhausted. Dung beetles appear to favour a clay loam (Doube, 2018).

Starter colonies usually contain about 1000 beetles with a 50:50 mix of males and females.

A handful of beetles were placed on the top of fresh dung pads up to four days old, over about a 0.5 hectare. They were healthy and quick to burrow into the dung after release.



Figure 5 Dung beetle trap with fresh manure awaiting dung beetles!



Figure 6 Beetle release

Figure 7 Costs of dung beetle colonies and trap

Costs	\$
2015 (1) Colony of Bubus Bison	\$625.00
2017 (1) Colony of Bubus Bison	\$650.00
Dung beetle traps (each)	\$15.00
Total	\$1,290.00

Monitoring

The participating landholders who distributed beetles on their properties, along with members of Cannibal Creek Landcare Group assisted in the monitoring.

Seasonal monitoring (once per season, four times annually) of beetles was expected to be undertaken on each property utilising the constructed traps. Beetles were counted and identified.



Figure 8 Checking dung pads for beetles

Beetles were attracted to the fresh pads, burrowed into them and fell into the collection bucket. Beetle numbers were monitored and recorded and photos taken each day as a record of dung break-down. Photo monitoring of dung pads was also undertaken with a digital camera daily over a 7-day period.

Results of monitoring

Figure 9 Monitoring results			
Date	Property	Species reported	Quantity
	Property 2. Beef stud & horses		
1/09/2015		<i>Onthophagus taurus</i>	4
1/12/2015	“	<i>Geotrupes spiniger</i>	1
		<i>Onthophagus taurus</i>	23
1/03/2016	“	<i>Onthophagus taurus</i>	2
		<i>Onthophagus taurus</i>	3
	Property 3 Beef		
8/02/2015		Brown	5
		Black	1
9/02/2015	“	Brown	1
		Black	1
15/05/2015	“	Not known- small (4mm)	~30
10/06/2015	“	3mm small beetles	5
1/09/2016	“	3mm small beetles	few
1/12/2016	“	Black headed cock chafer	100’s
1/03/2017	“	Small 3mm black beetle	~30
	Property 4 Vealer & dairy heifers		
4/03/2015		Cockchafers	23
		African black beetles	2
10/6//2015		“ “ “	3
7/09/2015		Activity seen	
		unknown	1
12/12/2015		<i>Onthophagus taurus</i>	4
6/03/2016		Black headed cockchafer	10
		<i>Onthophagus taurus</i>	4
4/06/2016		Bubus Bison	6

- A number of dung beetles were identified across beef and sheep properties
- Distinguishing some dung beetle species proved challenging
- African beetles were identified in traps on farms
- The construction of traps provided effective monitoring tools
- Broader educational benefits of trap construction and beetle life cycles were delivered
- Identifying a sustainable population on properties over the course of the trial proved to be difficult
- Identifying the distinction between dung beetles, African beetles and cock chafer beetles was a worthwhile training exercise
- Unfortunately for a range of reasons, not all participants continued to monitor for the duration of the trial.

Experience of two participants

Location: Property 4 - Vealer and dairy heifers, Tynong North.

This 23 hectare property rotationally grazes 35-40 beef and dairy heifers. Two traps per fresh dung pad were placed in one paddock where beetles were released, each recording beetles in the first year. The second release was in a second paddock where beetles were deposited and pads marked with a bamboo stick. There was no sign of beetles four weeks after introduction.



Figure 10 Beef cattle on a selected beetle release paddock

Location: Property 3 - Beef property, Garfield North.

This is a 24 hectare beef property grazing 40 beef steers. Beetles were released into a 1.6 hectare paddock near the house with fresh hay provided to maintain fresh dung pads. Traps were used for the first few weeks but the participant found it easier examining the dung more closely on hands and knees. Pads over the whole farm were also checked. Recent examination of dung pads has not detected any beetles.

Summary

This project in its conception was a worthwhile exercise but proved to be difficult to implement. The regular monitoring of beetle numbers and the recording of data put pressure on landowners who had many other management issues that required their attention. As a result, only three of the six landholders monitored and recorded the beetles on their properties.

The construction of the beetle traps, the supply of educational material and the benefits of experts in this field (one workshop by Dr Bernard Doube, Dung Beetle Solutions, and one workshop by John Feehan, SoilCam) provided both stimuli and constructive advice for all Landcare members.

It remains a vexing question concerning the introduction of dung beetles to a property and the maintenance of a sustainable population capable of recycling animal dung. Bernard Doube suggests that it may take several years for beetles to become established on properties. On the basis of this information the three year study should be seen as an important introduction of the species to the area and that active populations could still be built up over the next few years.

References

Doube, Bernard, Dr. Dung Beetle Solutions Australia Fact Sheet
<http://www.dungbeetlesolutions.com.au/about-dung-beetles/>
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McKay A, 1976, 'The industrious dung beetle, Surprise and Enterprise: fifty years of science for Australia's CSIRO', [White F](#), Kimpton D (eds), *CSIRO Publishing*, pp.8-9.

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