

PROCEDURES FOR DUNG BEETLE HARVESTS AND RELEASES



These procedures have been designed by the Northern Tablelands Dung Beetle Express in conjunction with the Queensland Dung Beetle Project (in particular Dr. Angus Macqueen and Dr. Penny Edwards). The assistance of John Feehan is acknowledged with thanks.

The procedures aim to reduce the possibility of transferring weed seeds and soil borne diseases, increase the number of dung beetles harvested and ensure the establishment of redistributed beetle colonies.

This booklet has been designed as a guide to harvest and release techniques for common Australian Dung Beetle species. A knowledge of Dung Beetle behaviour and species specific traits is essential to ensure success using the techniques outlines in this guide. Information contained in this publication is provided as general advice only. For application to specific species and circumstances professional advice should be sought. The Northern Tablelands Dung Beetle Express has taken all reasonable steps to ensure the information is accurate at the time of publication.

Any person or organisation wishing to harvest or release Dung Beetles using this guide should make appropriate inquiries to determine whether new information is available on the subject matter.

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HARVESTING

1. **The property supplying the beetles should be declared free of Footrot, Ovine and Bovine Johnes disease (See annexure A). In some States it may not be possible to have a declaration signed by an authority (Rural Lands Protection Board, DPI etc).**
2. **The harvesting should occur at a time of peak beetle activity to ensure that labour time is reduced.**
3. **Harvesting methods include trapping, floating, night lights and digging. The correct method is species dependent. (See Annexures D, E and F for detail of methods).**
4. **Trapping times are also species dependent. For night fliers traps must be in place prior to dusk to ensure flight interception.**
5. **Minimum colony sizes are variable. In general 800 to 1000 beetles is acceptable if they are large (ie *Onitis pecuarius*) while 1,500 is an acceptable release for smaller species (*Onthophagus taurus*, *Euoniticellus sp.*).**
6. **Counting of harvested beetles can be manual or by estimates using weight or standard cup sizes.**
7. **Disease prevention protocols (Annexure B) should commence before leaving the harvest site.**
8. **It is important to ensure that all equipment is cleaned at the site.**

RELEASES

(Part 1) Releases under average seasonal conditions

- 1. Depending on the species to be released it may be necessary to have water on site to float beetles from the packing medium. This can be from any source but must be free of chemical contamination.**
- 2. The owner of the recipient property should ensure that sufficient cattle have been camped at the release site to supply dung for the release. This should be upward of 100 pads.**
- 3. The timing of the release should be considered with reference to the species' preferred flight time. Day fliers should be released in the late afternoon and night fliers early in the morning (Annexure F). If there is likelihood of heavy rainfall the release should be delayed. Dung pads can disintegrate when exposed to heavy downpours.**
- 4. Ensure that the owner of the recipient property has signed the declaration acknowledging the risk of transmission of soil borne diseases and weed seeds (Annexure C).**
- 5. The beetles may be sorted from the medium either by hand or, in the case of small or day active species, by placing handfuls of the medium in water and collecting the beetles as they float. Floating prevents flight and also reduces damage to smaller species. Beetles should be removed from the water as soon as possible to avoid excessive stress.**
- 6. Smaller beetles can be counted using containers which hold the desired number of beetles or by weighing. Larger beetles can be counted manually.**
- 7. The number of beetles per pad is size dependent. In the case of smaller beetles (*O. taurus* etc.) 20 beetles per pad is optimum, however, 30 appears acceptable. Larger species (*O. alexis* etc) should be limited to 6 – 8 per pad (Annexure F). This reduces competition for dung.**

8. **The beetles should be placed into the pads. Different species prefer different dung placement in terms of depth and position (side, middle etc.). The simplest way to determine preferences is to place some beetles in, on and under a pad and observe.**
9. **Once the beetles have been released, all equipment should be cleaned at the site.**

(Part 2) Drought Releases

If the release site can be watered using irrigation then the release can be undertaken in the same manner as it would be under average seasonal conditions once the ground has been thoroughly watered. If irrigation is not available additional measures will be necessary:

1. **The owner should arrange for a large mob of cattle to be contained in one paddock on the day before the release to facilitate dung collection. Each artificial pad is produced using 2L of fresh dung so the amount of dung required is the number of pads multiplied by 2L.**
2. **Depending on available labour, it is best to water the site and collect dung simultaneously. This gives the soil a chance to absorb the water with limited waiting time. If there is limited labour, watering should be the first priority.**
4. **Flower pots with the bases removed should be sunk approximately $\frac{1}{2}$ an inch into the ground. In soft soils this may be achieved by placing the pots on the ground and rotating them firmly until a seal is formed. Other soils may require the use of some type of tool such as the “biscuit cutter” shown in figure 1 (Appendix E).**
5. **Approximately 5 litres of water should then be poured into each pot.**
6. **Once the water has been absorbed the pots should be removed and 2L artificial dung pads created on the damp area.**

The release can then be made as described in Part 1.

ANNEXURE A

THE NORTHERN TABLELANDS DUNG BEETLE EXPRESS

PART 1

DUNG BEETLE TRANSFER DECLARATION

I of
Owner/Manager

hereby declare that I have no knowledge of the following diseases being present or suspected of being present on the above property.

- **Ovine Johnes Disease**
- **Bovine Johnes Disease**
- **Footrot**

Signed Date

Witness' signature Date

Name of Witness (Printed in Full)

PART 2

Rural Lands Protection Board Declaration (NSW only)

To the best of my knowledge after searching RLPB files held at Office, I have no reason to doubt the Owner/Managers declaration in Part 1.

Signed Date
RLPB District Veterinarian (RLPB Stamp required)

ANNEXURE B

SUGGESTED METHODS FOR CLEANSING BEETLES

- 1) All beetles to be placed in a plastic tub with cool, non-chlorinated water and rinsed. If they have spines, horns etc. it may be necessary to scrub them individually. This can be done using a soft toothbrush.

With some species (*Sisyphus*) it may be better to shower them to prevent stress and the subsequent risk of increased mortality.

- 2) All beetles should have a final rinse in fresh cool water.
- 3) After rinsing, the beetles should be placed in a plastic container with clean, damp peat moss.
- 4) All equipment used in the cleaning process should be thoroughly scrubbed and bleached before removal from the property of origin.
- 5) The recommended time for holding is a minimum of 24 hours to allow ingested dung to be purged.
- 6) Beetles should be fed on dung from the property of destination or from a property known to be free of soil/dung borne diseases and weed species. This dung can be frozen if necessary and thawed prior to feeding.
- 7) Prior to delivery the beetles should be rinsed to remove purged material adhering to the cuticle and placed in fresh, damp peat moss. It may be necessary to scrub some species.
- 8) All equipment used for rinsing should be thoroughly cleansed and the peat moss burnt to avoid contamination of the disposal site.

ANNEXURE C

THE NORTHERN TABLELANDS DUNG BEETLE EXPRESS

Dung Beetle Transfer Disclaimer

There is a risk of transmission of soil borne diseases and weed seeds in dung beetle transfers. In any transfers both parties need to be aware of this risk.

The Northern Tablelands Dung Beetle Express and partner organisations (Granite Borders Landcare Committee Incorporated, Southern New England Landcare Committee Incorporated, Northern New England Rural Lands Protection Board and Armidale Rural Lands Protection Board) have taken precautions to ensure this risk is minimised.

The Northern Tablelands Dung Beetle Express takes all care, but no responsibility, with the transfer of these dung beetles.

We do not encourage indiscriminate beetle distribution.

I understand that a declaration of the disease status of the properties of origin has/has not been made and endorsed by the Rural Lands Protection Board.

I of
.....

Have received (number in colony) of
..... (Species).

I have read and understand the disclaimer.

.....

.....

Signature of recipient

Date

.....

.....

Signature of witness

Date

ANNEXURE D

FLOTATION

1. Select dung pads which are between 12 to 36 hours old.
2. Use a sharp shovel to lift the pad plus approximately 3-5 cm of soil beneath the pad.
3. Place the dung and soil into a container with water and stir.
4. The beetles will float to the surface and can be collected.

Note: As harvesting targets specific species it is helpful to use one age of dung initially (ie all 24 hours old) in order to determine which age dung the species prefers.

TRAPPING USING PLASTIC SHEETS

1. Heavy duty clear builders' plastic should be selected and cut into squares approximately 40cm x 40cm square. Weights may be added to the corners – these prevent the plastic from folding over the bait in strong wind.
2. Place the plastic on the ground and bait with 1 litre of fresh dung.
3. The baits should be left overnight (night/dusk fliers) and the dung sorted through the following morning. In the case of day fliers the plastic should be set in the morning and sorted in the afternoon and following morning.
4. Dung may be floated in water to remove the beetles, however, if the species is large enough to be easily spotted or dung needs to be re-used it is advisable to manually sort through each pad using disposable gloves.
5. The plastic can then be folded around the dung to keep it fresh.
6. That afternoon (or morning) the dung can be “veneered” with fresh dung. This process ensures that the “dung plume” remains attractive to beetles.

7. This process can be repeated for three days at which time the dung should be replaced.
8. The number of plastics baited is optional, however, in general the more plastics, the more beetles.

USING PITFALL TRAPS

Pitfall traps are often not suitable for harvesting as their installation is labour intensive. They are more useful as a monitoring tool which can indicate when beetle numbers are sufficient to harvest.

1. A pitfall trap consists of a container which is sunk into the ground
2. A funnel is then placed on the top of the container
3. A sheet of light weight metal grid is then placed over the top of the funnel
4. Fresh dung is then wrapped in nylon gauze and placed on top of the grid
5. Traps should be left in place overnight and then emptied.

LIGHT TRAPS

Light Traps can be useful in collecting night-flying species but are usually used as an additional method to plastic traps as they are relatively expensive to obtain and are only useful for a few species. Figure 2 (Annexure E) illustrates a common light trap design.

1. A light coloured tarp or sheet should be hung from a solid structure (ie shed wall).
2. The sheet should ideally be long enough that it will reach the ground and then extend outwards for approximately 2 metres.
3. A light on an extension lead is then hung near the supporting structure (ie wall). This light can be a normal light globe or a special insect attracting globe (250 watt mercury-vapour).

4. **Dung should be placed at the base of the trap. This may help prevent beetles flying away.**
5. **The trap is emptied in the morning.**
6. **Ready made traps can be purchased from commercial suppliers.**

DIGGING

Digging is not recommended for many species as it is time consuming, destructive and, often, futile. It can be combined with trowelling and used when harvesting species such as *Copris elphenor* which bury down and out from the dung pad rather than directly down beneath it.

TROWELLING

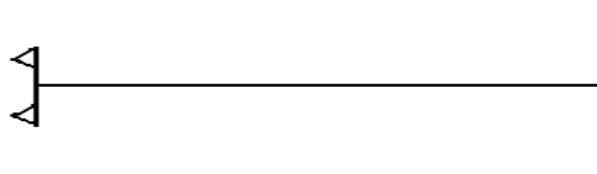
This is not really a stand alone harvesting method, but rather one that can be used in conjunction with plastic trapping or flotation. It involves locating dung pads which are the age preferred by the target species and removing the pad (with some top soil). The dung is trowelled away quickly and the ground underneath searched for beetles. Following this the trowelled dung can be sorted through. Trowelling the dung away from the area where the pad was deposited prevents beetles from retreating into their tunnels, allowing a more thorough examination of the dung pad.

Hand Collection

Similar to trowelling but done by hand. The pad is quickly swept away and the ground below searched for beetles. The rest of the pad is then sorted through by hand. This method allows a more rapid retrieval of beetles once the pad is scraped away and avoids damage to the beetles which can occur with trowelling.

ANNEXURE E

Handle

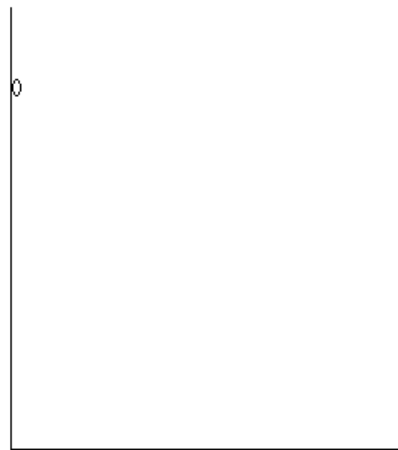


Cutting Blades

Figure 1: The “Biscuit Cutter”

Note – The cutting blades must be spaced so that they cut a circle which has the same diameter as the flower pot base.

Light source attached
to wall



Sheet or tarp

(approx 2m)

Figure 2: Light Trap

ANNEXURE F

HARVESTING SPECIFIC SPECIES

SPECIES	PREFERRED HARVEST METHOD	OTHER SUITABLE METHODS	ADDITIONAL INFORMATION
<i>Onitis alexis</i>	Hand collection/plastics	Trowelling (trowelling can damage beetles)	Flotation is time consuming and unnecessary with larger species
<i>Onitis caffer</i>	Plastics	Trowelling/hand collection (Due to depth of tunnels and beetle speed both these methods may result in a higher male to female ratio)	Digging is not suitable for this species as the tunnels average 1 metre in depth.
<i>Onitis pecuarius</i>	Plastics/hand collection	Trowelling	As above
<i>Onthophagus binodis</i>	Hand collection,/trowelling	Flotation	Plastics or pitfall traps may be used, however, when in harvestable numbers it is less time consuming use other methods
<i>Euoniticellus africanus</i>	Hand collection/trowelling	Flotation	As above
<i>Euoniticellus intermedius</i>	Flotation/hand collection	Trowelling	As above
<i>Copris elphenor</i>	Plastics, digging and trowelling	Light traps	These beetles tunnel down 30cm and then out for an average of 90 cm. For this reason a combination of digging and trowelling can be used.

RELEASING SPECIFIC SPECIES

SPECIES	TIMING OF RELEASE	DUNG AGE	PLACEMENT	NO. OF BEETLES PER PAD
<i>Onitis pecuarius</i>	Morning (dusk and dawn flyer)	24 to 48 hours old	Each side of pad, midway through the depth	8 – 12 depending on size of pad
<i>Onitis alexis</i>	Morning (dusk, dawn & night flyer)	24 to 48 hours old	As above	As above
<i>Onitis caffer</i>	Morning (dusk and dawn flyer)	12 to 24 hours old	As above	6 – 10 depending on pad size
<i>Onthophagus binodis</i>	Late afternoon (day flyer)	Fresh to 24 hours old	As above	10 – 20 depending on pad size
<i>Euoniticellus africanus</i>	Late afternoon (day flyer)	Fresh to 24 hours old	Each side but just under a layer of dung	15-25 depending on pad size
<i>Geotrupes spiniger</i>	Morning (dusk and dawn flyer)	24 hours old	Underneath the pad on two sides	6 – 10 depending on pad size

Harvest and release methods are species dependent. Some experimentation is usually necessary to determine the most efficient method for the target species. The above are guidelines to methods we have used successfully.