



**Landcare Research**  
**Manaaki Whenua**

# **The New Zealand Dung Beetle Project: Background, Potential Benefits, Progress**

**Shaun Forgie**

**LCR, science providers for the Dung Beetle  
Release Strategy Group (DBRSG)**



**7,000 species worldwide**



# Three 'types' of dung beetle

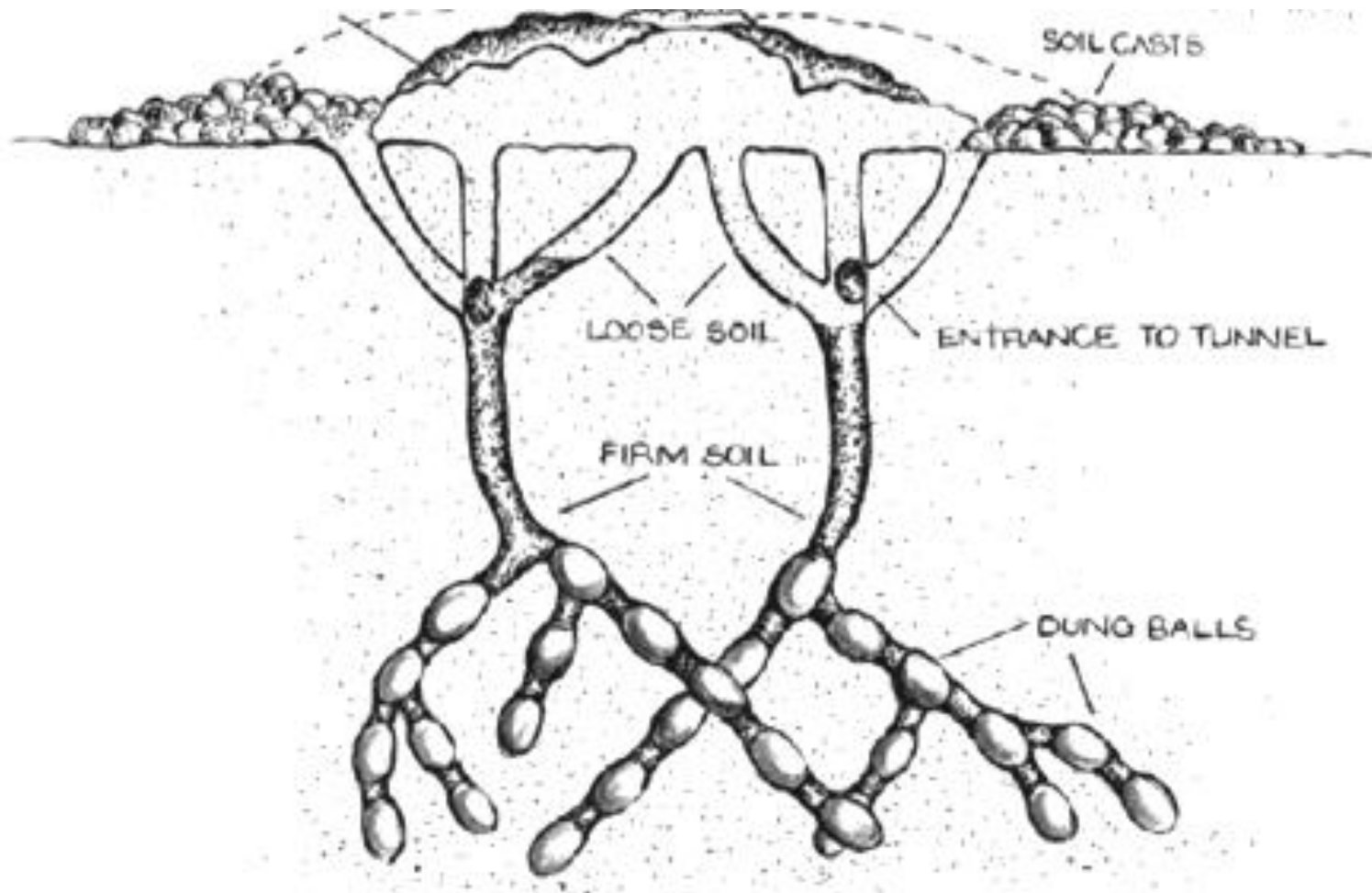
# Tunnelers are:

- **by far the most abundant**

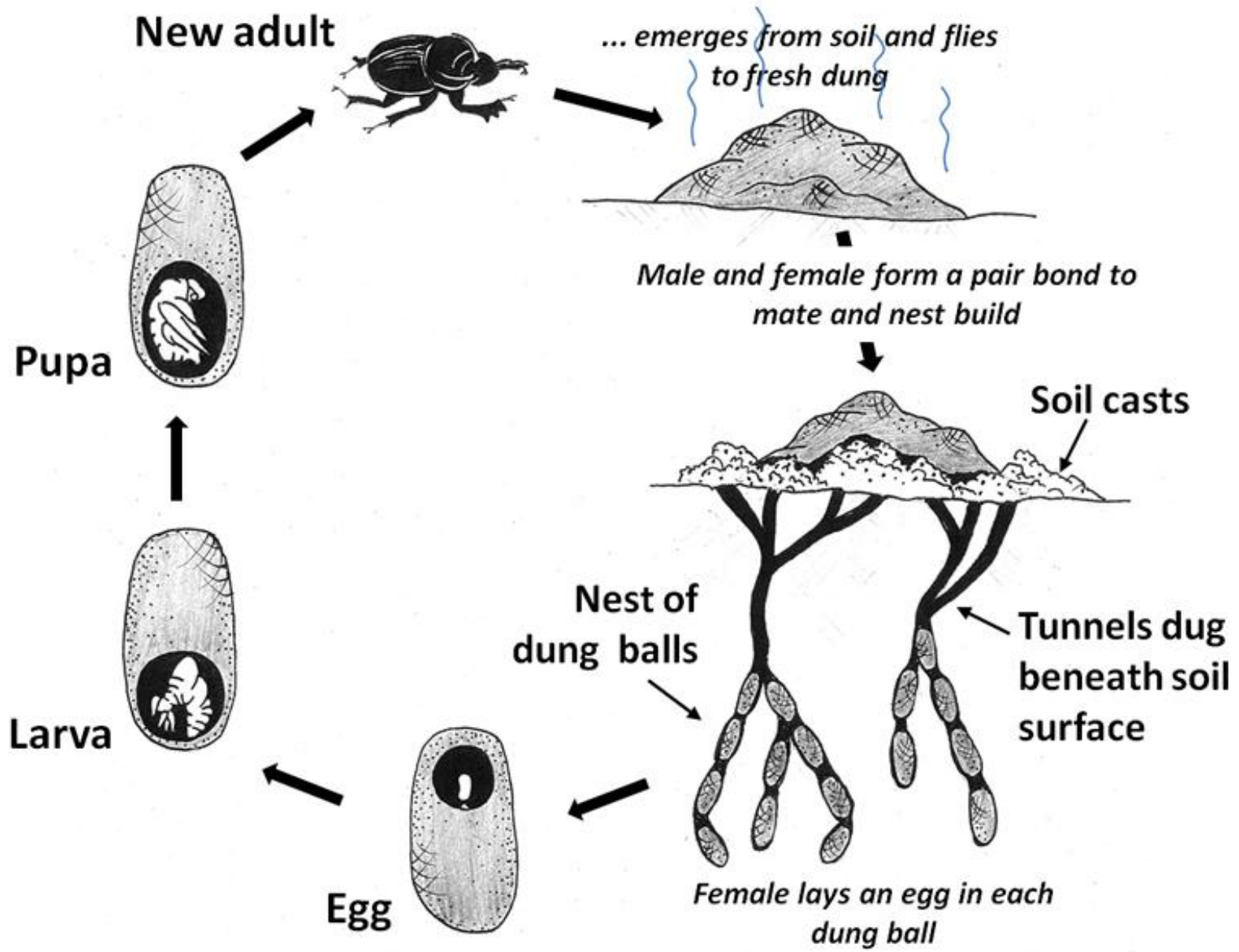


# Tunnelers are:

- responsible for the most dung buried







**What dung beetles do we  
already have in NZ?**





d



etl



# Exotic pastoral dung beetles already in NZ



# Exotic pastoral dung beetles already in NZ



# **Why do we want to introduce dung beetles**

**What's the problem?**

Many problems *primarily in cattle industry* stem from .....

**Intensive livestock farming**

**Excess faeces (and green house gas emissions e.g. methane)**

**Soil compaction**



# Intensive livestock farming promotes

## Forage fouling

**1 cow produces  $\pm$  12 dung pads per day = 18kg/day**

**9.6 million cattle = 180 000 tonnes of dung per day!**

**This equates to 570 – 950 ha of pasture loss a day directly under dung.**

**Without dung beetles, dung in NZ can sit accumulating on pasture for weeks.**



# Intensive livestock farming promotes

## Rank growth (swards) & zone of repugnance

- an area 5x the size of the dung itself

Fincher, 1981

## Break feeding

- forces livestock to feed on this growth and grass in this zone



# Intensive livestock farming promotes

## surface runoff

- dependent on slope, soil texture and soil structure

## degradation in water quality

- nitrogen and phosphorus
- faecal coliforms
- pathogens (Cryptosporidium, Giardia)





# **What do we do with all this dung?**

**Leave it**

**Rotational grazing**

**Harrowing**

**Dragging apparatus to spread/shred dung**

**Alternatively.....**

**we can recreate an age-old nutrient recycling process by establishing dung beetles and let them bury it.**

# Potential Benefits

*Some key benefits that potentially can mitigate adverse effects of dung on:*

- **Soil structure and function.**

**Tunnelling beetles increase levels of plant nutrients in the subsoil at similar levels to typical application rates of solid fertiliser inputs.**

**Tunnels increase aeration, reduce compaction, bring subsoils to the soil surface (bioturbation)**

**Burying dung increases the amount of organic matter in the soil, stimulates microbial activity, and nutrient cycling**

**Burying dung provides a food source for soil organisms such as earthworms**

# Potential Benefits

- **Pasture quality**

**Dung beetles can contribute to reducing forage fouling**

**Several studies show “dung + beetles” results in increases in:**

- **plant height**
- **above ground biomass**
- **grain production**
- **protein levels**
- **nitrogen content**

**Root biomass and growing depth is increased improving water holding capacity and drought tolerance**

# Potential Benefits

- **Water issues**

**Tunnelling and improvements to the physical structure of soils have a “flow-on” effect which can include:**

**1) Improved water infiltration reduces surface ponding, assists agricultural inputs (lime, fertilisers) to enter the upper soil profile and reduce the level of contaminants entering the waterways**

(Waterhouse 1974; Bormemissza 1976; Doube 2005b)

**2) which leads to improved water quality** (Doube 2008)

# Potential Benefits

**Benefits demonstrated in other countries are likely to occur here**

**Likely to help contribute to improvements in the long term sustainability of live stock farming in NZ**

**We stress that the importation of dung beetles & the benefits they provide are not focused on beef and dairy industries solely**

**sheep, horse, deer, goat, alpaca farming can also benefit from the services provided by dung beetles**

**Who is introducing dung  
beetles to NZ?**

# The Dung Beetle Release Strategy Group



This work was funded by MAF SFF, Landcare Research, DBRSG, DairyNZ, Rodney District Council + ARC (in part), Environment Southland, Rodney Economic Development Trust & Ngati Whatua

# EPA (ERMA) process



**Risks identified include:**

**Invasion of native habitats**

**Outcompeting native dung fauna**

**Spreading animal and human disease**

**Benefits**

**Significant**

**Risks**

**Negligible**



**EPA granted permission for importation and full unconditional release of 11 species of dung beetle for use in NZ pastureland.**

**EPA and LCR have subsequently done several intensive reviews surrounding questions of risk subsequently raised. EPA stands by its decision 100%.**

**LCR has completed several internationally reviewed tests on disease risk (B-Tb, MAP) and food preference with results showing no risk.**

**LCR commissioned international review of the ERMA application with review showing the process was thorough.**

# Technical Advisory Group

- **DBRSG has organised a TAG to advise how best to progress the project so potential benefits can be maximized while taking into account the needs of all stakeholders and need to protect environment.**
- **Members currently include DBRSG, LCR, AgR, MPI, Auckland Council, Environment Southland, Beef & Lamb NZ, Federated Farmers. Others are being approached to join.**
- **First meeting held in May and proposal for monitored caged field trials currently being considered.**



*Bubas bubalus*  
17mm



*Bubas bison*  
16mm



*Copris hispanus*  
18mm



*Copris lunaris*  
18mm



*Euoniticellus fulvus*  
10mm



*Onitis alexis*  
20mm



*Geotrupes spiniger*  
22mm



*Onthophagus taurus*  
9mm



*O. (Digitonthophagus) gazella*  
11mm



*Onthophagus binodis*  
12mm



*O. (Paleonthophagus) vacca*  
10mm

# Selection Criteria

*At least 11 species needed to control livestock dung 24-7, 365 days a year throughout NZ.....*

- All species occupy differing but overlapping seasonal activity periods
- Some species are day active, others night active or active only at dawn and dusk
- Climatic suitability
- All species are habitat specific to open grasslands
- All species evolved to feed specifically on the dung of herbivorous mammals (artiodactyles)



# Scope of the NZ Dung Beetle Project

It is expected this project will last at least 10-15 years

Current DBRSG phase of project was funded for 3-4 years which involved:

- EPA process ✓
- Importation, quarantine and control release at least 5 species ✓



*Bubas bubalus*  
17mm



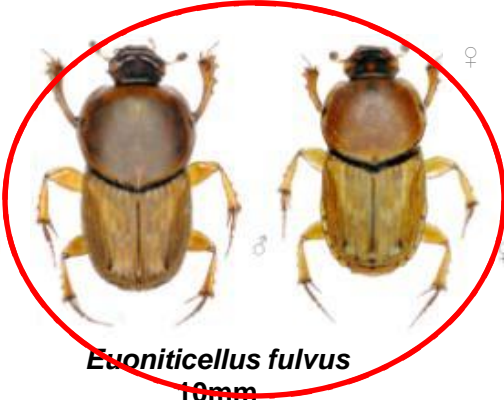
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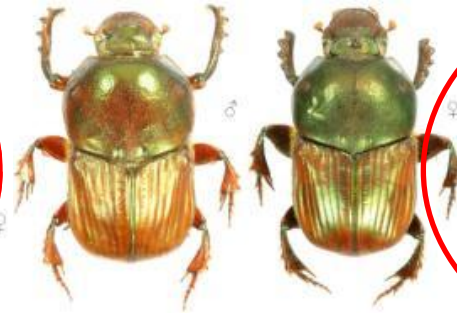
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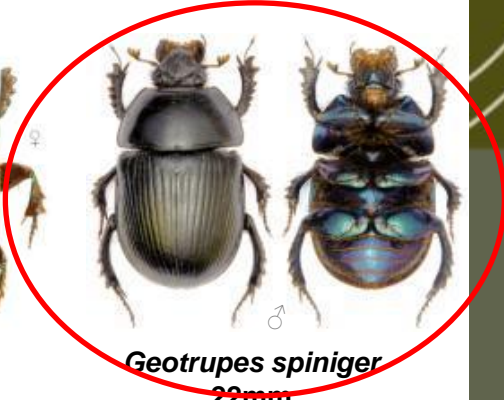
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**Winter**



**Summer**



**Spring-  
Autumn**



**Spring-  
Autumn**



**Autumn-  
winter**

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- Importation, quarantine and control release at least 5 spp

**Next phase, DBRSG plan:**

- **Controlled releases with research (TAG - LCR and Agr)**
- **Continuing mass rearing for nation wide releases**
- **Importation of remaining species**





# **Acknowledgements**

**MAF SFF**

**Landcare Research**

**DBRSG**

**EPA**

**Auckland Council**

**Environment Southland**

**Greater Wellington Regional Council**

**Rodney Economic Development Trust**

**Ngati Whatua**

**Beef and Lamb NZ**

**Dairy NZ**

**Federated Farmers**