

# The Beneficial Insect Files

## Dung beetles

By Anna-Marie Barnes

### What are they?

Hardworking beetles (order Coleoptera) with a penchant for dining partially or entirely on dung, as well as completing their reproductive cycles in it. Most belong to the subfamilies Scarabaeinae (true dung beetles) and Aphodiinae (small dung beetles) of the family Scarabaeidae, (scarab beetles), with others belonging of the family Geotrupidae (earth-boring dung beetles). They are present on every continent, except Antarctica.

### Why are they important?

New Zealand hosts large populations of introduced herbivores, which produce significant amounts of manure. Unfortunately, these grazing animals arrived without the insects capable of dealing with what is left behind. Without these tiny sidekicks, the presence of excess manure in pastoral ecosystems can lead to reduced soil and plant health, increased run-off and microbial contamination of surface water after rainfall and increased animal parasite burdens.

### Identifying characteristics

Relatively large beetles, growing up to 30 mm in length and 20 mm in width.  
Prominent shovel-shaped head for shunting and shifting.  
Robust front legs with tooth-like serrations to aid digging.

Dung beetles are classified into three main groups, based on their dung-handling behaviour.

*Rollers* roll dung from deposits into round balls, which they then use as food sources and breeding chambers.

*Tunnellers* bury dung wherever they find it, performing the vital service of cycling surface dung into the subterranean environment.

*Dwellers* don't bother with rolling or tunnelling, preferring to just live on and nest in dung deposits wherever they fall.

Dung beetles are specialised creatures; most species are habitat specific (be it forest, open grassland, desert or farm pasture), with very little territorial overlap. Many specialise in dealing with the dung of one particular species.

### What exactly do they do?

Dung beetles provide a number of ecosystem services. Beetle tunnelling and dung burial processes aerate the soil, allowing increased water filtration, deeper grass rooting and enhanced biological activity in the soil under and adjacent to dung deposits.

Stock will avoid feeding in the zone immediately around dung deposits, so pasture productivity is improved when dung and the nutrients it contains are effectively cycled back in to the soil.

Increased water penetrability and improved nutrient cycling also results in reduced microbial contamination of surface water and less surface water run-off after heavy rainfall, giving better overall water quality and therefore benefits for animal and human health.

By aiding the decomposition of dung deposits that host gastrointestinal parasites, such as nematodes, dung beetle activity can result in reduced infection rates in livestock.

Quantitative research has also shown that dung deposits in open grassland, exposed to oviposition by flies and then colonised by dung beetles had 96% less adult flies emerge than their covered control counterparts (Bornemissza 1976). The burying actions of the beetles not only relocate manure from the soil surface underground so flies are unable to use it as a food source, but the mechanical processes involved along the way also destroy eggs and larvae that may be present in the substrate. This reduction again results in positive outcomes for environmental animal and human health.

The improved cycling of solid animal waste and infiltration of liquid waste into the soil may also have potential benefits, decreasing amount of methane and nitrogen produced, and therefore reducing the emission of greenhouse gases from these wastes.

### **Species found in New Zealand**

New Zealand hosts a relatively small number of endemic dung beetle species, which dwell exclusively in undisturbed forest habitats from sea level to 1100 m. These 15 species are flightless, night-active 'rollers', comparatively small (2-15 mm) but often abundant and play an important role in the decomposition process in our native forests, breaking down carrion, humus and faecal material. Unfortunately, they are rarely found in pasture, so are of little use for the breakdown of manure in pastoral systems.

There are two self-introduced Australian species with a wide distribution, but their low prevalence and small size means the overall impact is low. A larger Mexican dung beetle (deliberately introduced 1956) is present in Northland but is uncommon and again, the overall impact it has is negligible.

### **New Zealand's Dung Beetle Release Strategy Group**

A taskforce, spearheaded by landowners and guided by Landcare Research scientists was formed in 2008. Supported by a number of industry stakeholders and backed by a Sustainable Farming Fund grant, the group applied to import and release 11 species of exotic dung beetles in 2010. Approval for release was gained in 2011 and the first beetles were released on an organic dairy farm in Gore in September 2013.

Given that animal manure is produced in consistent quantities year-round, the species chosen for importation and release were required to ensure sufficient activity across the seasons, activity throughout different times of day (the flight periods of individual species vary, and can be nocturnal, crepuscular or diurnal), preference for different soil types and climatic conditions as well as habitat specificity, in this case, specific to open grassland habitat and the dung of ungulate animals.

For more information, see <http://dungbeetle.org.nz/>

### **Food for thought:**

- The economic benefits gained from ecosystem services provided by dung beetles in USA are valued at US\$380 million p.a.
- A dung beetle can bury 250 times its own weight in dung in one night and 'roll' up to ten times its own weight.

- Dung beetles are the only known non-human animal to navigate and orient themselves using the Milky Way.
- Dung beetles are one of the few insect groups that exhibit parental care for their young.

#### References:

Bornemissza, GF (1976). The Australian dung beetle project 1965-1975. Australian Meat Research Committee Review 30: 1-30.

Dung Beetle Research Strategy Group (n.d.). Dung beetles in New Zealand. Retrieved from <http://dungbeetle.org.nz/> [Accessed 20 January 2017].

Wikipedia contributors (2017). Dung beetle. Retrieved from [https://en.wikipedia.org/w/index.php?title=Dung\\_beetle&oldid=762959054](https://en.wikipedia.org/w/index.php?title=Dung_beetle&oldid=762959054) [Accessed 20 January 2017].

About Education (2017). 10 fascinating facts about dung beetles. Retrieved from <http://insects.about.com/od/beetles/a/10-Fascinating-Facts-About-Dung-Beetles.htm> [Accessed 28 January 2017].

#### Images

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Dung beetle at work

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