

Dung Beetle Biology & Life Cycles



Introduction

Dung beetles belong to the scarab family of beetles. There are 4,500 species worldwide, with most found in Africa where they have evolved with a wide range of herbivores, including large species such as buffalo and elephants. There are approximately 400 native dung beetle species in Australia.

Dung beetles provide a range of environmental and agricultural production benefits.

Burial and shredding of dung:

- reduces pasture fouling and nutrient runoff into waterways
- removes fly and parasite breeding habitat
- facilitates nutrient recycling by exposing dung to soil microbes, plant roots and earthworms
- improves water infiltration and aeration of soil by generating a network of underground tunnels

Feeding

Dung beetles feed on the dung of vertebrates. The adults feed on the dung fluid, which they extract by squeezing dung in their mouthparts. In contrast, dung beetle larvae feed on whole dung (fluid and fibre) which they cut and chew with their mouthparts. Dung beetles do not require anything else - not even water.

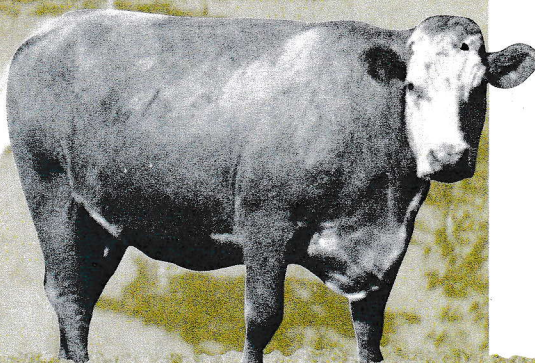
Flight

Dung beetles are strong fliers - and can fly up to several kilometres in one flight. Species fly either during daylight hours (day fliers) or at dusk and dawn, or at night (night fliers). They can detect dung from a considerable distance by its smell, and fly upwind along an odour plume to the dung. They fly to fresh dung once they have finished burying their current pat. When stocking rates are low or cattle are regularly moved, dung beetles will fly considerable distances to find fresh dung.

Breeding

There are two main types of breeding behaviour in dung beetles. Most species (the "tunnellers") make tunnels under the dung pat and take dung down into an underground nest to provide food for their offspring. The male collects dung and passes it down to the female, who constructs the nest and makes brood balls (see figure 1). A pair may work together in one dung pat for several days or even a couple of weeks, as long as suitable dung is available. The beetles then fly off separately in search of fresh dung.

Most species of tunnellers mould dung into individual brood balls into which one egg is laid, while other species make a longer sausage of dung into which two or three eggs may be laid. Larvae hatch from the eggs and feed on the dung in the brood balls. When larval growth is completed, the larva pupates and then emerges as a new adult and digs up to the soil surface. The time between egg laying and adult emergence can vary from one month to a year or more, depending on the species and the season.



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The other group of species (the “**rollers**”) make a ball of dung at the dung pat and then roll it away (see figure 2). *Sisyphus rubrus* buries the ball before laying an egg in it, while *Sisyphus spinipes* lays an egg in the ball and leaves the ball propped up in a tussock of grass or other vegetation.

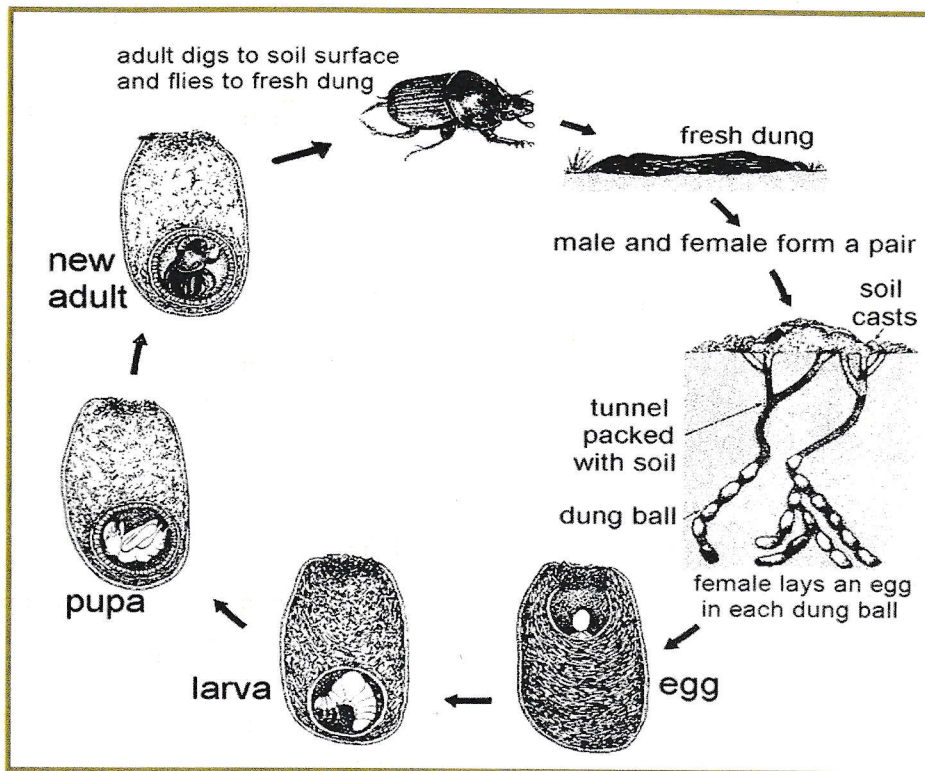


Figure 1: Life cycle of tunnelling dung beetle species (adapted from Bornemissza 1976)

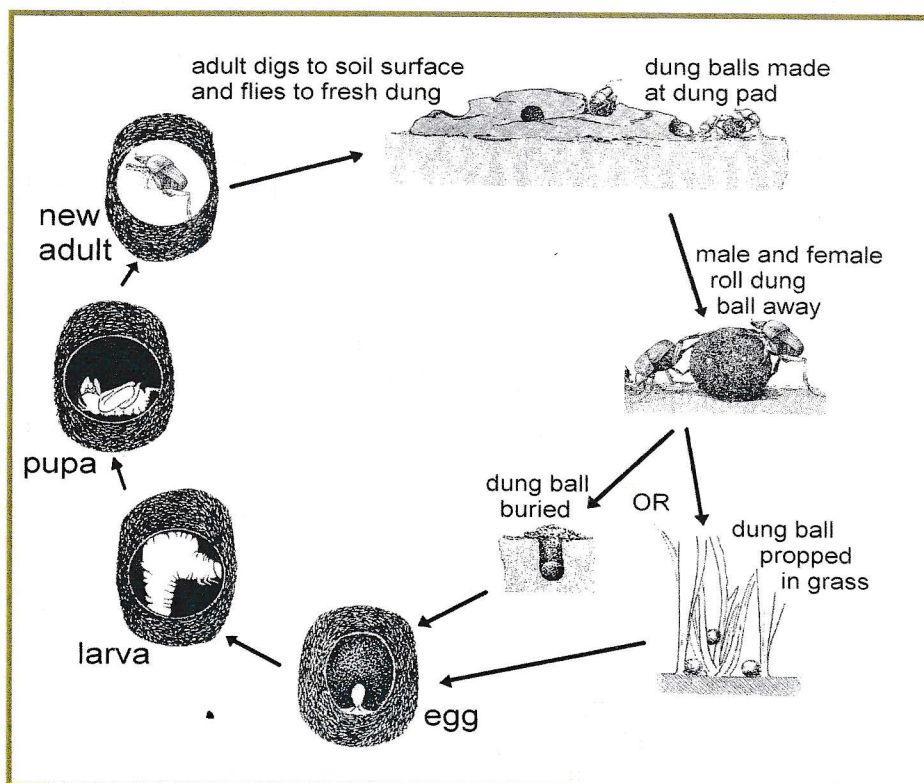


Figure 2: Life cycle of ball-rolling dung beetle species (adapted from Tyndale-Biscoe 1990)

Seasonal Activity

In Queensland, dung beetles are most active during the warmer months of the year, particularly after rainfall. Breeding activity declines before winter. One species, *Onitis caffer*, is active in autumn and early winter in parts of southeast Queensland. During the cold months, dung beetles over-winter underground as either adults or larvae. There is considerable mortality of adults during this time. Some species simply become less active during winter, but others go into a state of diapause (similar to hibernation) and do not emerge until stimulated by the correct temperature and by adequate rainfall. In the case of *Onthophagus gazella*, the first good spring rain triggers larvae to pupate, and the second good rain triggers emergence of new adults.

Life cycles of common dung beetle species

SPECIES	FLIGHT TIME	DEVELOPMENT PERIOD (EGG TO ADULT)	LIFE SPAN OF ADULTS	NUMBER OF EGGS LAID PER DAY	DEPTH OF TUNNELS
Tunnelling species					
<i>Onthophagus gazella</i>	dusk/dawn	4-6 weeks	2 mth	1-2	20-30cm
<i>Onitis alexis</i>	dusk/dawn	2-5 months	>2mth	2-3	10-20cm
<i>Onitis viridulus</i>	dusk/dawn	6-8 weeks	?	2-3	<10cm
<i>Euoniticellus intermedius</i>	day	5-6 weeks	1-2 mth	2	5-15cm
<i>Liatongus militaris</i>	day	?	?	?	5-15cm
<i>Onthophagus sagittarius</i>	dusk/dawn	?	?	?	?
Ball rolling species					
<i>Sisyphus spinipes</i>	day	7-11 weeks*	2-4 mth*	1 per 2 days	no tunnels
<i>Sisyphus rubrus</i>	day	5-16 weeks*	2-6 mth*	1 per 2 days	10cm

? = no information available * = laboratory data

In an average summer rainfall season, species with a short egg-to-adult development period of 4 to 8 weeks can complete three generations. This results in up to three distinct peaks of beetle activity for species such as *Onthophagus gazella*, *Euoniticellus intermedius* and *Sisyphus rubrus*, which are not necessarily in phase with each other. For species with a longer development period, such as *Onitis alexis*, only two generations are completed in a season. This results in a peak of activity in spring and a second peak in autumn.

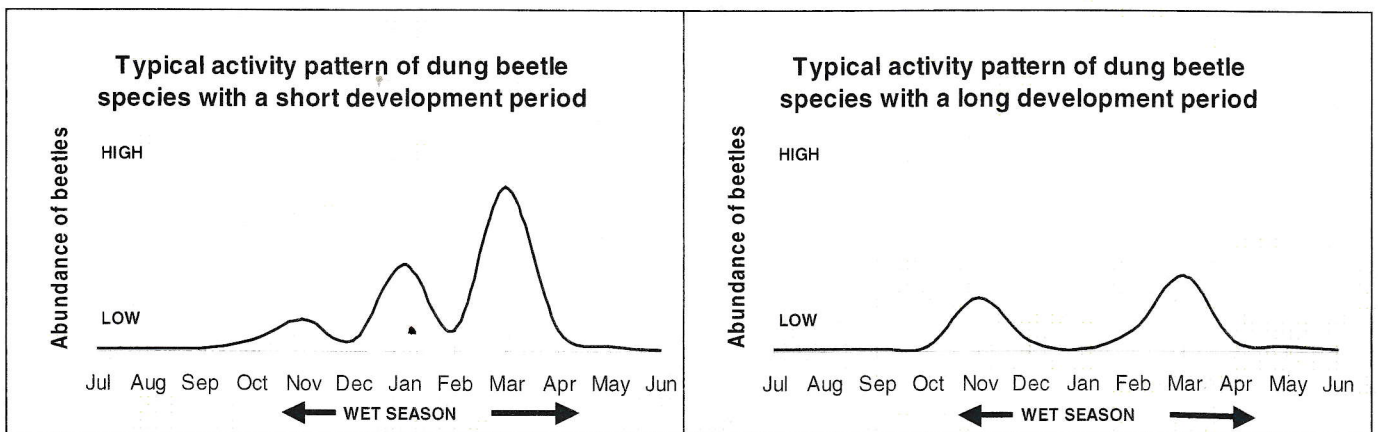


Figure 3: Typical activity patterns of introduced dung beetles in Queensland





Factors that affect dung beetle populations

Dung beetle populations can be adversely affected by a number of factors including:

- Dry weather
- Cold weather
- Predators – e.g. cane toads, ibis, crows, pigs, foxes
- Dung from high intake grain fed animals e.g. feedlots and some dairies
- Chemicals – certain parasiticides pass into the dung and can be harmful to dung beetles
- Pasture quality – good quality pasture produces good quality dung (higher moisture and nitrogen content), resulting in higher rates of egg production by dung beetles, hence higher population levels.

Managing to optimise beetle populations

Dung beetle activity is largely governed by seasonal conditions. However, there are a number of things that property managers can do to enhance their dung beetle populations:

1. Strategic use of chemicals. If possible, try to use chemicals which have little impact on beetle populations and use only as necessary at times of the year when beetle numbers are low (eg. autumn, winter and in dry periods).
2. Avoid feeding large amounts of grain to cattle.
3. Manage pastures to improve dung quality - if your cattle are on high quality feed, it will generally enhance dung beetle populations.

Further Information



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AgForce Website: www.agforceqld.org.au
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"Dung today, gone tomorrow"