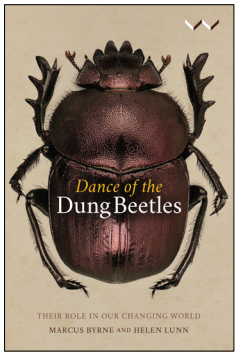
BOOK TITLE:
Dance of the dung beetles: Their role in our changing world



AUTHORS:
Marcus Byrne, Helen Lunn

ISBN:
9781776142347 (softcover, 240 pp)

PUBLISHER:
Wits University Press, Johannesburg; ZAR320

PUBLISHED:
2019

REVIEWER:
Sue Nicolson

AFFILIATION:
Centre for the Advancement of Scholarship, University of Pretoria, Pretoria, South Africa

EMAIL:
sue.nicolson@up.ac.za

HOW TO CITE:
Nicolson S. Dung beetles do the dirty work for the planet with style and charisma. S Afr J Sci. 2020;116(1/2), Art. #6479, 1 page. https://doi.org/10.17159/sajs.2020/6479

ARTICLE INCLUDES:
☐ Peer review
☐ Supplementary material

PUBLISHED:
29 January 2020

Dung beetles do the dirty work for the planet with style and charisma

The 6000 species of dung beetles form a large and successful subfamily of the Scarabaeidae. They make a living from dung as rollers, dung dwellers or tunnellers: most are tunnellers but it is the rollers that catch our attention. They are most diverse in Africa and South America, and South African scientists have been active in research on these insects. Broad in scope, this book weaves together dung beetle mythology, ecology, behaviour and evolution in a most entertaining and readable way.

We follow the fortunes of dung beetles in human history, beginning in Chapter 1 with ancient Egypt. While dung beetles have featured in various human belief systems, best known is the sacred scarab (*Scarabaeus sacer*). Dung beetles bury their balls in the ground and the larva develops inside the ball. In the Egyptian world view, the re-emergence of the beetle was a symbol of the daily death and rebirth of the sun; also a symbol of resurrection. Later, the French entomologist Cambefort compared the pupa in its chamber to a mummified body, the chambers and tunnels to pyramid interiors.

The following two chapters describe the role of dung beetles in the history of science. Their subterranean nests were first described in 1602, and an early microscope enabled Swammerdam to describe a scarab and its immature stages. International trade and exploration led to the discovery of new fauna and flora. As collections from around the world expanded, it became important to explain the similarities and differences between the newly named species. Darwin's notes made during the second voyage of the *Beagle* show he was thinking about the links between dung beetles and herbivores, and about how beetles might adapt to new dung types in new places (Appendix A). Detailed observations by the French naturalist Fabre led to a delightful description of the life cycle in 1918.

The book then moves to the ecological roles of dung beetles. Chapter 4, about colonising insects, focuses on the fascinating story of how dung beetles were introduced as a form of biological control, first to Hawai'i and later to Australia. Unlike Australian dung beetles which are adapted to marsupial dung, introduced beetles such as *Onthophagus gazella* (a small tunneller) were spectacularly successful in burying cow pats and reducing bush fly numbers. When it was realised that different beetles were needed for different soil types and rainfall patterns throughout Australia, the Dung Beetle Research Unit was established in Pretoria. This was a great impetus for research on their taxonomy and biology, and extensive collections were made (now in the National Collection of Insects). Strangely, there is an appendix listing introduced species that became established in Hawai'i, but no similar list for the 23 out of 50 species that were introduced into quarantine in Australia. The Australian dung beetle project is being revived, with a new AUD13 million grant aimed at quantifying the ecosystem services rendered by exotic dung beetles across Australia.

Early ecological studies on the relationships between dung beetles and large herbivores such as elephants, mainly in Africa, are covered in Chapter 5. The establishment of game parks, initially in areas made uninhabitable by tsetse flies, led to the new profession of wildlife management, although it took a while for dung beetles to be noticed. Malcolm Coe was first to examine the interactions between elephants and dung beetles in Kenya, and to publicise the value of their recycling activities.

Chapter 6 celebrates the value of dung beetles for research on ecological and behavioural questions. Multiple species, attracted by scent, converge in large numbers on fresh dung. Ball rollers are intent on rolling their balls – backwards – away from the dung pile, and are undeterred by experimental interventions. They roll to avoid competition for space under the dung, and to avoid having the valuable resource stolen. In fights, the hotter beetle wins. Conversely, beetles cool down on the hottest days by standing on their balls; demonstrating this involved fitting them with silicone bootees (the colour photos are helpful).

The 'dance' in the book's title refers to the beetle standing on top of its ball and rotating to get its bearings. Ball rollers need to get away from the dung pile quickly and efficiently, i.e. in a straight line, and Byrne and his colleagues have carried out a series of ingenious and fun experiments showing how beetles use celestial cues for orientation. Apart from the sun, dung beetles use polarised light from the sun or moon, and even the Milky Way – the only animals known to do this. Beetles wandered in circles when caps were put on their heads, or changed direction when what they could see of the sky in the field or in a planetarium was modified.

The final chapter is about the value of dung beetles for evolutionary studies. Astonishingly, more than 250 papers are written every year on the bull-horned beetle *Onthophagus taurus*. Male beetles come in different sizes with large or small horns or none. Large individuals win fights, guard females in tunnels, and help with parental care; while smaller males engage in sneaky copulations and have bigger testes, useful for sperm competition. Body size and whether the genes for horns are switched on are determined by the amount of larval provisions. The species is valued for allometric studies as well as its flexible breeding system.

This book is not the first text on dung beetles from South Africa: surprisingly, the select bibliography does not list the substantial academic volume by Scholtz et al.[1] These books differ greatly in approach and content, and complement each other.

Reference

1. Scholtz CS, Davis ALV, Kryger U. Evolutionary biology and conservation of dung beetles. Sofia: Pensoft Publishers; 2009.