

## The Dirty Dozens – The UK dung beetles







**Darren Mann**  
 Oxford University Museum of Natural History

## Oxford University Museum of Natural History



**Life Collections**



**Earth Collections**



**Library & Archives**



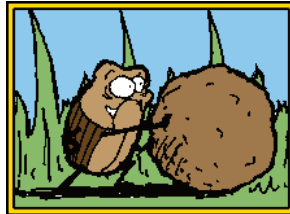
**Public Engagement**

<ul style="list-style-type: none"> <li><span style="border: 1px solid black; border-radius: 50%; padding: 2px;">1600</span> Tradescant Collection formed</li> <li><span style="border: 1px solid black; border-radius: 50%; padding: 2px;">1677</span> Ashmole Cabinet arrives in Oxford</li> <li><span style="border: 1px solid black; border-radius: 50%; padding: 2px;">1860</span> Museum of Natural History opens</li> <li><span style="border: 1px solid black; border-radius: 50%; padding: 2px;">Today</span> Most visited non-national UK science museum</li> <li><span style="border: 1px solid black; border-radius: 50%; padding: 2px;">Today</span> Second most visited University museum globally</li> </ul>	<p><b>7 million</b> objects</p> <p>zoological type specimens <b>30,000</b></p> <p><b>6,000</b> specimen loans made annually</p> <p><b>200</b> active volunteers</p> <p><b>£4 million</b> operating budget</p>	<p><b>750,000</b> visitors a year</p> <p><b>40,000</b> students visits</p> <p><b>1 million</b> web visits</p> <p><b>300</b> events for families</p> <p><b>125</b> events for families</p> <p><b>50</b> museum staff full-time equivalent</p>
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[www.oum.ox.ac.uk/](http://www.oum.ox.ac.uk/)  
[@morethanadodo](https://twitter.com/morethanadodo)






### Worshipped



### Dung Beetles

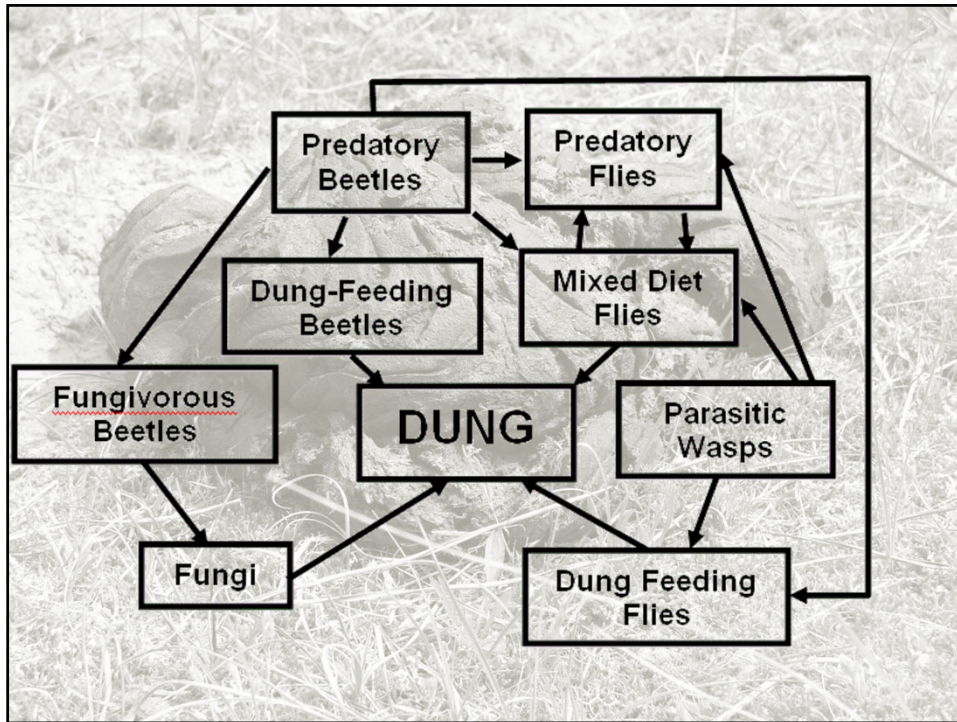
		
<b>Geotrupidae</b>	<b>Scarabaeidae</b>	<b>Scarabaeidae</b>
<b>Dor Beetles</b>	<b>Scarabaeinae</b>	<b>Aphodiinae</b>
	<b>True Dung Beetles</b>	<b>Lesser Dung Beetles</b>
<b>UK species - 8</b>	<b>UK species - 10 (4 extinct)</b>	<b>UK species - 46 (1 extinct)</b>
<b>World Species - 600</b>	<b>World Species - 5000</b>	<b>World Species - 3200</b>

### 'Other' Dung Beetles

		
<b>Hydrophilidae</b>	<b>Staphylinidae</b>	<b>Histeridae</b>
<b>Water Beetles</b>	<b>Rove Beetles</b>	<b>Clown Beetles</b>

**Predators of fly eggs and maggots**





**Biology**

1 metre

**Different ways of using dung..**

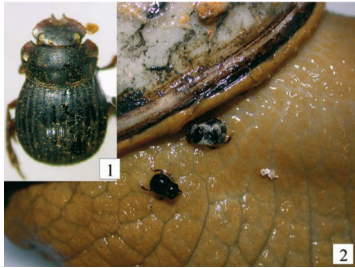
**Rollers**  
**Tunnellers**  
**Dwellers**

**Time of day**  
**Decomposition state**  
**Type of dung/resource**

Doube, B. M. 1990. A functional classification for analysis of the structure of dung beetle assemblages. *Ecological Entomology* 15:371-383.



## Biology





## Cattle Dung

One cow can produce **9 tonnes of dung per year!** (Fincher, 1981)

There are over **10 million cattle in the UK** (DEFRA, 2007) which produce **~90 million tonnes of dung per year**

One cow produces enough dung to cover 0.8m<sup>2</sup>/day (Stevenson & Dindal, 1987). UK – **800 hectares** of land covered in cow dung /day (**292,000 ha/year**)

An additional 6-12% of the area surrounding each pat is avoided by grazing livestock (Fincher, 1981) = **896 ha/day (327,040 ha/year)**

**...and it's not only cattle the produce dung!**



## Dung - Global estimate = 100 billion kg



*This much dung  
would flow  
over Victoria Falls  
24 hours a day!*



## Multitude of Ecosystem Functions & Services

- Dung removal
- Fly control
- Parasite suppression
- Nutrient cycling
- Plant growth enhancement
- Enhance soil structure
- Secondary seed dispersal
- Pollination
- Reduction of greenhouse gas emissions





## Value for Money


Ecological Entomology

*Ecological Entomology* (2015), **40** (Suppl. 1), 124–135 DOI: 10.1111/een.12240


INSECTS AND ECOSYSTEM SERVICES SPECIAL ISSUE

### The application of an ecosystem services framework to estimate the economic value of dung beetles to the U.K. cattle industry

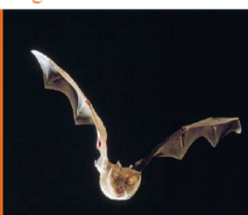
SARAH A. BEYNON,<sup>1</sup> WARWICK A. WAINWRIGHT<sup>2</sup> and MICHAEL CHRISTIE<sup>2</sup> <sup>1</sup>Dr Beynon's Bug Farm, St Davids, Pembrokeshire, U.K. and <sup>2</sup>The School of Management and Business, *Institute of Management, Business and Information Science*, Aberystwyth University, Aberystwyth, U.K.




**U.K. cattle industry c. £367 million/year**  
Does not include rest of the livestock




Managing landscapes for the greater horseshoe bat



## Food for Others





BIRD STUDY  
<https://doi.org/10.1080/00063657.2018.1505626>

SHORT REPORT

**The diet of a declining Red-billed Cough *Pyrrhocorax pyrrhocorax* population on Islay, Scotland**

Fiona S. MacGillivray\*, Gillian Gilbert<sup>†</sup> and Clive R. McKay<sup>†\*</sup>

\*RSPB Loch Gruinart, Bridgend, Argyll, Islay, UK; <sup>†</sup>RSPB Centre for Conservation Science, Glasgow, UK; <sup>‡</sup>Department of Life Sciences, Glasgow University, Glasgow, UK

ABSTRACT  
**Capsule:** We quantify Red-billed Cough *Pyrrhocorax pyrrhocorax* diet from faecal samples collected on Islay. Dung invertebrates formed the majority of prey biomass in dune pasture and *Tipulid* larvae in mixed pasture but *Aphodius* larvae were scarce in the diet, whereas they had been a major component in the 1980s. There are management implications from the indication of a reduction in availability of preferred food.

ARTICLE HISTORY  
Received 7 April 2018  
Accepted 23 July 2018

## GB Scarabaeoidea Review

**Regionally Extinct**  
 9 species **Now 8**

**Critically Endangered**  
 (Possibly Extinct)  
 4 species **Now 2**

**Critically Endangered**  
 2 species

**Endangered**  
 2 species

**Vulnerable**  
 7 species

**Near Threatened**  
 7 species

**Least Concern**  
 Nationally Scarce  
 19 species

**Least Concern**  
 51 species

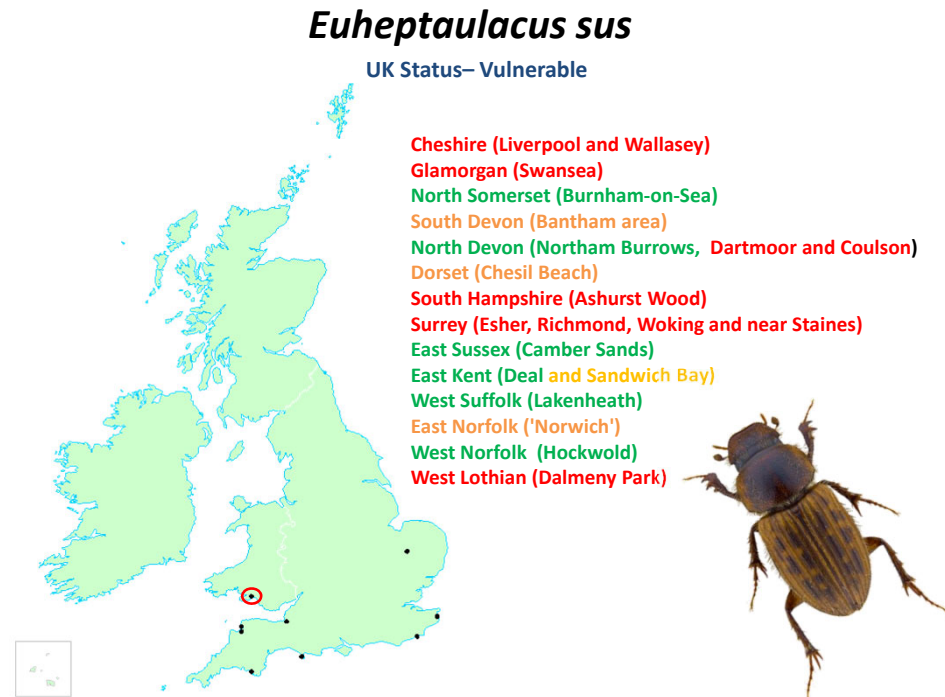
**A review of the status of the beetles of Great Britain: The stag beetles, dor beetles, dung beetles, chafers and their allies - Lucanidae, Geotrupidae, Trogidae and Scarabaeidae (NECR224)**  
<http://publications.naturalengland.org.uk/publication/5488450394914816>

## Winners?

*Aphodius consputus*  
 Hyman, 1992 – Rare (RDB 3)  
**Current Review – Nationally Scarce**

*Aphodius zenkeri*  
 Hyman, 1992 – Notable B  
**Current Review – Least Concern**  
 25-30% increase in records

***Euheptaulacus sus***  
 UK Status– Vulnerable



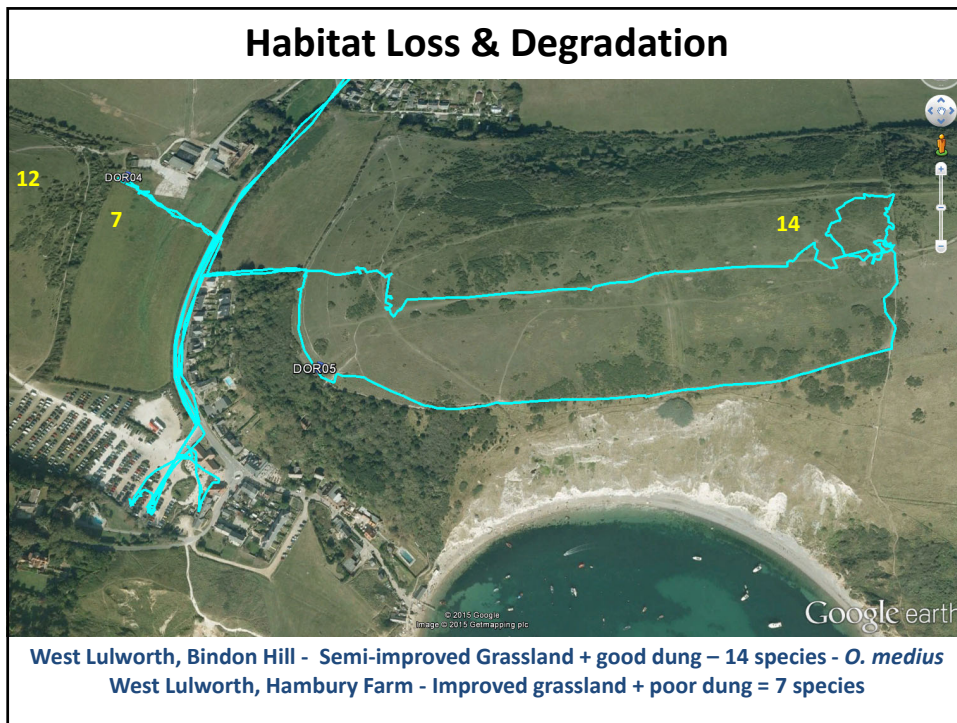
**Cheshire (Liverpool and Wallasey)**  
**Glamorgan (Swansea)**  
**North Somerset (Burnham-on-Sea)**  
**South Devon (Bantham area)**  
**North Devon (Northam Burrows, Dartmoor and Coulson)**  
**Dorset (Chesil Beach)**  
**South Hampshire (Ashurst Wood)**  
**Surrey (Esher, Richmond, Woking and near Staines)**  
**East Sussex (Camber Sands)**  
**East Kent (Deal and Sandwich Bay)**  
**West Suffolk (Lakenheath)**  
**East Norfolk ('Norwich')**  
**West Norfolk (Hockwold)**  
**West Lothian (Dalmeny Park)**

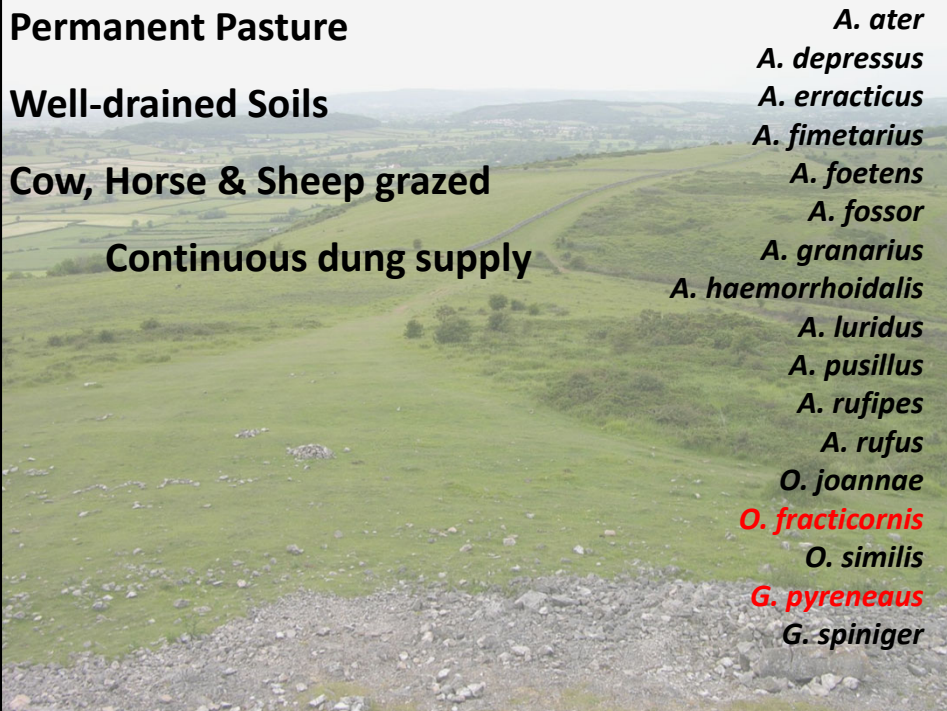
**Conservation**

**Threats**

- Habitat loss & degradation
- Habitat fragmentation
- Dung quality and quantity
- Loss of continual grazing
- Use of endectocides








**Permanent Pasture**

**Well-drained Soils**

**Cow, Horse & Sheep grazed**

**Continuous dung supply**

*A. ater*  
*A. depressus*  
*A. erracticus*  
*A. fimetarius*  
*A. foetens*  
*A. fossor*  
*A. granarius*  
*A. haemorrhoidalis*  
*A. luridus*  
*A. pusillus*  
*A. rufipes*  
*A. rufus*  
*O. joannae*  
*O. fracticornis*  
*O. similis*  
*G. pyreneaus*  
*G. spiniger*



***Onthophagus fracticornis***

UK status – Vulnerable - 11 sites in the UK

Mendips – 5 recent sites, 3 historic

Wales – 3 historic records

- Matley Bog, New Forest – re-determined as *O. similis*
- Johnson, 1991: N. Wales
- 1998: Museum specimens in Cardiff & Oxford dating from 1898-1928
- Gibbs, 2000: 1<sup>st</sup> modern record
- Duff, 2006: D.G. Brown specimen recognised
- Duff et al. 2007 published
- 2008-2017: additional sites on the Mendips
  - Survey of >30 sites
- 2015: Bristol City Museum historic records

Duff, A.G., Mann, D.J. & Gibbs, D.J. 2007. *Onthophagus fracticornis* (Preysslter) is alive and well in western Britain. The Coleopterist 16(3): 131-133.



## Habitat Degradation and Fragmentation

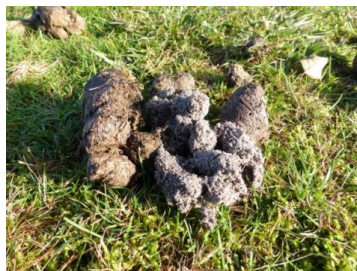


## Dung Quality





### Loss of Grazing



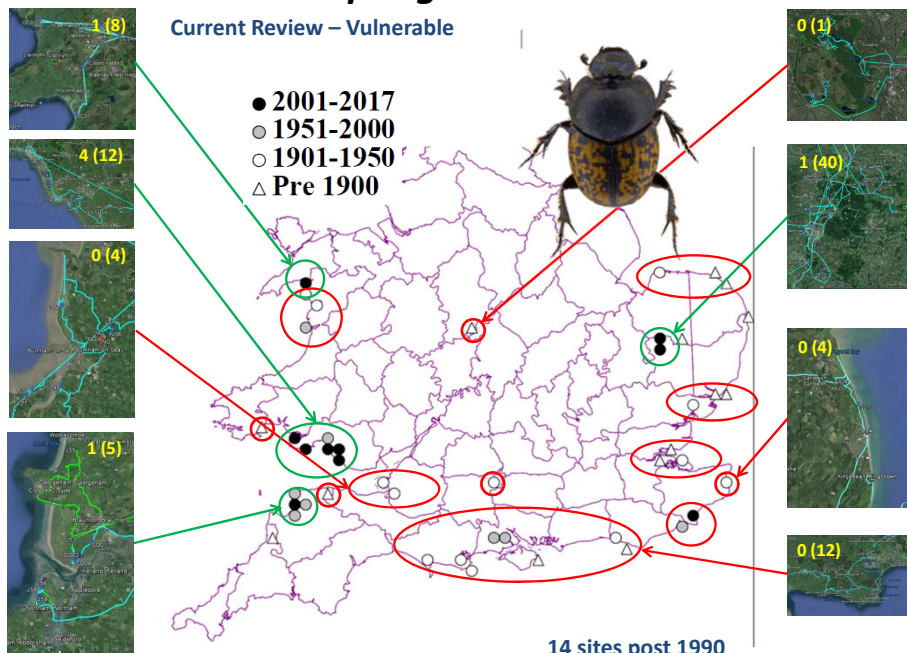
Minotaur Burrow

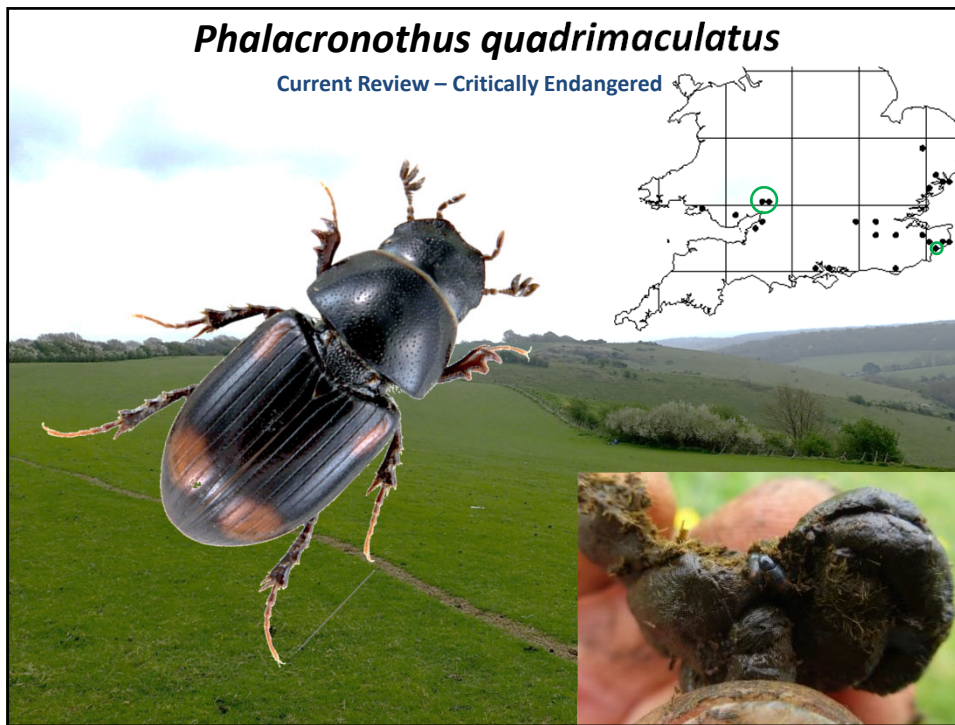
104 - *O. joannae*;  
4 - *O. nuchicornis*; 4 - *O. similis*

### *Onthophagus nuchicornis*

Current Review – Vulnerable

- 2001-2017
- 1951-2000
- 1901-1950
- △ Pre 1900





## Impact of chemical and alternative cattle wormers on dung beetles & decomposition processes

**Journal of Applied Ecology** doi: 10.1111/j.1365-2664.2012.02210.x

*Journal of Applied Ecology* 2012, **49**, 1365–1372

### Species-rich dung beetle communities buffer ecosystem services in perturbed agro-ecosystems

Sarah A. Beynon<sup>1\*</sup>, Darren J. Mann<sup>2</sup>, Eleanor M. Slade<sup>1,3</sup> and Owen T. Lewis<sup>1</sup>

Agriculture, Ecosystems and Environment 162 (2012) 36–44

Contents lists available at SciVerse ScienceDirect

**Agriculture, Ecosystems and Environment**

journal homepage: www.elsevier.com/locate/agee

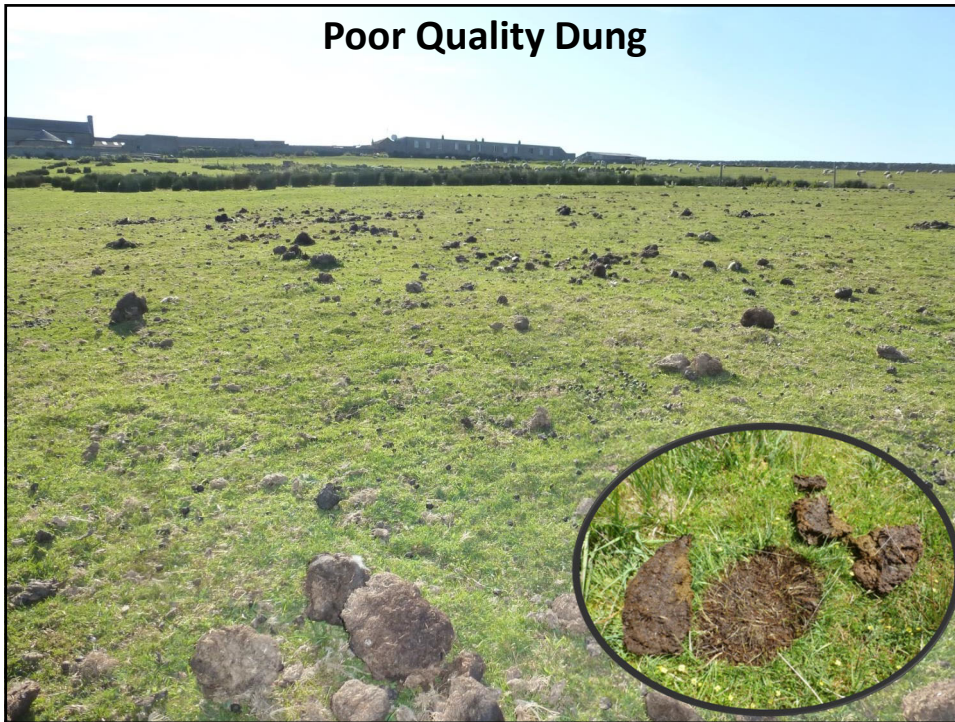
Consequences of alternative and conventional endoparasite control in cattle for dung-associated invertebrates and ecosystem functioning

S.A. Beynon<sup>1\*</sup>, M. Peck<sup>3</sup>, D.J. Mann<sup>2</sup>, O.T. Lewis<sup>3</sup>

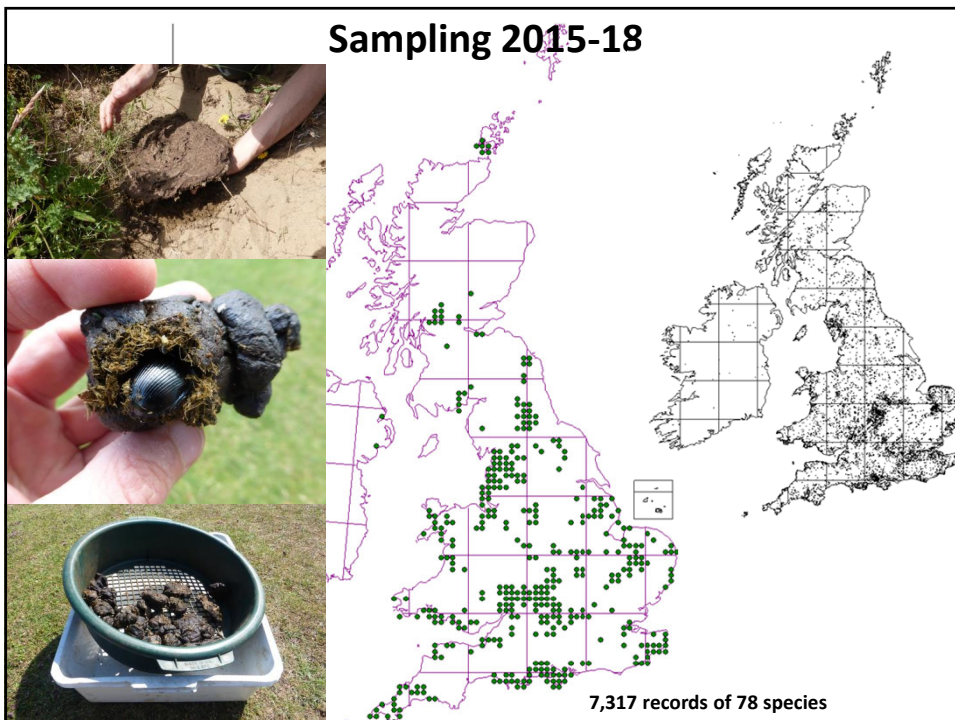
**Fig. 2.** Monoculture species-specific (a) adult survival and (b) offspring emergence in control and ivermectin dung. Bars are estimated means (and standard errors). Key to species codes: A = *Aphodius ater*, B = *Aphodius grammus*, C = *Aphodius peckii*, (dung-soil-poising endocoprids), D = *Aphodius agrorum*, E = *Aphodius foveolatus*, F = *Aphodius laticollis*, (soil-soil-poising endocoprids), G = *Aphodius erraticus*, H = *Onthophagus joazeiro*, I = *Onthophagus similis* (paracoprids). Species-specific significant differences due ivermectin are indicated as follows: \**P* < 0.05, \*\*\**P* < 0.001.



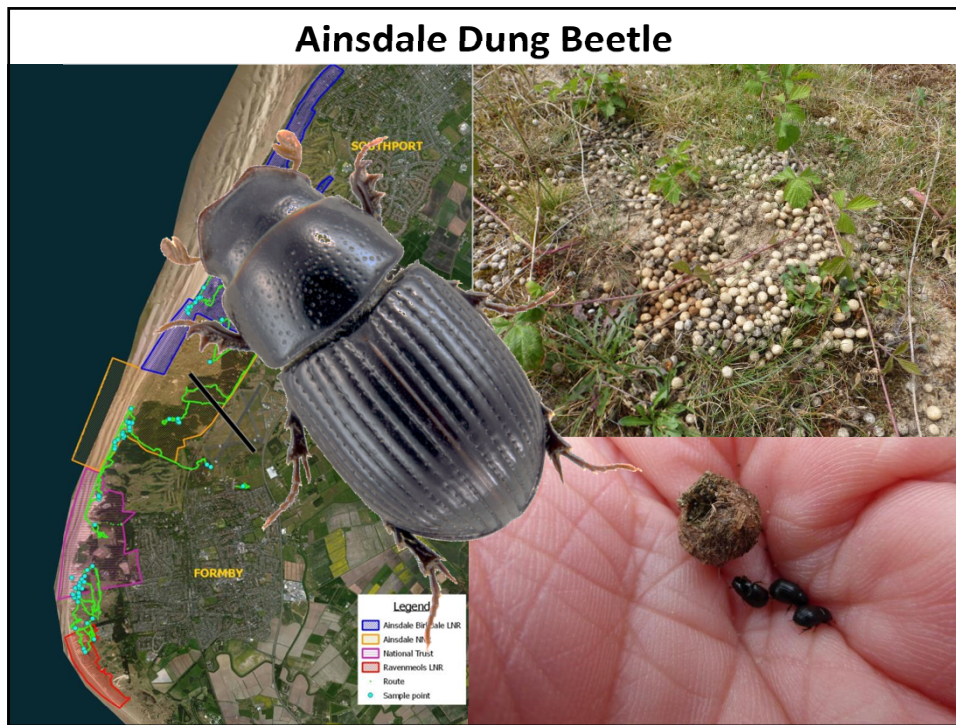
### Poor Quality Dung




### Sampling 2015-18








## Ainsdale Dung Beetle



### North West Invertebrates

Promoting the study and conservation of invertebrates in the North West




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### ‘Possibly Extinct’ UK dung beetle rediscovered on the Sefton Coast after 21 years

After two decades with no records, experts had feared that a rare diminutive scarab beetle *Aphodius brevis* had become extinct from our shores (Lane & Mann, 2016). In the UK, it's only ever been known from the sand dunes of the Sefton Coast but years of searching by coleopterists had failed to locate the elusive dung feeder.

The Tanyptera Project decided this species was worthy of one last intensive search so this summer we brought in two of the UK's top scarab beetle experts, Darren Mann and Ceri Watkins, to scour the dunes at Formby and Ainsdale. After the first fruitless week walking miles of the shore tirelessly sieving piles of rabbit dung (known as middens) along the way, it seemed unlikely that the beetle would ever be found here again.



*Aphodius brevis* dune habitat

DISCOVER Wildlife

Wildlife and photography at its best from BBC Wildlife Magazine


NEWS | PHOTOGRAPHY | BRITISH WILDLIFE | ANIMALS | TRAVEL | DIRECTORY

#### Why did this tiny beetle make an Oxford scientist swear?

Entomologists celebrate the first UK record of a beetle species in 21 years.

19th July 2017 Megan Sherryby

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## *Aphodius punctatosulcatus*


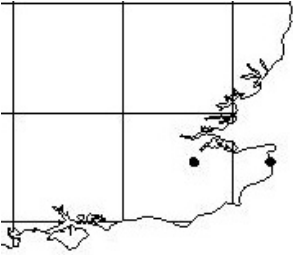
**Current Review – Regionally Extinct**

**Hyman, 1992 – Not Included**  
**Current Review – Regionally Extinct**

Deal (TR35) 1871-1923  
 NMW, Cardiff, WM, Liverpool, OUMNH, NMS, Edinburgh  
 NHM, London  
 (35 specimens in total – 5,000 checked)

BENHS Collection, Ryarsh (TQ65) Kent, 1938

Standing over *A. sphacelatus* & *A. prodromus*

Mann, D.J. 2000. 1999 Annual exhibition, Imperial College, London SW7. 27 November 1999. Winter Breeding Aphodius (Scarabaeidae). *British Journal of Entomology and Natural History* **13**: 179.  
 Mann, D.J. 2002. Changes to the British Coleoptera List published in 2000 and 2001. *The Coleopterist* **11**(2): 52-63.



**NHM Coleoptera**  
@NHM\_Coleoptera

Following

Still looking for a British example of this in [@NHM\\_London](#)'s collection- I'm sure there will be one hiding away among similar species!



**Ashleigh Whiffin** @AshWhiffin

Melinopterus punctatosulcatus - 1st known UK specimens (from Deal, 1871) discovered by @BlattaMann in our Waterhouse Collection! #DungBeetle

2:52 PM - 30 Sep 2017

9 Likes



🗨️
↻
❤️ 9
✉️

 **Max Barclay** @Coleopterist · Jan 21


Aphodius punctatosulcatus - a new species to the British collections of the @NHM\_London thanks to Darren and Mary-Emma from @Team\_DUMP : not every day, or even every year, we add a species to the British collection!

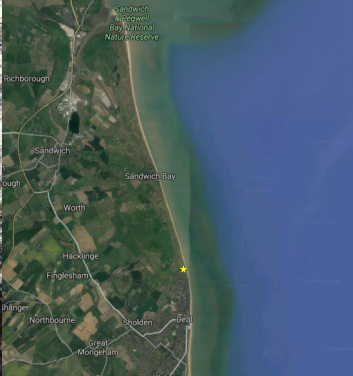


You, NHM Coleoptera and NHM Science

1 27 110


### *Aphodius punctatosulcatus*









## Dung beetle UK Mapping Project DUMP



**@Team\_DUMP**  
**#DungBeetle #dungisfun #dungathon**



## DUMP Advocacy, Outreach & Training




The collage includes:

- Twitter posts from users like Darren J Mann, AnonPurble, and Paul Fuggle.
- News articles from BBC News and Scottish News with headlines such as "Why farms need dung beetles, why choughs need dung beetles, why we all need dung beetles" and "'Alarming trend' of decline among UK's dung beetles".
- Photographs of people participating in field activities, including a group of people in a field, a person with a cow, and a person kneeling in a field.
- A photograph of a group of people sitting around a table in a meeting or training session.

**#dungisfun #dungathon #Turd Tuesday #DUMP**







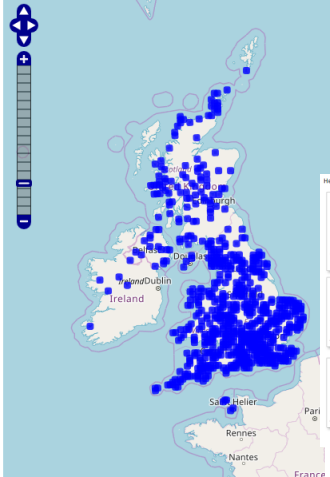
# Data

Home Record Explore Activities Summarise Verify Forum Help

Home » DUMP – Dung beetle UK Mapping Project: Activity summary

## DUMP – Dung beetle UK Mapping Project: Activity summary

Summary Species League Tables Trending












**Totals for this activity**

52 species

3218 records

1948 photos

Here are a few of the photos recently uploaded for this activity.

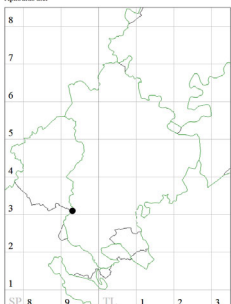
Trending species

- Anoplotrupes stercorosus
- Aphodius (Acrossus) depressus
- Aphodius (Acrossus) rufipes
- Aphodius (Agrilinus) ater
- Aphodius (Agrilinus) rufus
- Aphodius (Melinopterus) prodromus
- Aphodius (Melinopterus) sphacelatus

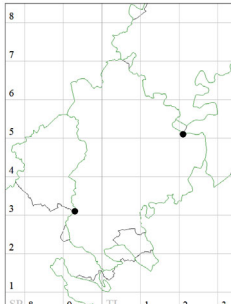
<http://www.brc.ac.uk/irecord>  
 @iRecord

## Data Flow

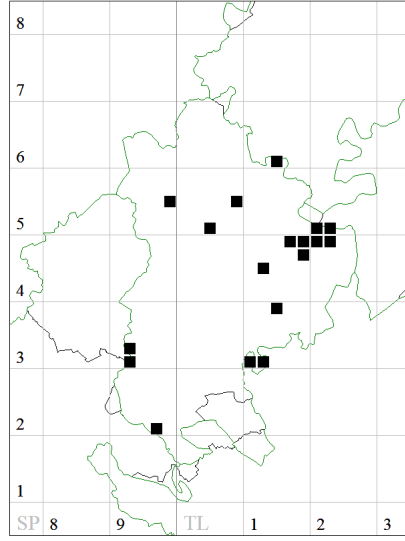
**Aphodius ater**



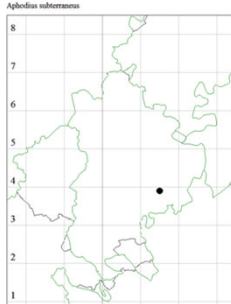
**Aphodius sphaecelatus**



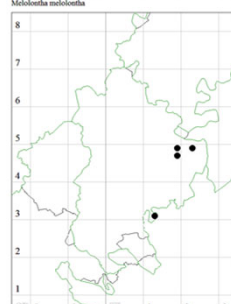
**Bedfordshire All Recorded 2km squares**



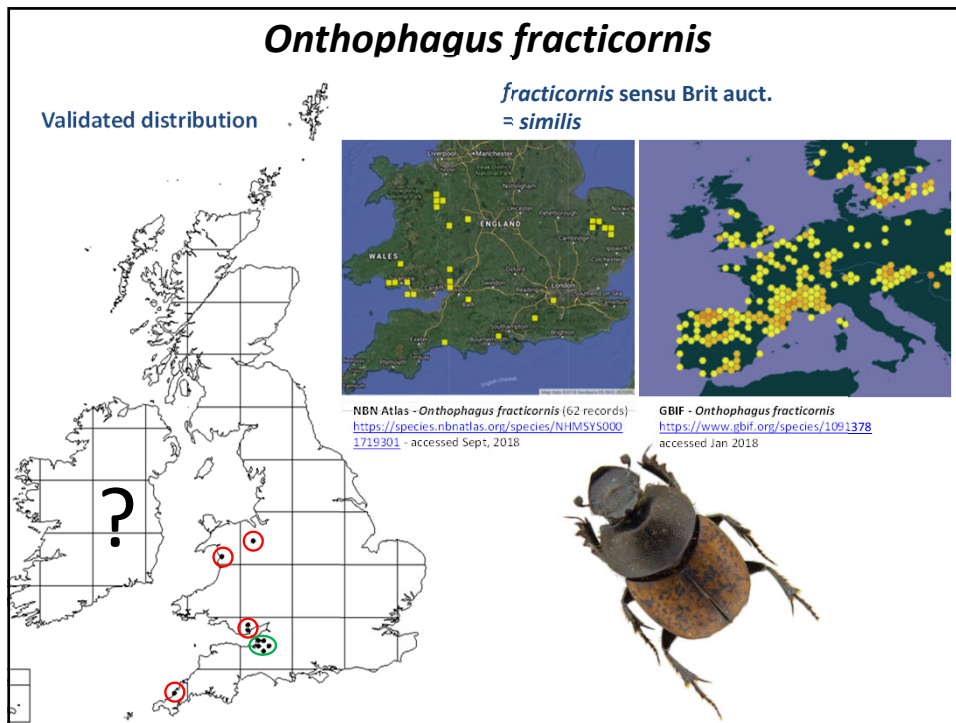
**Aphodius subterraneus**



**Meloidontia meloidontia**



22



## What's Next?

**Collections & Literature:** verification & data mining

**Data Cleaning of National Recording Scheme data**

		☺	<b>Targeted Surveys</b> Hand Searching Trapping
<i>rufa</i>	<i>brevis</i>		
		☺	<b>Funding for DUMP</b> Dung beetle UK Mapping Project
<i>4-maculatus</i>	<i>vulneratus</i>		
			ID Guides Outreach
<i>verticornis</i>	<i>lunaris</i>		
		☺	Survey under-recorded areas
<i>subterraneus</i>	<i>4-maculatus</i>		
		☺	
<i>testudinarius</i>			