Soilcam

LEADER IN DUNG BEETLE DISTRIBUTION

John Feehan

MAINTAINING THE BALANCE

Presentation Agenda

- Introduction to John Feehan and his story
- Understanding the problem and why dung beetles needed to be introduced into Australia.
- The solution. CSIRO dung beetle program and John’s involvement.
- The implementation and John’s personal quest.
- Summary and future outlook
- Q&A and discussion session

John Feehan started his career in the Division of Entomology, CSIRO working on the dung beetle program from 1965 to 1993. This involved the importation of surface sterilised dung beetle eggs, breeding and dispatching adult beetles throughout Australia.

When funding ceased, John established SOILCAM Pty Ltd, continuing the distribution and promotion of the benefits of dung beetles throughout Australia and overseas.

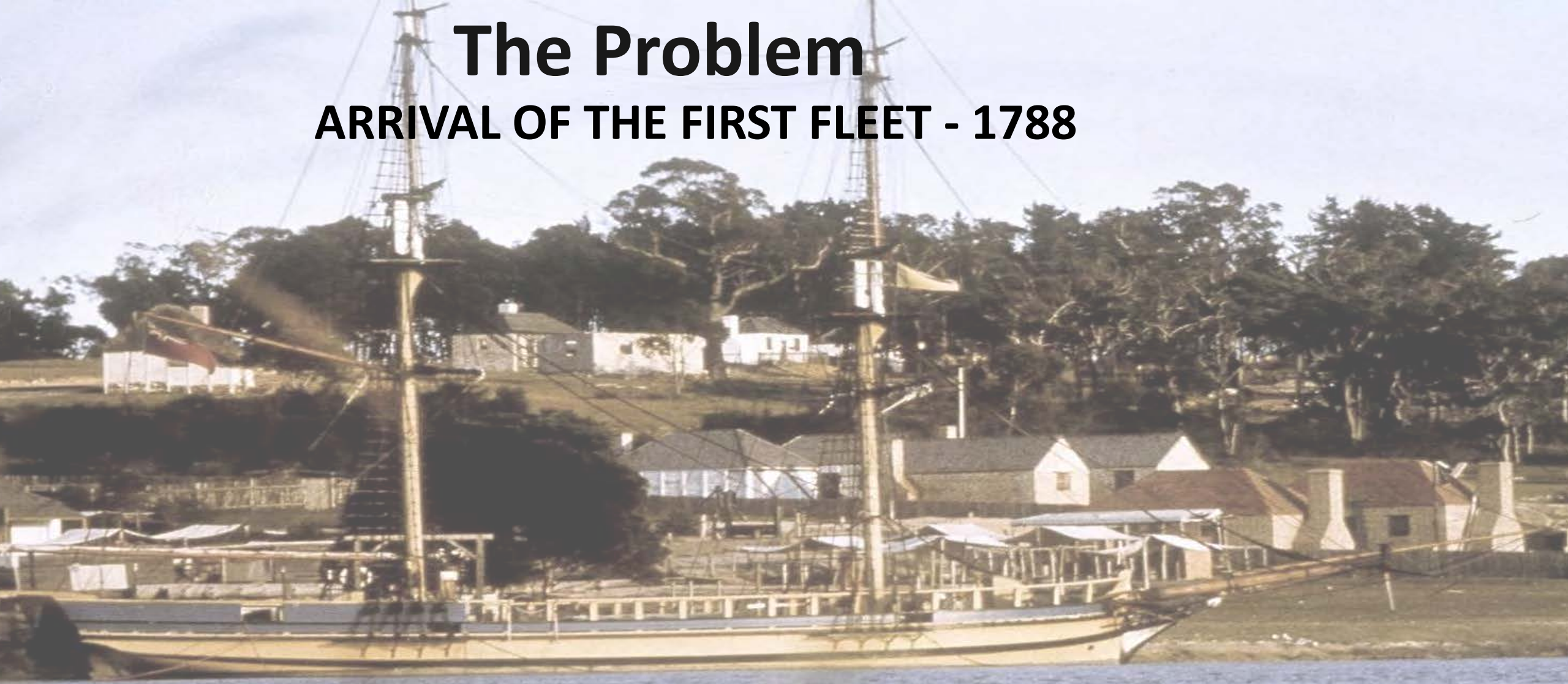
John Feehan – “Soilcam” est. 1990
The Dung beetle Expert

John’s business Soilcam, is the largest distributor of dung beetles in the world, having dispatched more than 8,500 starter colonies, consisting of 20 species and totalling over 7.5 million beetles to new locations.

John was awarded an Order of Australia medal (OAM) in 1997 and was nominated and shortlisted for Australian of the Year in 2011. John is a regular interviewee in print, broadcast and electronic media promoting the benefits of dung beetles.

The Problem

ARRIVAL OF THE FIRST FLEET - 1788



Captain Phillips first shipment of livestock to the Australian continent

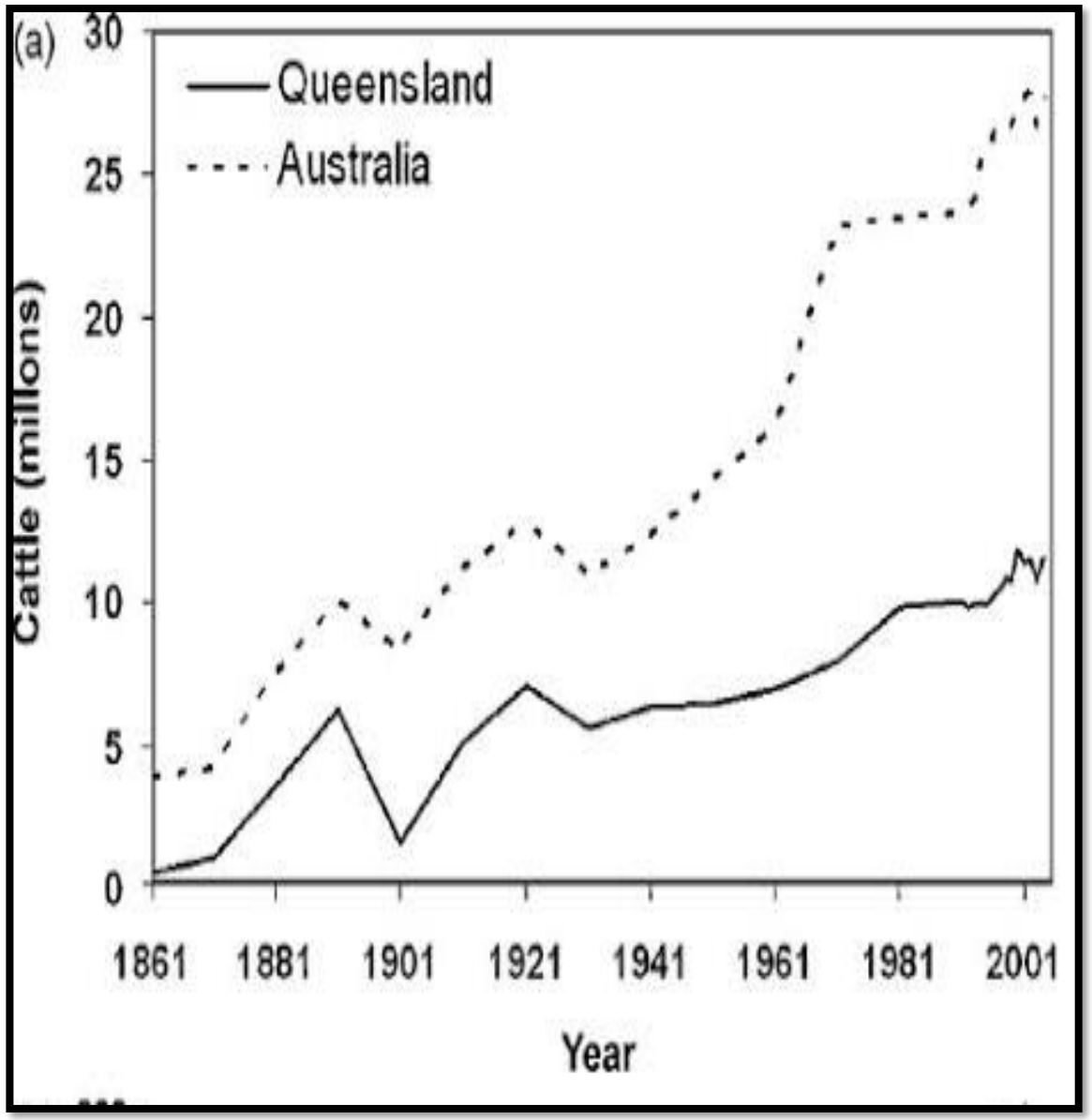
9 cows 4 Horses

44 sheep 32 pigs

Marsupial dung was the only dung on Australian soils pre colonialism

- Native dung beetles evolved with the marsupials. Despite over 500 native dung beetles identified, these could not process and bury the millions of tonnes of nutrient rich dung from large introduced Mammals.
- This unburied dung fast became a significant problem creating a ecological imbalance.

Cattle population explosion



CURRENT SITUATION

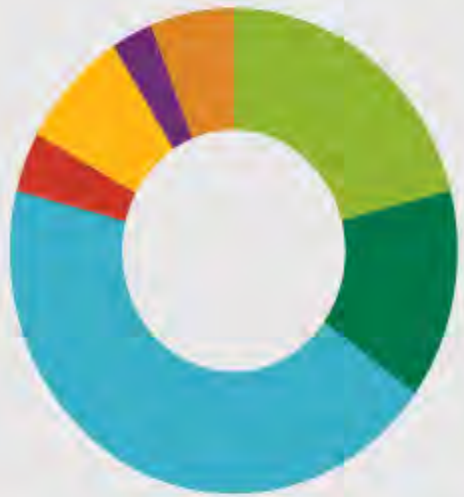
- 29 Million head of cattle
- 340 Million cow pats / Day
- 480,000 Tonnes of Dung day
- 175 million Tonnes per year

Australian cattle herd by state (head)

Total (as of 30 June 2023)

29,878,186

Australian cattle herd by state (%)



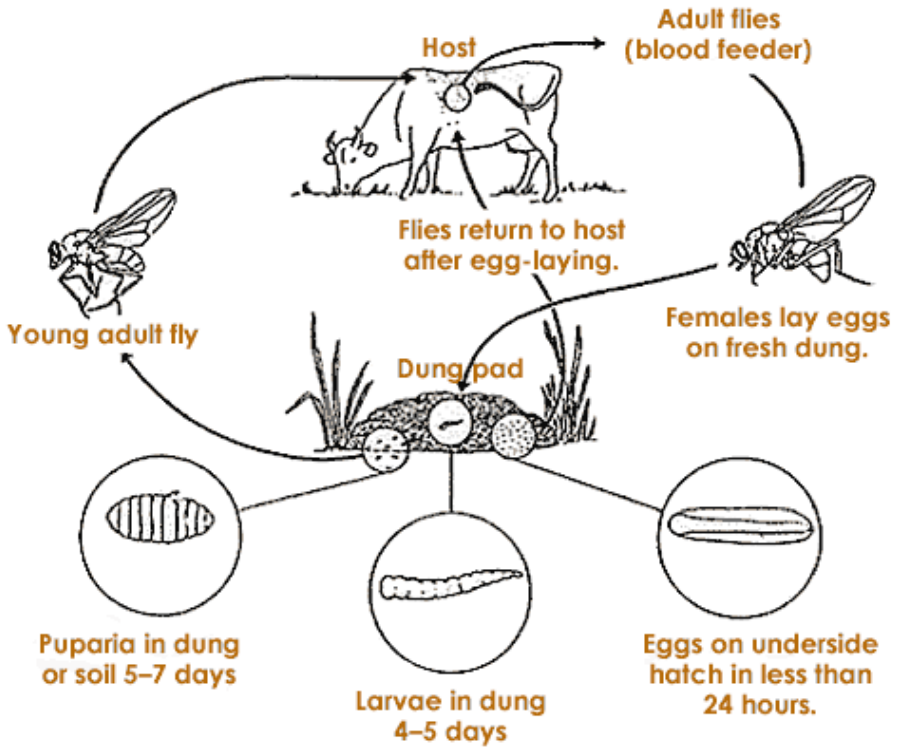
- New South Wales **21%**
- Victoria **14%**
- Queensland **44%**
- South Australia **4%**
- Western Australia **8%**
- Tasmania **3%**
- Northern Territory **6%**
- Australian Capital Territory **0%**

Source: ABS

Note: Data is using ABS experimental figures.

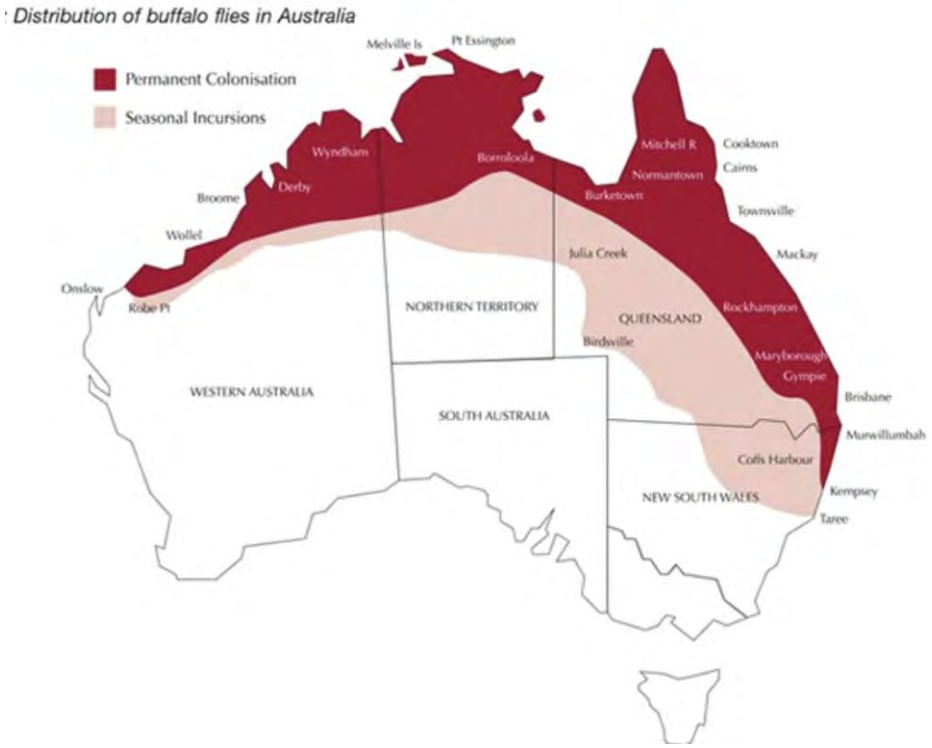
The Unintended consequences - Buffalo Fly

- Each dung pad can produce up to 5000 or more flies
- Buffalo flies require 4-5 days in an undisturbed dung pad



The Unintended consequences - Buffalo Fly

- **Negatively Impacting through**
- **torment and weight loss**
- **High input cost for treatment**
- **Additional stock handling and mustering**
- **Limited cattle breed selection**



The Unintended consequences

Buffalo flies cost Australian agriculture, particularly the beef and dairy industries, an estimated **$170 million annually**, with this figure encompassing both production losses and control costs. These are direct costs with indirect costs estimated closer to 1 billion dollars

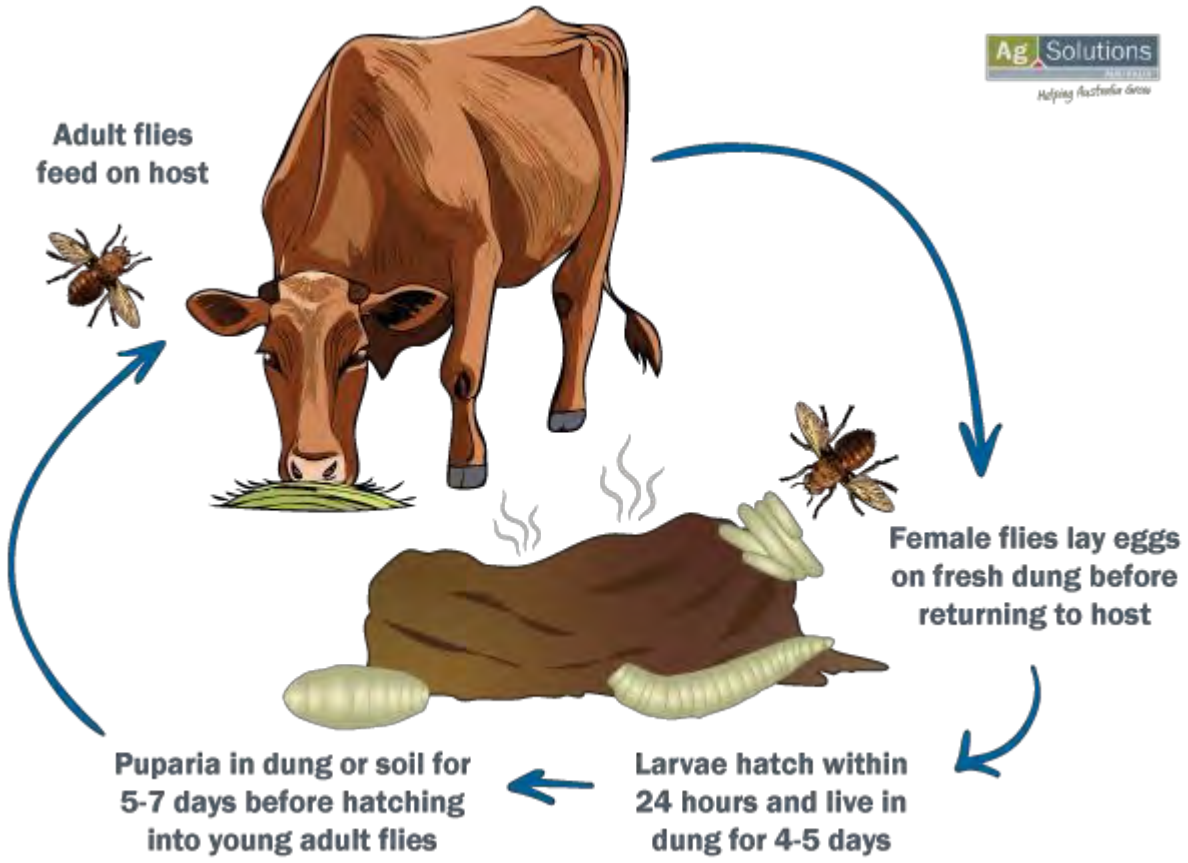
Breakdown of the costs

- **Production losses:** The most significant cost comes from lost productivity.
  - **Reduced weight gain:** Heavily infested cattle can have their live weight gain reduced by up to 16%.
  - **Lower milk production:** Dairy cattle can see a drop in milk yield of up to 0.5L per cow per day.
  - **Hide damage:** Scratches and sores from the flies reduce the value of the animal's hide.

- **Control and treatment costs:** Producers spend millions annually on chemicals to control buffalo fly populations.

- **Welfare and irritation:** The flies cause constant irritation, which interrupts grazing and feeding, leading to pain and stress for the animals.

Ranking: The buffalo fly is considered the number one most costly endemic disease or pest for the Australian beef cattle industry, according to a 2022 Meat and Livestock Australia report



The Unintended consequences

- **Polluted Paddocks**

  - Undisturbed dung pads can take up to 4 years to break down
  - Dung can cover and fowl up to 20 % of useful pasture.
  - Wasted resource of usable phosphorus and nitrogen lost to the atmosphere and not returned to the soil

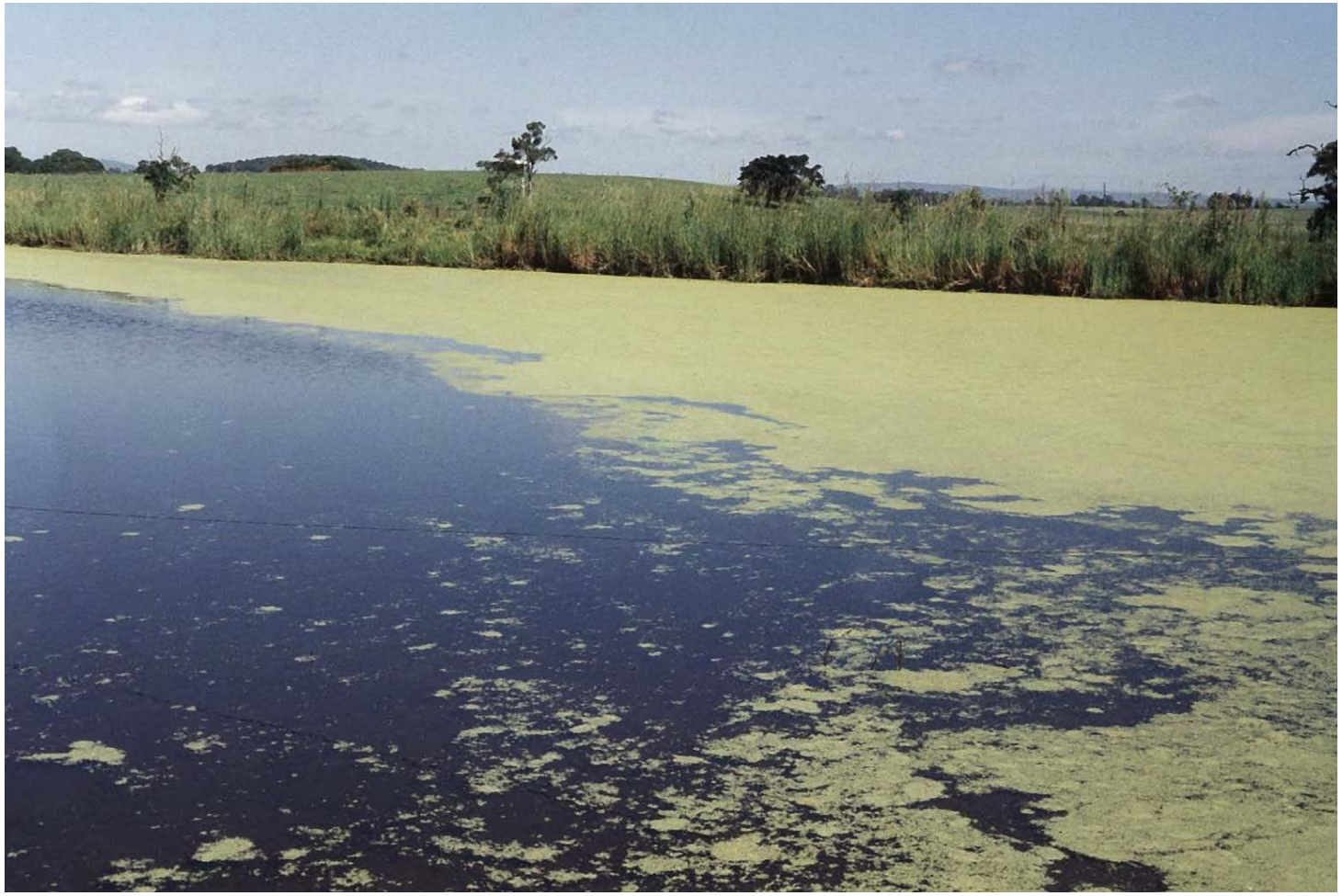
Polluted Paddocks

Unpalatable rank grass growth around unburied dung

The Unintended consequences

- **The waterways and oceans**

  - Nutrient rich dung washed into waterways.
  - Creating Algal blooms and killing aquatic life.
  - Fine sediments transporting phosphorus, nitrogen, and other trace elements into waterways and oceans



The waterways and oceans

The Unintended consequences

Bush Fly

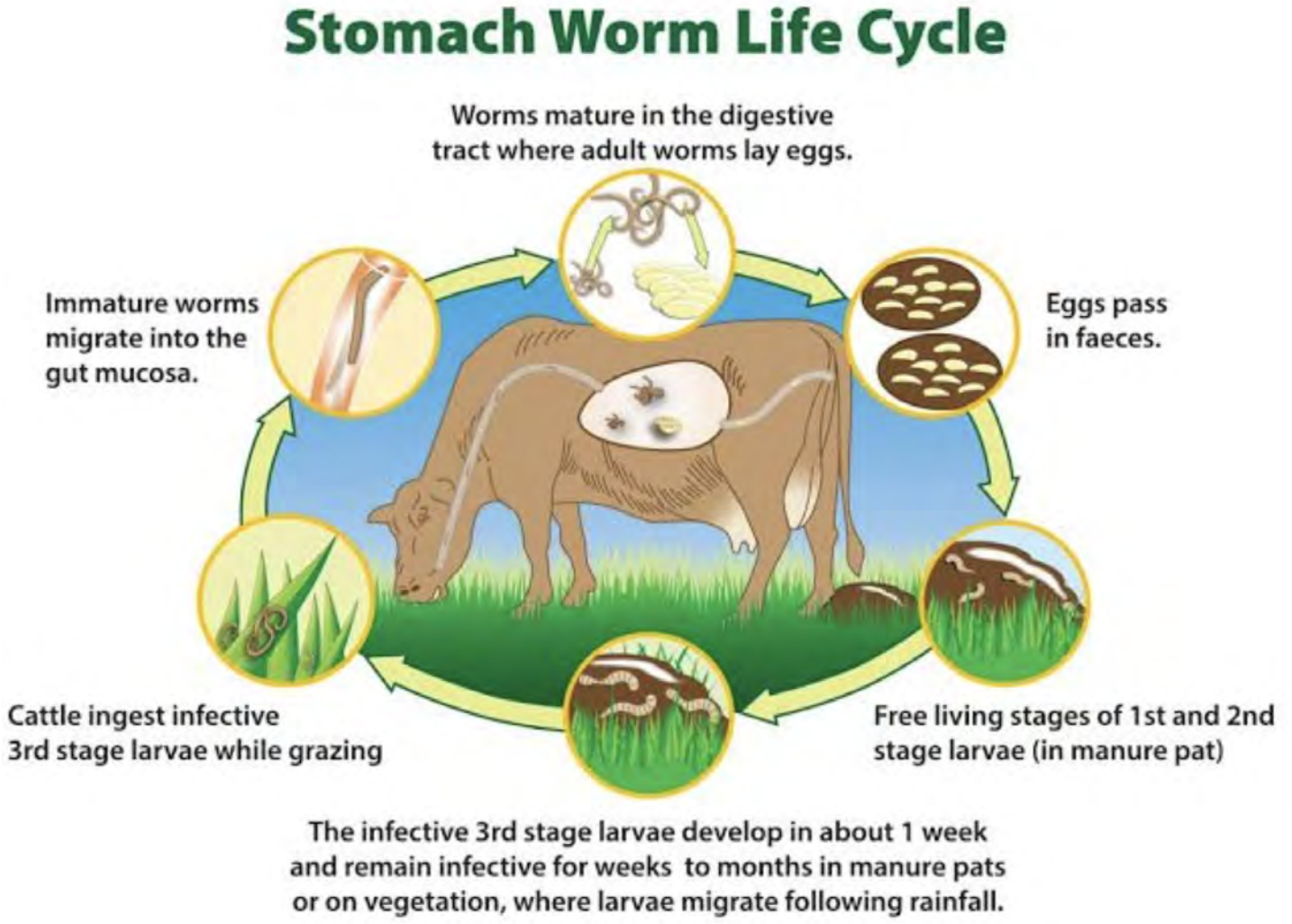
- Each dung pad can produce 2000 to 3000 flies
- Bush flies require 5 - 6 days in an undisturbed dung pad
- Pink eye
- Social wellbeing and human health
- Vector for the transmission of disease.

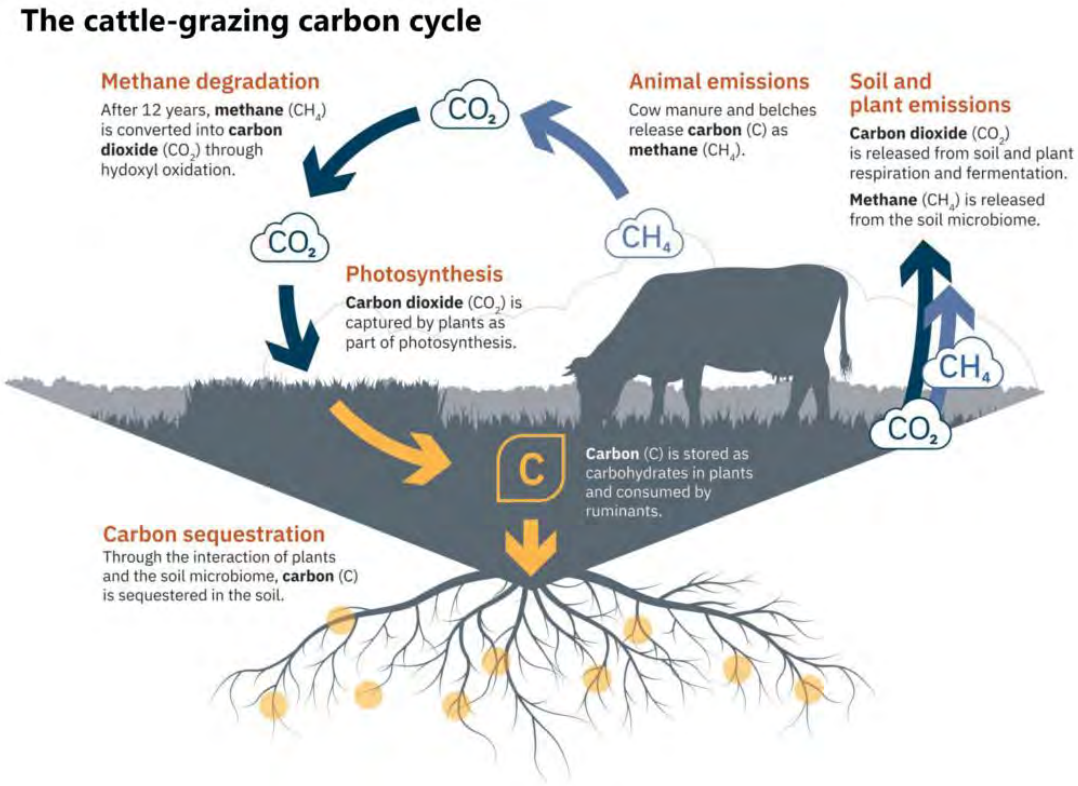
Social benefits

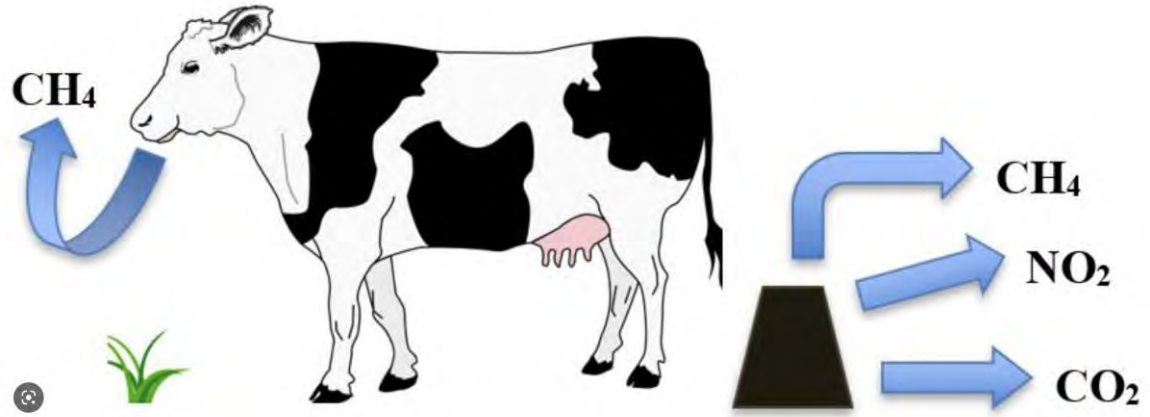
The Unintended consequences

- **Internal Parasites**

  - **Life cycle is disrupted due to rapid burial of dung**
  - **Reduced input costs for mustering and treatment.**
  - **Higher yields.**







The Unintended consequences

Green House gas emissions

- **Methane and nitro's oxide emitted from undisturbed dung in paddocks.**
- **Carbon released into atmosphere as opposed to being returned to soil**

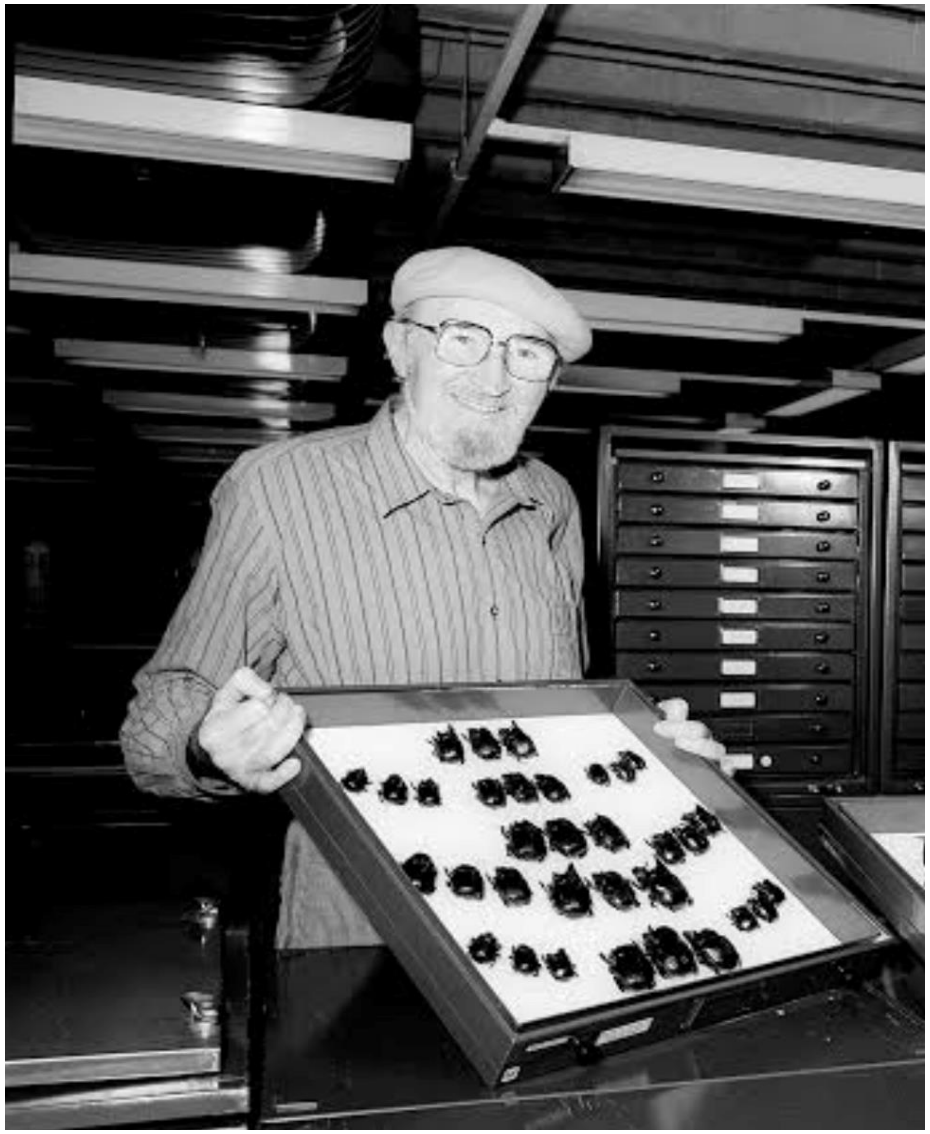
CSIRO DUNG BEETLE PROJECT

Dung beetle project established 1965
Then referred to as the

“Buffalo fly control program”

Founded by Dr George Bornemiza.

Primary objective to control buffalo fly however widespread benefits in soil fertility and nutrient runoff became very evident as well as the social and health benefits associated with bush fly reduction.



THE DUNG BEETLE PROJECT Importation, quarantine and breeding

Beetles sourced from Africa and Europe

CSIRO Facility in Pretoria south Africa

Eggs were immersed in formalin solution

THE DUNG BEETLE PROJECT

BREEDING FROM IMPORTED EGGS

Artificial brood balls made hand made in the early days

THE DUNG BEETLE PROJECT

Mass rearing in controlled environments

THE DUNG BEETLE PROJECT

The beginning of field releases, monitoring and harvesting

As beetles were produced, they were released in pre-determined sites for each species – based on climate matching.

THE DUNG BEETLE PROJECT - SUCCESS

Results

- 500 Australian native dung beetles identified to date
- 44 introduced dung beetle species bred and released
- 25 species became established in very limited areas in varying climate zones.

Field harvesting of first established species for Re-distribution.

Soilcam

LEADER IN DUNG BEETLE DISTRIBUTION

John Feehan

MAINTAINING THE BALANCE

Soilcam established in 1994 by John Feehan after the closure of the CSIRO dung beetle program. Soilcam's primary goal was aimed at –

- **Education, awareness and promotion of dung beetles.**
- **Lobbying government to fund ongoing dung beetle research, development and expansion projects.**
- **Harvesting dung beetles from established sites for release into new climate matched areas.**
- **Dung beetle identification.**

EDUCATION AND AWARENESS – The relentless self funded awareness campaign to promote the benefits and importance of dung beetles

- Conducted over 250 presentations and field days.
- Participated in 75 radio interviews.
- Featured in over 40 publications.

EDUCATION AND AWARENESS – The relentless awareness campaign

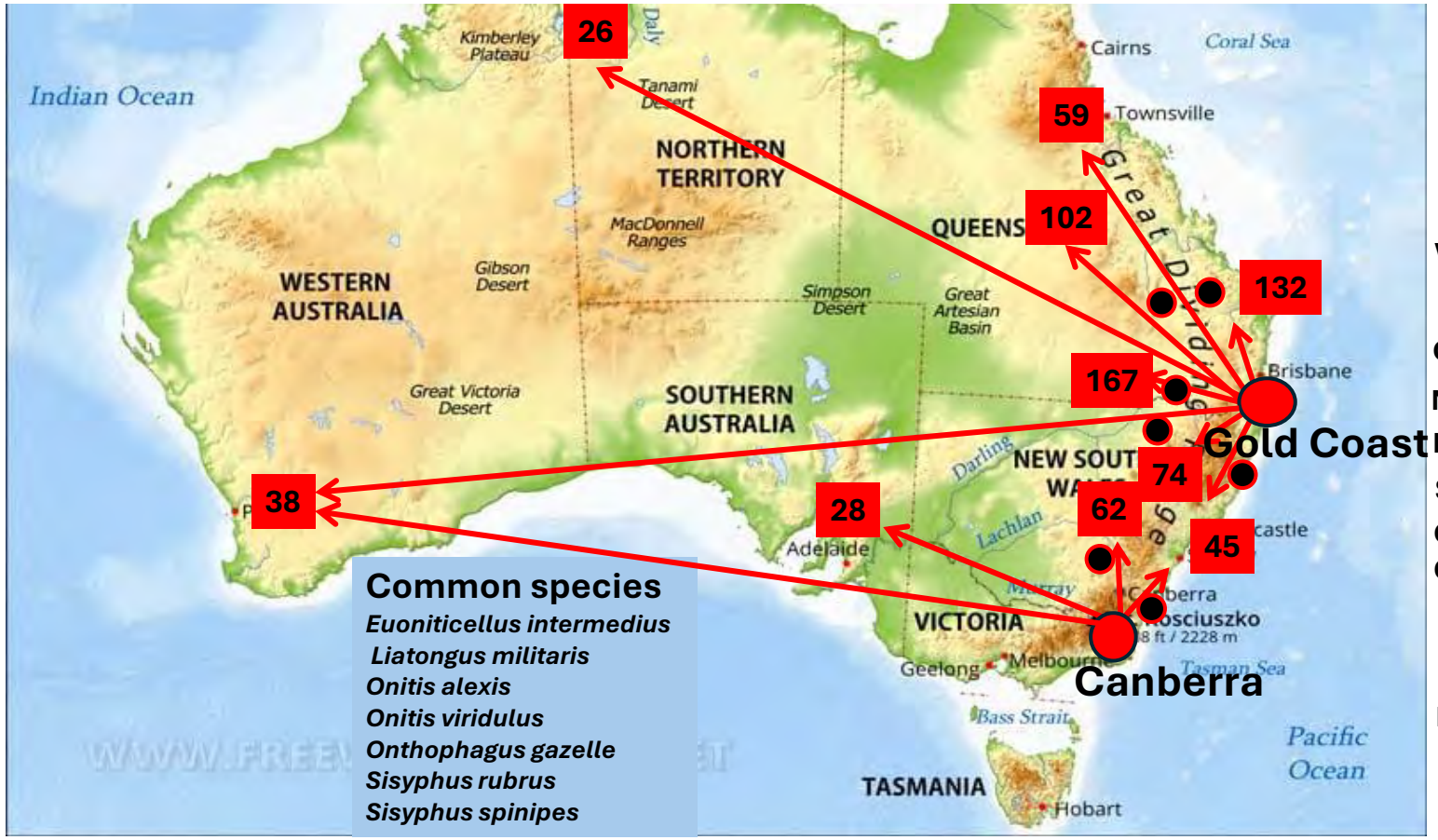
2022 Fenner conference - Improving soils

https://youtu.be/CzSIjmDMKig

The power of the dung beetle | John Feehan | TEDxCanberra

https://youtu.be/YP2YU0VOO5U

Starter colonies distributed 2020 – 2025
Northern summer / spring active species



Operational centres

Northern summer species harvesting sites

Distribution

Western Australia - 38

South Australia - 28

Central NSW - 62

Mid North Coast - 45

Northern Tablelands- 74

Southwest QLD - 167

Coast and table lands QLD - 132

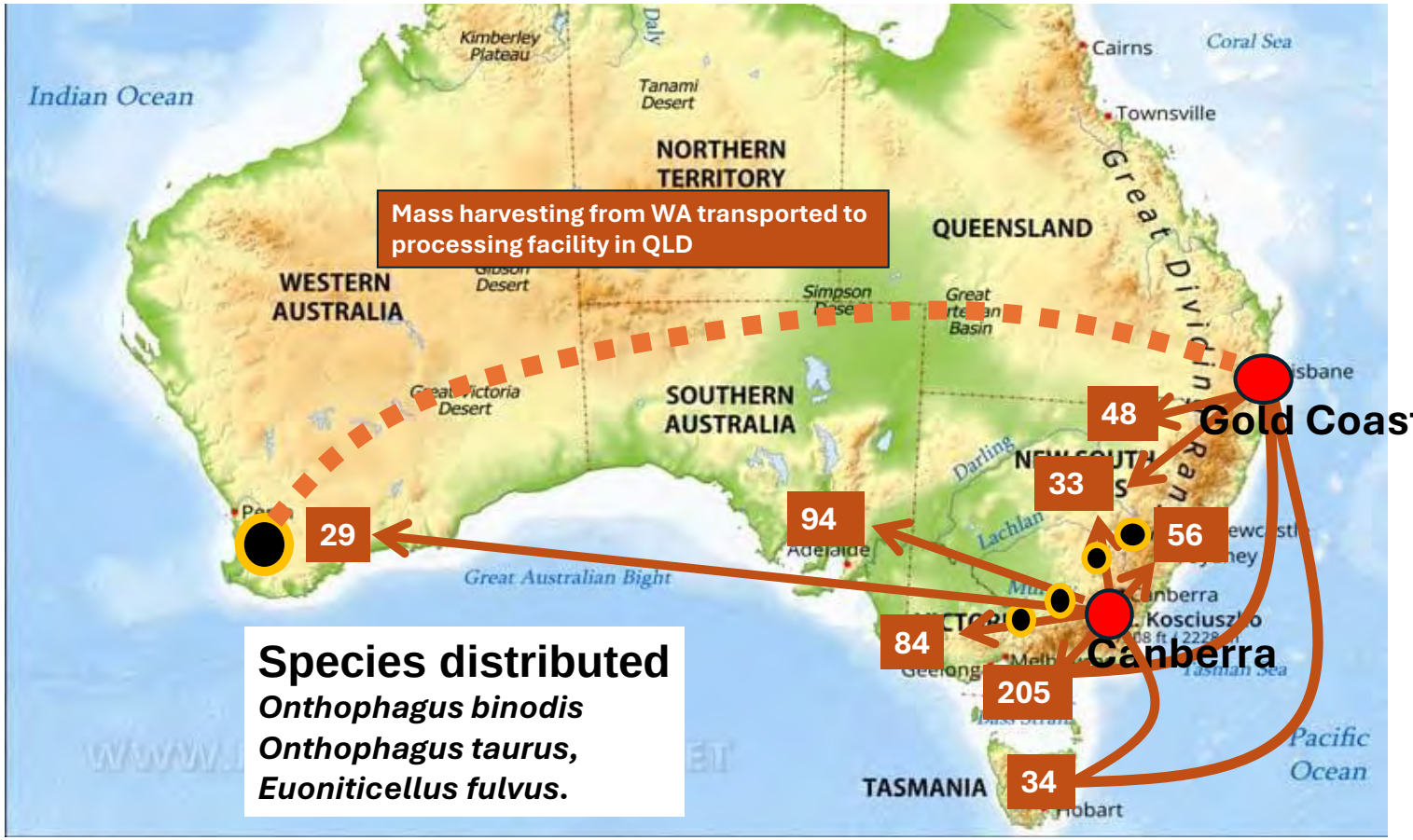
Central west QLD - 102

Northern QLD - 59

Northern Territory - 26

TOTAL - 733

Starter colonies distributed 2020 – 2025
Southern summer / spring active species



Operational centres

Southern
summer species harvesting sites

Distribution

Western Australia - 29

South Australia - 94

Western Victoria - 84

Central /southern Victoria- 205

Tasmania - 34

South /Central NSW - 33

Coastal NSW- 56

Northern NSW / tablelands QLD - 48

TOTAL - 583

Starter colonies distributed 2020 – 2025
Southern Winter active species

Species distributed

- *Bubas bison*
- *Onitis Caffer*

Operational centres

Southern
summer species harvesting sites

Distribution

Western Australia - 29

South Australia - 94

Central /southern Victoria- 205

SE Victoria- 33

Tasmania - 34

Lower Murray - 56

Southern NSW - 48

Northern tablelands- 37

Southern QLD CAFFA species - 11

TOTAL - 547

Harvesting and distribution of dung beetles

Harvesting and distribution of dung beetles

Harvesting and distribution of dung beetles

Chemicals and dung beetles

Dead dung beetles from recent drenching

Some cattle drenches can harm dung beetles by killing larvae and juvenile beetles in dung.

Strategic drenching and product selection can minimize the impact.

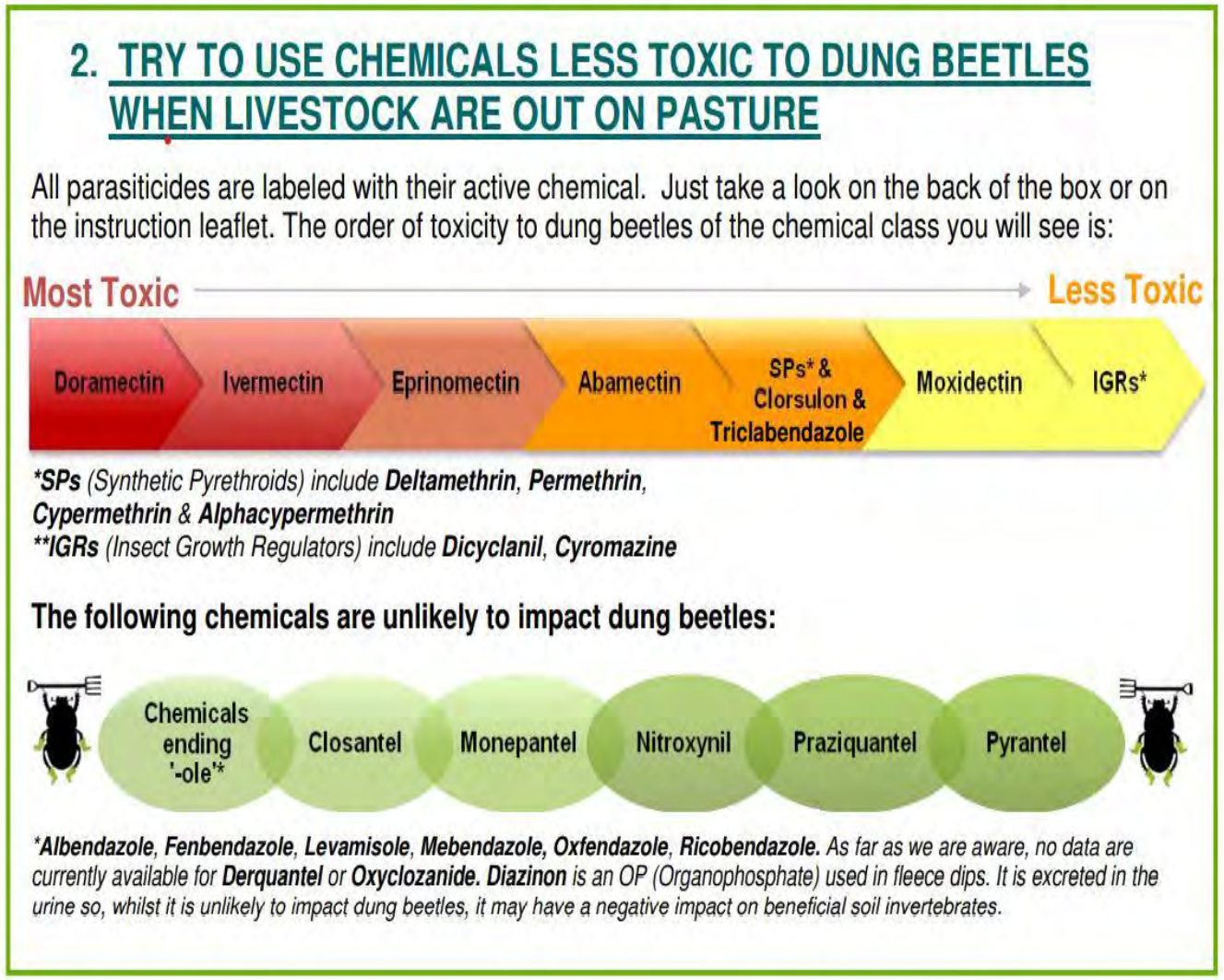
To protect dung beetle populations, producers can hold drenched animals in a separate area for a week or two, drench during periods of low beetle activity, or use less-toxic drenches like those in the Moxidectin range.

Newly emerging beetles can also be negatively impacted by chemicals as they tend to feed prolifically for the first two weeks taking in higher quantities than breeding adult beetles. – This was the case in the adjacent image.

Potential impacts of drenches on dung beetles

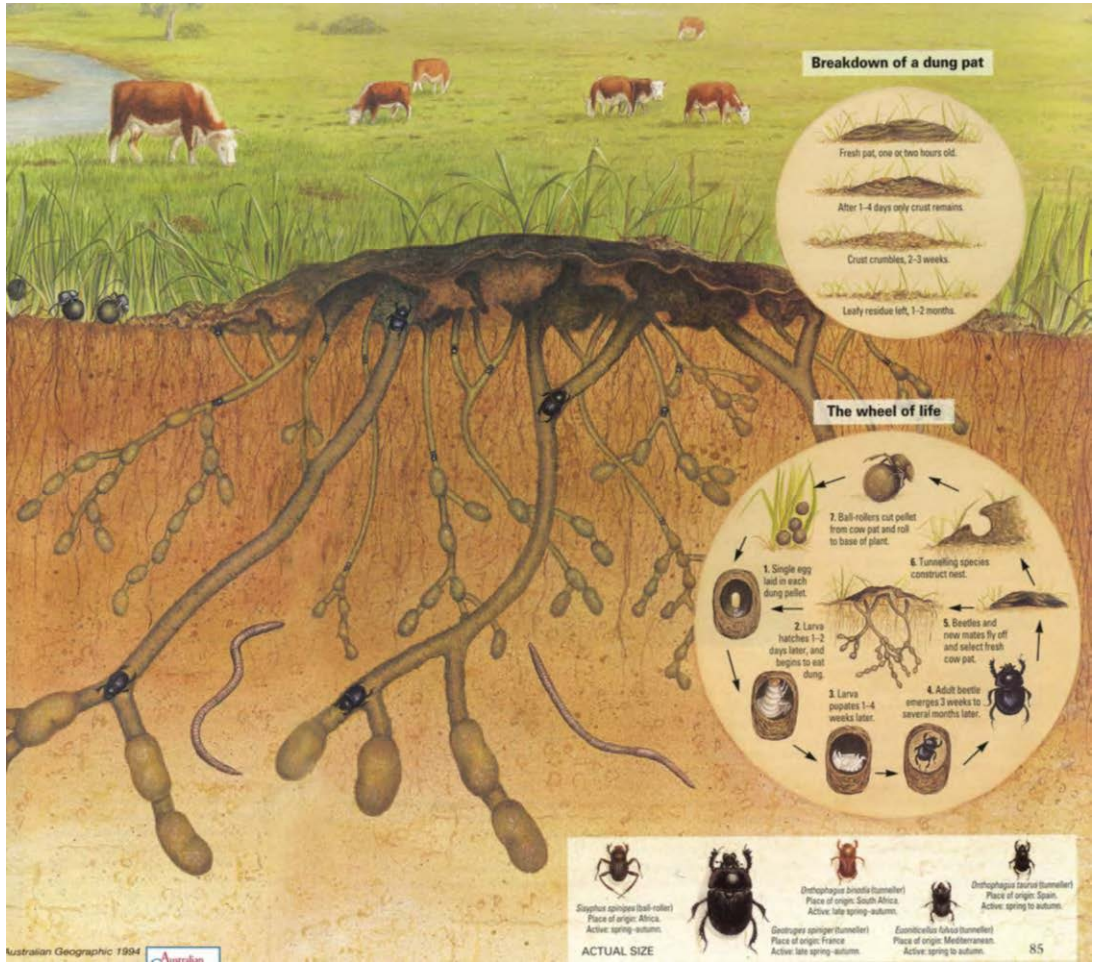
- **Larval mortality: Drenches can kill dung beetle larvae in the first few days after the animal is treated, particularly if applied via pour-on or oral treatments**

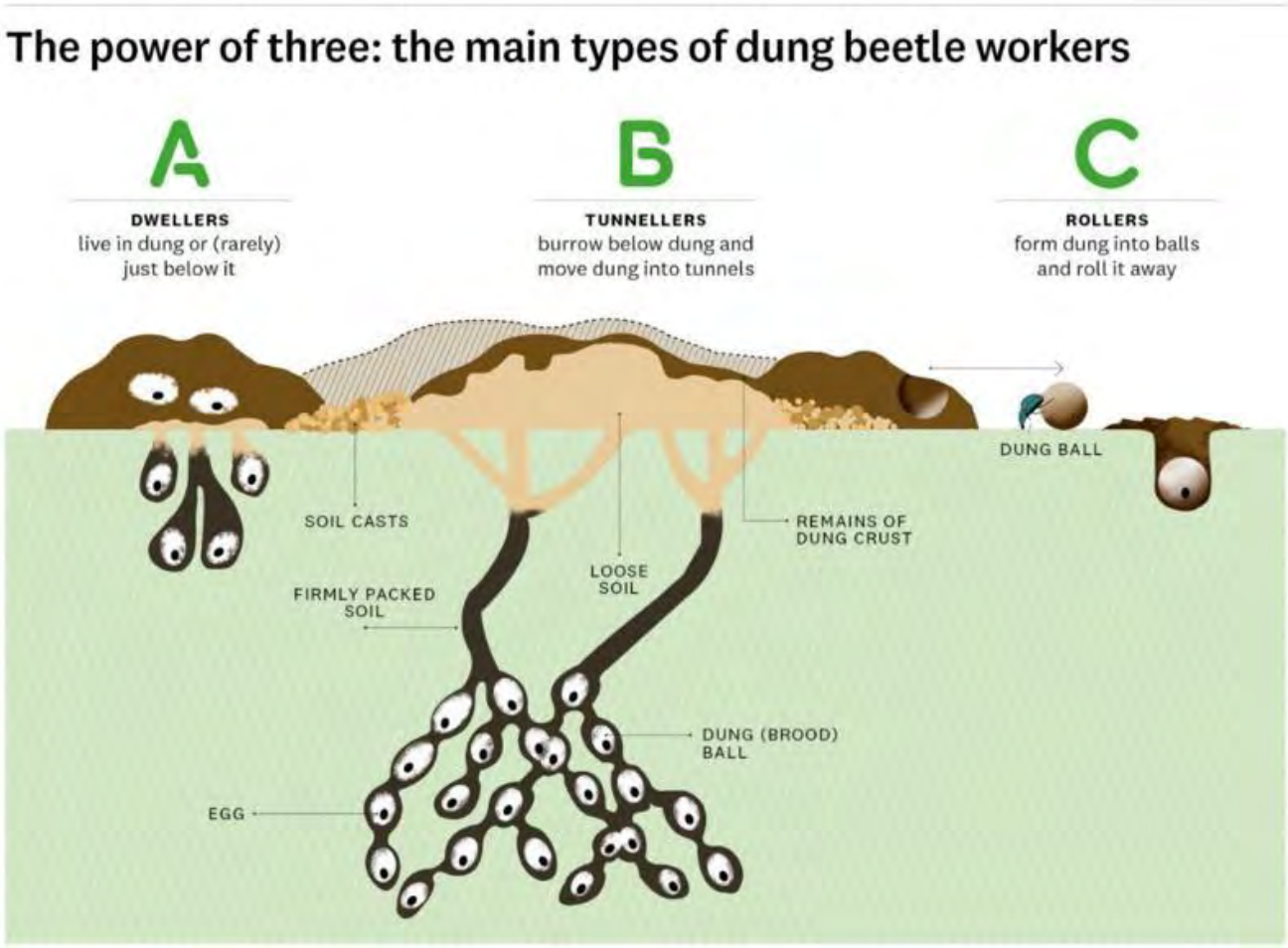
- **Toxic chemicals: Chemicals such as eprinomectin, doramectin, and synthetic pyrethroids can be harmful to dung beetles.**



What goes on below the surface

What goes on below the surface





Typical dung burial after 24 hours Northern Australia

Euoniticellus intermedius , Liatongus militaris, Onitis alexis, Onthophagus gazella

Dung burial after 24 hours Western Australia –

Bubas Bison winter active beetles

Introduced dung beetles typically suited to Northern Australia

Also commonly found in isolated pockets where introduction may have previously occured

Sisyphus spinipes

Origin – Southern Africa, Mozambique, Zimbabwe, Kenya

Genus *Sisyphus*
Length 9–11 mm
Colour brown to dark brown/grey with long thin legs
Horns none
Flight time day
Yearly Activity spring to early winter
Distribution QLD, northeast NSW

Similar Species
S. rubrus is smaller and lighter. The inside edge of hind femur is rounded in male *S. rubrus* and angled in male *S. spinipes*.

Roller
Other notes
Dung balls are not buried but instead are attached to vegetation (larval development takes place aboveground).

Onitis alexis

Origin – Warm dry parts of Africa south of the Sahara and in Southern Europe

Genus *Onitis*
Length 13–20 mm
Colour green/coppery pronotum, light brown wing covers
Horns
Both sexes have a ridge midway between eyes and front of head; fe- male has distinct bump at back of head
Flight time dusk and dawn
Yearly Activity spring to autumn
Distribution all of Australia except TAS

Similar Species
Onitis aygulus is larger and has an unequal double spur on hind femur of male (single spur in *O. alexis*).

Onthophagus gazella

Origin – Southern and Eastern Africa south of the Sahara

Genus *Onthophagus*
Length 10–13 mm
Colour
Two-toned; darkbrown pronotum, lighter brown elytra
Horns males have a pair of horns atthe back of the head
Flight time dusk and dawn
Yearly Activity spring to autumn
Minor male/female minor males have smaller horns
Distribution
northern and eastern Australia (up to the VIC border)

Similar Species
Female *Onthophagus nigriventris* is similar, but has a black underside with no leg markings as above.

Liatongus militaris

Origin – Southern and Eastern Africa

Genus *Liatongus*
Length 8–10 mm
Colour
brown to dark brown; distinc- tive black broken stripes on wing co- vers. Yellow 'shoulder patches' and a dark oval patch on the top and bot- tom of each femur.
Horns none
Flight time day
Yearly Activity spring to autumn
Distribution QLD, NT, northeast NSW

Similar Species Unlikely to be confused with other species.

Euoniticellus intermedius

Origin – Africa South of the Sahara

Genus *Euoniticellus*
Length 7–9 mm
Colour yellow–brown, with diamond pattern on pronotum
Horns
males have a blunt horn in mid- dle of head; females have a ridge be- tween the eyes
Flight time day
Yearly Activity spring to autumn
Distribution
throughout Australia except very dry and southernmost regions

Similar Species
Similar to other species of *Euoniticellus*, but the distinctive markings on pronotum differentiate it from other species.

Sisyphus rubrus

Origin – Southern Africa, Mozambique, Zimbabwe

Genus *Sisyphus*
Length 6–8 mm
Colour light–medium brown w/ long thin legs
Horns none
Flight time day
Yearly Activity spring to autumn
Similar Species
S. spinipes is larger and darker. The inside edge of hind femur is rounded in male *S. rubrus* and angled in male *S. spinipes*.

Roller

Sampling and identifying existing dung beetles

- **Select a dung pad showing signs of disturbance or soil castings**
- **With a shovel, approach the pad quietly and take a scoop of dung with approximately 30 cm of soil from beneath the pad.**
- **Place into a large bucket of water and agitate – allowing beetles to float to the surface.**
- **Collect the beetles selecting 3-4 of each individual type or appearance and place them in boiling water to humanly kill them.**
- **Lay them out on a non reflective white surface like paper towel and photograph them from different angles maintaining good focus. Don't over zoom .**
- **Send images to soilcam**
- **jon Lea – jon@dungbeetleexpert.com.au**
- OR johnfeehan0@gmail.com

Purchasing Introduced dung beetles

- **Before purchasing dung beetles, make sure you have as much information as possible so you can make an informed decision.**

- **Establishing dung beetles requires climate matched species in robust starter colonies which Soilcam will advise on. Generally, starter colonies consist of approximately 1000 beetles. Introduced dung beetles have adapted well outside of there original climatic zones, so species selection has improved.**

- **Depending on the size and scale of an operation, multiple releases sites may be required on a single large property with follow up releases recommended.**

- **For best results - Soilcam recommends bulk batches containing all the relevant species suited to your area. These consist of approximately 6000 beetles of relevant species.**

- **Enquiries are best placed on the soilcam website so we can capture the information needed to best service your needs. We are more than happy to discuss further in person.**

- **Soilcam douse not sell dung beetles as they are not ours to sell . The cost of supplying dung beetles relates only to the logistical costs associated with harvesting, processing, storing and dispatching of the dung beetles which is generally $2000 per bulk batch.**


Thank You
Questions ?

FREQUENTLY ASKED QUESTIONS

- ***Q*. How many dung beetles do I need?**

- ***A*. For best results, we recommend that you purchase as many species as possible that are suitable for your climatic condition, including both day and night flying species to cover all seasons and as many variations of climate as possible. This is because individual dung beetle species tend to operate in certain months of the year and having several species ensures that dung beetles will be active over most of the year.**

- ***Q*. What species of dung beetle would suit my property and livestock?**

- ***A*. SOILCAM matches species to your climate using the CLIMAX program.**

- ***Q*. Is the soil on my property suitable for dung beetles?**

- ***A*. Yes. Dung beetles have no control over where dung is dropped and so will bury dung in most soils wherever they find dung.**

- ***Q*. Will dung beetles control buffalo fly?**

- ***A*. Yes, once dung beetles are established with good burial activity . Buffalo fly larvae require 4-5 days undisturbed in a cow pad to mature and survive, so burial within 24-72 hours will prevent larvae development. Some control is also due to shredding and desiccation when the cow dung is broken up.**

FREQUENTLY ASKED QUESTIONS

- ***Q*. Can dung beetles help me reduce artificial fertilizer application?**

- ***A*. Yes, and to a significant extent. Burying dung positions 80% of the nitrogen in dung under the roots of the grasses in your pastures as well as many other valuable trace elements including phosphorus.**

- ***Q*. If there is no dung to consume, will dung beetles attack plants or other insects such as bees?**

- ***A*. Dung beetles and their numbers are self-governing. They will breed and increase their numbers to whatever level the food supply can sustain. Adult dung beetles have no teeth and animal dung is their only food. They feed by taking the liquid and bacteria in fresh dung into their digestive systems.**

- ***Q*. What about other animals, birds and insects that prey on dung beetles?**

- ***A*. Dung beetles have evolved in company with nature's natural predators, such as birds and foxes, lizards and cane toads for which they form part of the food chain. However, these predators have little significant long-term impact on dung beetle populations.**

FREQUENTLY ASKED QUESTIONS

- **Q . Are dung beetles a one-off investment or do I need to continuously keep adding them to my operation.**

- **A . Dung beetles are supplied as a starter (Breeding colony) of each species and will multiply and adapt over time. After significant floods or other unforeseen events, the beetle populations may suffer short term.**

- **Q. How long will it take for dung beetles to become established**

- **A. Dung beetles are a naturally occurring biological control to manage dung dropped from animals so depends on many factors. Introduced dung beetles are specifically selected to handle cow dung. Dung beetles won't go past a sufficient food source so they can take a while to spread. For large scale operations we recommend several release sites to speed up the process. With good management dung beetles will start to become effective after about 3 years with significant burial after 5 years.**

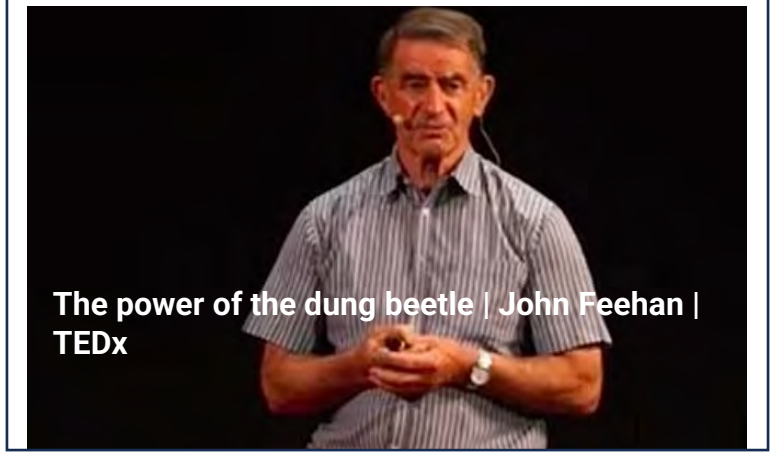
Useful resources

Soilcam Website

https://dungbeetleexpert.com.au/

https://youtu.be/o9wGfjIIgDk

https://youtu.be/YP2YU0VOO5U?si=LX5s4jVl6wmqyQ2P



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