

Conservation strategies for the American burying beetle

Professor Wyatt Hoback of Oklahoma State University is on a journey to reveal the hidden habits of the American burying beetle (*Nicrophorus americanus*). Alongside a primary focus of teaching students, Professor Hoback has conducted research into the distribution of American burying beetle populations in North America. His research explores reasons for the beetle's decline and teaches the importance of tailoring conservation methods to each isolated population in order to protect this useful insect.

The American Burying beetle (*Nicrophorus americanus*) could be the unlikely hero of your summertime picnic. Professor Hoback of Oklahoma State University has devoted 20 years to researching the habits of this species, and understanding why it remains in about 10% of its former range. His latest research focuses on understanding the remaining distribution of this endangered beetle in North America.

BURYING AND BREEDING

The unusual breeding habits of the burying beetle make it an important contributor to ecosystems. To breed, the beetle buries a small dead animal (such as a squirrel or pigeon) which it then

but will only produce 15 beetles. The disease spreading abilities of flies makes the burying habits not only important to beetle larvae but also potentially to human and livestock health.

Unfortunately, despite the health and environmental benefits the American burying beetle provides, their population is declining. In his latest work, Professor Hoback sought to understand more about the responses of different isolated populations of American burying beetles to the same environmental factors. His work aims to determine if it is essential to tailor techniques to suit different regional populations when considering conservation actions. One of the

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strips of hair or feathers and preserves as a food source for its offspring. It is thought that the chemicals used by the beetle to preserve the carcass could be a source of novel antibiotics. The process of preservation is still not fully understood but the ability to secrete chemicals which prevent meat rotting ensures a stable food supply for beetle larvae.

Each dead animal which is buried by the beetle ensures there are fewer resources for flies. One dead mouse could host as many as 300 fly larvae

mysteries associated with the beetle is why it has declined when a closely-related and ecologically similar species has remained.

Hypotheses for the decline of the American burying beetle include increased pesticide exposure, habitat loss, the effects of night-time lights, and increased competition with vertebrate scavengers. Each hypothesis to date has been largely countered by the fact that the 15 or so other North American burying beetles have not suffered dramatic declines.

In order to save the American burying beetle from further population decline, it was first important to understand their current distribution. Professor Hoback and his team used baited pitfall traps in the states of Oklahoma and Nebraska, areas known to still support relatively large populations of American burying



Professor Hoback teaching students about entomology and the benefits of insects to human society.

beetles, to capture the beetles and record their numbers.

Hoback and Leasure found impacts to the American burying beetle populations from agricultural conversion of habitat and from nearness to large human populations.

The finding led Hoback and his collaborators to investigate reasons why another closely related burying beetle was still common in these changed habitats. Specifically, they tested if both species were affected by light pollution.

Traps were checked daily with two key pieces of data recorded each time. Firstly, the number of American burying beetles was established. Each burying beetle found in the trap was marked using a numbered bee tag to identify it and then released. Secondly, all other *Nicrophorus* beetles (including the similar species – the roundneck burying beetle)

were counted and their numbers were also recorded. Environmental data was monitored throughout the course of the study to investigate whether factors such as moon phase or overnight temperatures affected the number of beetles caught in the traps.

BLAME IT ON THE CITY LIGHTS

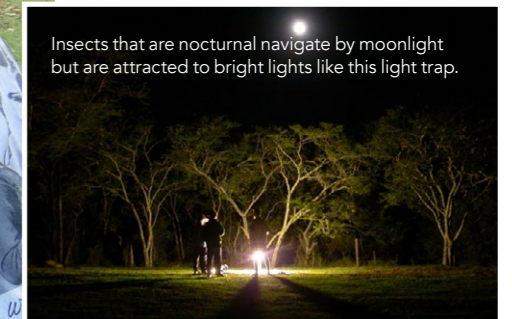
After analysing their data, the team found that the number of American burying beetles caught in Oklahoma was lower when moon illumination increased. Interestingly, on nights with noticeable cloud cover, the effect of lunar light intensity was overridden and fewer beetles were caught despite the reduction in natural light. City lights are reflected by the clouds leading to brighter nights and less American burying beetles.

In contrast, there was a slight positive correlation between the levels of illumination and the number of roundneck burying beetles recorded.

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A burying beetle trap in unaltered habitat.



Insects that are nocturnal navigate by moonlight but are attracted to bright lights like this light trap.



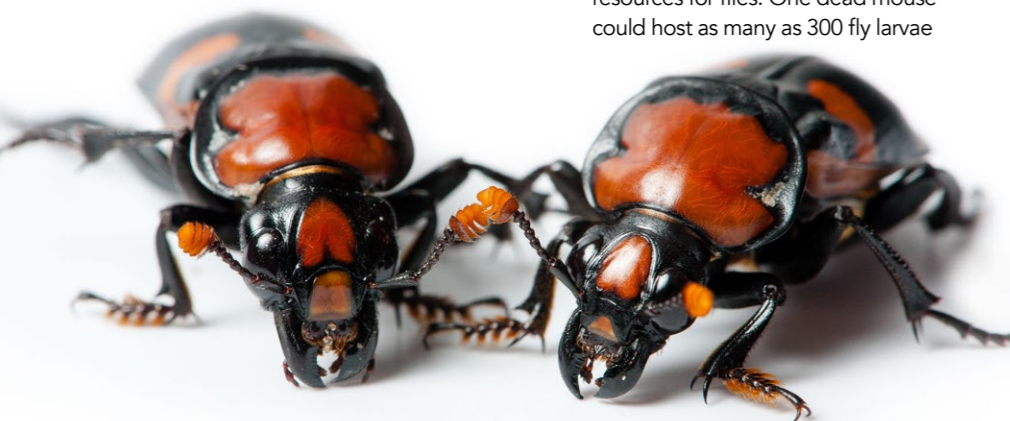
Since the 1900s, lights in North America have impacted more and more areas as seen from satellite.

This species is less affected by light pollution and has a greater abundance and wider distribution than the endangered species.

At the more rural research site in Nebraska, there was limited interference from artificial light and American burying beetles were caught on both moonless and cloudy nights.



Professor Hoback holding a captured American burying beetle.



The American Burying beetle (*Nicrophorus americanus*). Photo credit: NEBRASKAland Magazine/Nebraska Game and Parks Commission.



Pitfall trap containing carrion beetles, including the endangered American burying beetle and the related roundneck burying beetle.



Carrion beetle traps are baited with previously frozen laboratory rats that are rotted.

The team acknowledged that a short-term field study such as this one provides a useful snapshot of a very specific set of circumstances but should be treated with caution if used to create general guidance for all populations. This attitude further reinforces Professor Hoback's argument that individual populations must receive individual conservation treatments.

It is hoped that this most recent research into the impact of human activity on the nighttime behaviour of the American burying beetle could lead to future conservation strategies to better protect this species. As well as being a food source for larger animals, the American burying beetle also has an important role to play in preserving human health by continuing to reduce resources for flies and potentially providing live-saving compounds to humans.



Behind the Research

Professor Wyatt Hoback

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Research Objectives

Professor Hoback's research focuses on the interaction of closely-related organisms as it influences their physiology, ecology, and behaviours and the conservation of rare and endangered species, including the American burying beetle, *Nicrophorus americanus*.

Detail

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Bio

W. Wyatt Hoback is an assistant professor of Entomology at Oklahoma State University after serving as a professor of Biology for 15 years at the University of Nebraska. His primary focus is teaching, and he instructs more than 700 students per year about the interactions between insects and humans.

Collaborators

- Doug Leasure
- Jillian Wormington

References

Wormington, J.D., Risser, K., Hoback, W.W., Giles, K.L., Greenwood, C. and Luttbeg, B. (2017). 'Contrasting Influence of Natural Nighttime Illumination on Capture Rates of the American Burying Beetle and Roundneck Burying Beetle (Coleoptera: Silphidae)'. *The Coleopterists Bulletin*, 71(2), pp.339-347.

Leasure, D.R. and Hoback, W.W. (2017). 'Distribution and habitat of endangered American burying beetle in northern and southern regions'. *Journal of Insect Conservation*, 21: 75-86.

Personal Response

Have you been surprised by any of the reactions to your work?

// When people first hear that I study an endangered insect, their reaction is usually "why". Once they learn about its amazing lifecycle, benefits in reducing flies, and potential as a source of antibiotics, people want to keep the insect around. Our research showing greater artificial light effects on the American burying beetle in part explains why it disappears around cities while the roundneck burying beetle remains. Each new discovery hopefully brings us closer to being able to allow this amazing species to recover. //