

Pellet Detective: What do Barn Owls at Doddington eat?

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Abstract

This project presents the outcomes of a collaborative Undergraduate Research Opportunities Scheme (UROS) project between the Schools of Humanities & Heritage and Natural Sciences at the University of Lincoln. The project partnered with Wilder Doddington, a rewilding initiative based at Doddington Hall, Lincolnshire, aimed to design and produce a permanent educational exhibit focused on Barn Owl diet, hunting adaptations and small mammal biodiversity, as revealed through the analysis of owl pellets.

By combining zoological taxonomy with heritage conservation techniques, this project showcased the value of interdisciplinary approaches in public engagement, conservation education, and environmental monitoring. The final output, a bespoke display case featuring real skeletal specimens and interpretive materials, communicates the interconnectedness of Barn Owls with their small mammal prey, and the value of Barn Owl pellets in ecology.

Our findings highlight the importance of collaborative, student-led research in producing tangible outcomes that contribute to both regional ecological awareness and national conservation education strategies.

Keywords: Ecology, Barn owls, Barn owl pellets, long-term preservation, educational display, bone cleaning

Introduction

The rewilding of landscapes has prompted attention to how we interpret ecological change and communicate biodiversity to the wider public. In this context, the Barn Owl (*Tyto alba*) serves as a biological indicator of environmental health, particularly through

analysis of its diet preserved in regurgitated pellets. These compact masses of undigested bone, fur and sometimes feathers and insect remains, offer insights not only into the feeding behaviour of owls, but also into the diversity and abundance of small mammal populations in a given area (Heisler et al., 2015).

Wilder Doddington, a rewilding project launched in 2021 on the Doddington Estate in Lincolnshire, has embraced nature-led land management as a means of restoring habitats, increasing biodiversity, and engaging communities in ecology (Doddington Hall, 2024). As part of their ongoing ecological monitoring, over 360 owl pellets collected from the site have been dissected by University of Lincoln students.

This project emerged from a shared desire between Wilder Doddington and the University of Lincoln to transform these findings into a permanent, public-facing educational resource. Through UROS funding, two students, one from zoology and one from heritage conservation, were tasked with cleaning, identifying, and curating bone specimens into a display that communicates both scientific and cultural value. The resulting collaboration has provided a platform for interdisciplinary research, skills development, and civic engagement. This research paper documents the process undertaken, the methods employed, and the impact of the project, demonstrating how student research can play a meaningful role in heritage and ecological interpretation.

Project Background

The Doddington Estate, located a few miles west of Lincoln, began a significant rewilding initiative in 2021 under the title 'Wilder Doddington'. Their aim was to transition away from intensive farming practices towards a more ecologically sustainable model of land stewardship. This involved introducing new land management approaches, including reintroducing wetland features and allowing vegetation to regenerate naturally (Doddington Hall, 2024). These strategies allowed for the return and proliferation of native UK species.

Barn Owls, already nesting on the estate, became key subjects in monitoring the ecological transformation. As apex predators in grassland and farmland ecosystems, their diet reflects the presence and abundance of small mammal populations. Since owls consume prey whole and later regurgitate indigestible material in the form of pellets, these biological artefacts contain a valuable record of the biodiversity within the owl's hunting range.

From 2021 onwards, students from the University of Lincoln were invited to dissect and analyse these pellets as part of an ongoing partnership with Wilder Doddington. Over 360 pellets were examined, revealing a dataset of 937 small mammal remains, encompassing ten species, including that of the rare Harvest mouse (*Micromys minutus*) and Water vole (*Arvicola amphibius*). The identification of small mammal skulls and mandibles allowed the team to determine the relative abundance and

frequency of various species of mice, voles, and shrews over time, data which Wilder Doddington has used to inform its ecological planning.

Recognising the potential for public engagement, Wilder Doddington proposed the creation of a permanent educational display to communicate the value of this work. The idea was to create an aesthetically engaging exhibit featuring representative bone specimens mounted and labelled, alongside contextual information about Barn Owls, their prey and the use of owl pellets in ecology.

The UROS bursary scheme provided an ideal framework for this joint venture, with interdisciplinary collaboration as the core principle of the project. It was recognised that such an undertaking would benefit from both zoological and heritage conservation expertise.

Literature Review

Historically, the long-term conservation of biological specimens was generally seen as a secondary concern to that of presenting an aesthetically pleasing display for exhibition. Hendry (1999) argued that preparation methods were not previously researched in a scientific manner, rather any progression within the field of conserving vertebrate collections were attempts to produce specimens at a faster or more cost-effective rate.

Contemporary methods for the care and conservation of zoological collections highlight this concern (Hendry, 1999; Larkin, 2018), with the longevity of specimens now being viewed as paramount for their continued use in public exhibition and education. Such methods further increase public awareness and progress scientific research, including use in ecology and species conservation.

At the same time, looking after bones has become an important focus in heritage conservation. Small and broken bones can be tricky to clean, protect, and show in displays, especially that of small mammal bones which can be as small as 2mm. The Canadian Conservation Institute (Stone, 2016) recommend avoiding strong chemicals like bleach and instead suggest using gentle soaps and detergents such as Synperonic A7, which has seen use historically within zoological specimen cleaning and is a reliable solution to use in skeletal preparation (Larkin, 2018). To keep the bones stable, a special type of adhesive called Paraloid B-72 is often used due to its reversible nature.

Methodology

Work was divided into two key phases: specimen selection and cleaning, and display design and assembly. Regular meetings with supervisors provided oversight, troubleshooting support, and iterative feedback. We used a preexisting collection of Barn Owl pellets and previously extracted small mammal bones sourced from Doddington Hall between 2021 and 2024. In total, 58 pellets were evaluated for viable bones to be used for display. All pellets and their remains were frozen prior to use to reduce risk of pests.

Phase 1. Specimen selection and cleaning

Small mammal bones were first identified to genus level with guidance from established dichotomous keys and identification manuals, then degreased and cleaned using a 20% diluted solution of Synperonic A7 in distilled water. Mechanical cleaning was carried out using soft-bristled brushes and tweezers under stereo magnification. Due to their fragility after formation into a pellet, the structural integrity of the bones was questionable and many bones, especially the plates of the skull, were oftentimes only held together by the accumulation of fur within the intercranial space. Thus, it was imperative that the bones were exposed to cleaning solutions as little as possible and not allowed to soak in the solution. Due to their fragility, we decided against the use of bleaching agents and Paraloid B-72 (Conservation Resources (UK) Ltd., undated) was applied sparingly to consolidate fragile bones.

Once clean, the bones were allowed to air dry (Figure 1), as sudden changes in temperature or humidity risked the material swelling or shrinking, consequently leading to a higher chance of the bones fracturing or breaking.



Figure 1. Small mammal bones extracted from Barn Owl pellets after cleaning.

Phase 2. Display preparation and Assembly

To mount the specimens, entomology pins were adhered to the bones using Paraloid B-72 left to dry for 24 hours (Figure 2). Once dry, specimens were pinned within a custom A1 American walnut frame (LUXEHOUSE Decor, 2024) allowing for three-dimensional presentation. This frame was backed with a sheet of Plastazote adhered with a standard PVA glue for mounting the specimens. A thin layer of Paraloid B-72 in a 20% xylene solution was applied prior to final assembly to reduce the risk of long-term deterioration of the specimens due to acid exposure. Tests of multiple solutions including dilutions of white spirit and acetone ranging between 10% and 40% were also trialled, however a 20% xylene solution was chosen for a matte finish and easy workability.



Figure 2. Small mammal bones mounted and drying pinned to Plastazote.

The information board was drafted collaboratively, incorporating input from Wilder Doddington's Conservation Advisor Matthew Capper. The information board's content focused on Barn Owl prey diversity, hunting adaptations and the use of pellet analysis in environmental monitoring. Additional labels alongside specimens were added for visual clarity and provided brief descriptions regarding identifying small mammal species by their skeletal remains.

Specimens were pinned in place within the Plastazote backing alongside the information board, with this and specimen labels adhered to foamcore board using adhesive spray. A final review of the display case and content involved supervisors and Wilder Doddington staff, who provided feedback prior to installation.

Results

A total of 366 owl pellets were previously analysed by University of Lincoln students, producing 937 identifiable small mammal remains. Of these, at least 10 species were previously recorded, including the nationally declining Water vole (*Arvicola amphibius*) and Harvest mouse (*Micromys minutus*).

We selected representative specimens from this repository for mounting within the cabinet. All bones selected for display were identified to genus level with guidance from established dichotomous keys and identification manuals. A preserved Barn Owl pellet and feather were also included in the display. The specimens were supported by short panels of interpretive text and printed infographics, with language aimed at a broad audience, including school children and casual visitors, while maintaining scientific accuracy. Ensuring that these panels were written in an accessible manner, avoiding technical jargon, was important in order to circumvent overloading readers with information, allowing us to produce an engaging, easy to read display.

The final educational display produced a small, curated selection of small mammal bones recovered from Barn Owl pellets collected at the Doddington Hall estate between 2021 and 2024. The project successfully mounted and conserved specimens from several species of mice, voles, and shrews, each represented by multiple clean, stable examples. This installation that not only highlights the diet of Barn Owls and the diversity of local small mammals, but also invites broader reflection on land use, habitat recovery, and ecological monitoring. Wilder Doddington plans to feature the display in its main education centre, where it will support school visits, guided walks, and informal learning.

UROS Experience

This project allowed for a collaboration between two students; one studying Zoology and the other studying Conservation of Cultural Heritage. We worked together on this project and by sharing our knowledge, we learned new skills beyond our own subjects. This included how to clean, handle and identify delicate bones, how to design an exhibit, and how to display information clearly to the public. We also gained valuable experience in teamwork, communication, and problem-solving.

Although there were delays with sourcing materials, the project resulted in a display that is both visually appealing and scientifically accurate. Careful conservation methods, quality materials, and clear information harnessed from both of our backgrounds have made sure the display will last and be easy for visitors to understand.

We hope this project highlights just how beneficial collaboration between the arts and sciences can be, and that there are many potential transferrable skills to be gained and refined through similar approaches.

Conclusion

The 'Pellet Detective' UROS project brought together science and heritage conservation to create a permanent educational display which helps explain the

importance of rewilding and monitoring local wildlife through ecological techniques such as owl pellet analysis. Overall, this project shows how undergraduate research can make a real difference, turning scientific data into something people can see and learn from, helping to raise awareness about local wildlife and conservation, while also supporting the University's goals of public engagement and education.

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