Of Mice and Meadows: The Distribution and Habitats of Harvest Mice across Warwickshire

Dr Deborah Wright

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Abstract

Discovering where harvest mice are living and the habitats they are using is important for the long-term conservation of this declining species. In this project, sites are surveyed across Warwickshire for evidence of harvest mice, a county for which very little baseline data exists. Longworth trapping, nest searching and owl pellet analysis are used to obtain presence or absence data. Data is mapped using MapInfo GIS software and descriptive analyses conducted. Unexpectedly, evidence of harvest mice is found for all 16 sites surveyed, across a range of habitats. Both live harvest mice and nests are found to be most prevalent in farmland field margins, although evidence is also found in wetlands and drier grasslands. Consistent with other recent research, these findings suggest that harvest mice may we more widespread, and adaptable, than previously thought. Limitations, future work and implications for habitat management and improvement are discussed, alongside additional training and community engagement outcomes. It is suggested that connectivity between habitats may be of key importance, and that conservation efforts should be considered within the wider landscape, with results of studies such as these used to inform future developments.

Introduction

Figure 1. Adult harvest mouse trapped and released during training. Unlike other mice, they can be held by their tail when supported. Photo credit Deborah Wright.

The harvest mouse *Micromys minutus* is our smallest British rodent (Figure 1). It was first distinguished as a species by Gilbert White in 1767 in Hampshire, who noted its distinctive colour, size, shape and nesting habits (White, 2013). Harvest mice are russet-brown above and pale white below. They weigh on average only 6-8g and can be very elusive, moving amongst thick, dense vegetation where they build characteristic woven nests. They are adapted to climbing stems, with slightly opposed thumbs and a semi-prehensile tail. They lack the larger eyes and ears of other mouse species, such as wood mice *Apodemus sylvaticus*, often appearing more like small voles, with their small, furry ears and short, blunt muzzle.

Harvest mice are traditionally associated with farmland, living, eating and building nests amongst crops, such as maize and kale. However, they are found in a variety of other habitats including wet and marshy habitats, meadows, rough grassland and roadside verges (Bullion, 2012). A large proportion of their diet is made up of seeds and leaves, but they are opportunists, and also eat berries, fruits, fungi, moss, eggs, and insects. In urban environments, insects may form a majority dietary component (Dickman, 1986) and in captivity, harvest mice have been known to show a preference for insects over other food types, actively hunting and chasing adults and chewing stems to reach pupae (Harris, 1979; Trout, 1978a). Being secondary consumers of insects and seeds, which can concentrate residues of contaminants, harvest mice can act as good indicators of the status of overall small mammal communities (Perrow and Jowitt, 1995), and small mammal diversity has been found to be higher in areas where harvest mice are present (Meek, 2011). Harvest mice generally need to consume 30% of their body weight daily and choose high energy foods, which then allows them to spend more time resting in their nests (Harris, 1979).

Nests may be non-breeding, temporary shelters used by both sexes, which are relatively small at approximately 4cm in diameter and often found low to the ground. The more commonly seen nests are summer breeding nests, however, which are larger at 6-10cm in diameter, generally more tightly woven, and often situated above the ground, woven amongst the vegetation. They are often made from multiple grass species, but favoured ones include cock's-foot *Dactylis glomerata*, reed-sweet *Glyceria maxima* and reed canary *Phalaris arundinacea,*

Figure 2. Example nest woven amongst vegetation. Photo credit Deborah Wright.

as well as common reed *Phragmites australis* (Bullion, 2012). These species provide a strong supporting structure for the nest, and also have wide leaf blades which can be split and woven into the nest (Meek, 2011). Females will build a breeding nest for each new litter 10 days before giving birth. The peak breeding season occurs May-October, with females giving birth to an average litter of 4-5 young several times per year (Bullion, 2012). The young are born naked and blind but by day 16 they have fur similar to the adults, albeit slightly duller and darker (Figure 3). They are usually chased from the nest by the mother at this stage, becoming independent and able to breed by 1.5 months old (Trout, 1978a).

Figure 3. Juvenile harvest mouse trapped and released during training. Photo credit Deborah Wright.

Harvest mice do not hibernate, and generally move from living in the stalk-zone in the summer to being more ground-dwelling in the winter, where it is warmer (Bullion, 2012; Harris, 1979). They do not grow a particularly thick winter coat and are vulnerable to bad weather. They try to avoid getting wet, and although nests are largely water-resistant, young will die in the autumn if there is persistent rain and the nest becomes saturated (Harris, 1979; Trout, 1978b). Flooding, hard frosts, drops in temperature and constant rain are main causes of harvest mouse mortality. Harvest mice are largely crepuscular, and because they can be active over a 24 hour period, are preyed upon by a range of predators, such as birds of prey, toads, snakes, pheasants, corvids, foxes, weasels, rats and domestic cats (Bullion, 2012; Harris, 1979; Trout, 1978a). Although they can live up to 5 years in captivity, their likely lifespan in the wild is 6 months, with the longest survival rates for those born in October (see Trout, 1978b).

Harvest mice appeared 2-3 million years ago in China. They are now distributed widely across Europe from Britain and northern Spain through Europe and Russia to northern Mongolia, China, India and Japan (Aplin et al., 2008). Harvest mice are considered indigenous to Great Britain after the finding of early post-glacial fossil evidence (Bullion, 2012; Price, 2003), and their spread is likely to have been aided by large-scale deforestation for farming and agriculture (Harris, 1979). They are found mostly across southern England and coastal Wales, although there are populations as further north, such as in Durham and Northumberland (Bond, 2016; Bullion, 2012). The last UK population estimate was at 1425000, however, harvest mice are thought to have experienced a rapid decline by up to 71% in 18 years (JNCC, 2010). This is largely attributed to habitat loss combined with changes in farming practices, such as the introduction of combine harvesters, use of pesticides and the lack of winter crops providing shelter. Poor breeding success in cereal fields has also been attributed to the harvesting of crops in peak breeding season (Perrow and Jordan, 1992). Other threats include burning of vegetation (e.g. Trout, 1978b) and climate change.

Aims

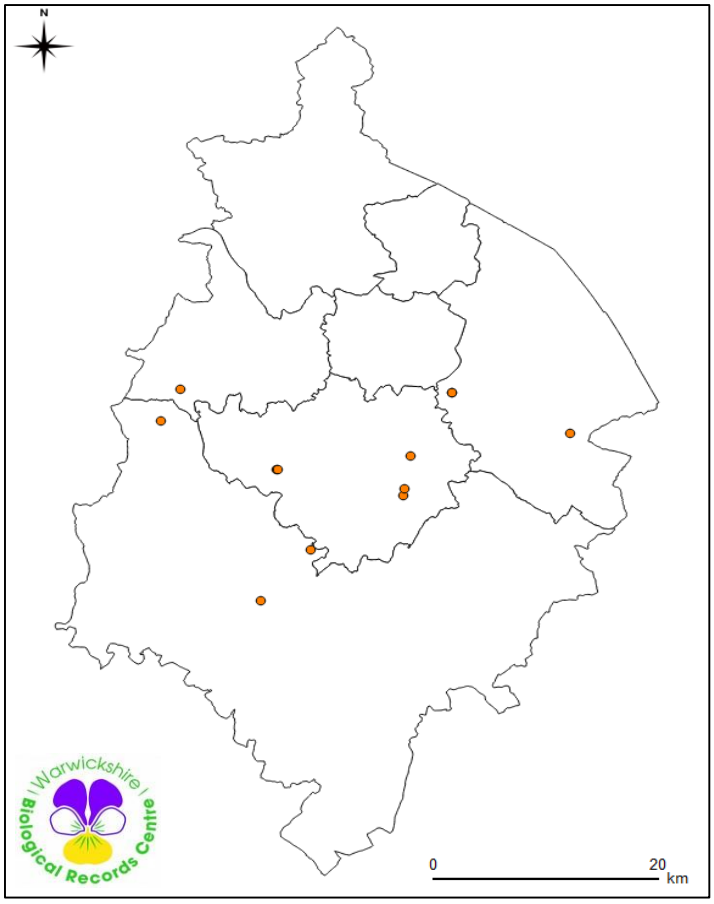

Figure 4. Harvest mouse records across Warwickshire for the decade preceding 2015.

Despite being awarded a red list 'least concern' status by the IUCN (Aplin et al., 2008), given the concerns over their decline in the UK, harvest mice have been listed as a BAP priority conservation species. Surveillance and monitoring schemes combined with landscape-scale habitat management and improvement have been identified as key actions by experts to conserve the species (Bullion, 2012; JNCC, 2010). Problems arise, however, when little baseline presence or population data exist to underpin conservation efforts to achieve these actions. For instance, in Warwickshire, there were only 12 records of harvest mice in just 10 locations for the decade preceding 2015 (Figure 4). These included nests, owl pellet remains and cat kills.

Accurate distribution data for a species is considered essential for species and habitat site protection, monitoring changes, and providing an indication of both where future survey effort should be focussed and introduction programmes may be appropriate (Muir and Morris, 2013). This internship project was an initial stage in collecting data for harvest mice presence and absence across the county, with the aim of increasing our knowledge of both distribution and habitat use. The intention is that this knowledge and increased awareness can now be used for future conservation of the species in Warwickshire.

Methodology

Presence of harvest mice was determined using three methods: longworth trapping, nest searching and owl pellet analysis. Both trapping and nest searching were conducted at ideal times of year

between October and March, when vegetation has died back and harvest mice are largely ground-dwelling (Bullion, 2012). Sixteen sites across Warwickshire were surveyed using these two techniques. Sites were initially selected based on contact from landowners and organisations, and knowledge of Warwickshire Wildlife Trust reserves. Potential sites were then scoped and chosen based on containing suitable harvest mouse habitat, showing landscape connectivity and meeting basic access requirements. Each site was surveyed for a period of three consecutive days. Consent was obtained from Natural England for surveying on Sites of Special Scientific Interest (SSSI).

Longworth trapping

Up to 52 longworth traps were set up in transects or grids at each site. The number and spacing of traps was determined from size and habitat present, but generally consisted of 2 traps set at each point, with 10m intervals between each point. The majority of traps were placed on the ground because harvest mice are largely terrestrial in the winter, although in particularly wet areas, traps were attached to stakes and placed higher up in the stalk-zone.

Figure 5. Preparing longworth traps before surveying. Photo credit Deborah Wright.

Figure 6. Sexing a caught harvest mouse before release. Photo credit Stephen Stroud.

Traps were baited with chicken feed (mostly maize and wheat), porridge oats and mealworms (live and then frozen to preserve moisture). Hay bedding was also provided (Figure 5). The majority of traps were fitted with a 13mm wire grid ‘excluder’ to prevent larger mammals from entering and thus maximise the number of harvest mice caught. Traps were set less than 16 hours before checking, meeting Natural England licencing protocol. Traps were set for three consecutive sessions, including two evenings and one day. By the third session, it is generally thought that 80% of the individuals likely to be caught will have been caught, thus giving a good indication of harvest mouse presence (R. Trout, *pers comm*).

Triggered traps were emptied into a large transparent bag. The species and 10 figure grid references of all small mammals caught during trapping were recorded before the animals were rereleased back into the area in which they were found. Harvest mice were sexed and placed in a small transparent bag to be weighed, before being rereleased (Figure 6).

Nest searching

To minimise disturbance during trapping, nest searching was conducted at each site on the third day of surveying, after trapping was complete. Transects or grids were searched by hand, with vegetation carefully being parted down to ground level, in search of either non-breeding or breeding nests. Flopped-over vegetation and tussocks were thoroughly searched and care was taken to avoid disturbance to nests as per guidelines (Bullion, 2012). Searches were conducted for up to 2 hours dependent on the number of searchers and size of suitable habitat.

Harvest mouse nests are considered a reliable field sign and are generally distinctive, woven from leaves that have been shredded longitudinally and are often still attached to the stems (Muir and Morris, 2013). However, towards the end of the season when nests are disintegrating, they can be confused with those of other species, such as voles or birds. Great care was taken to avoid misidentification and in one case, expert opinion sought (Figure 7). Ten figure grid references and features of nests, such as height from the ground and percentage cover of surrounding vegetation were recorded.

Figure 7. Expert advice was sought for this nest, likely built by a wren. Photo credit Deborah Wright.

Owl pellet analysis

Over 300 barn owl pellets were collected from 26 locations in South Warwickshire and donated to the project by the Stour Valley Wildlife Action Group (SVWAG). Combined with several pellets collected from Brandon Marsh, these were analysed for small mammal remains using a citizen science approach. Two day workshops were held at Brandon Marsh SSSI Nature Reserve during the course of the project, to train volunteers in owl pellet analysis. The first was taught by Derek Crawley from the Mammal Society and the second by the author. The total numbers of remains of all small mammal and other species found along with the four figure grid reference of each pellet were recorded.

Data analysis

All harvest mouse trapping, nest and owl pellet records were mapped using MapInfo GIS software. Results were combined with Warwickshire Wildlife Trust's Habitat Biodiversity Audit (HBA) data. The

HBA is a detailed Phase 1 habitat survey dataset for the county, and is the longest continual dataset in the country, having begun in 1995. Habitat statistics were then conducted for trap and nest data using the HBA dataset. No statistical analyses could be conducted on owl pellet data because only one set of harvest mouse lower jaws was found, and only four figure grid references were provided, owing to confidentiality stipulations regarding the barn owl roosts.

Results

Distribution

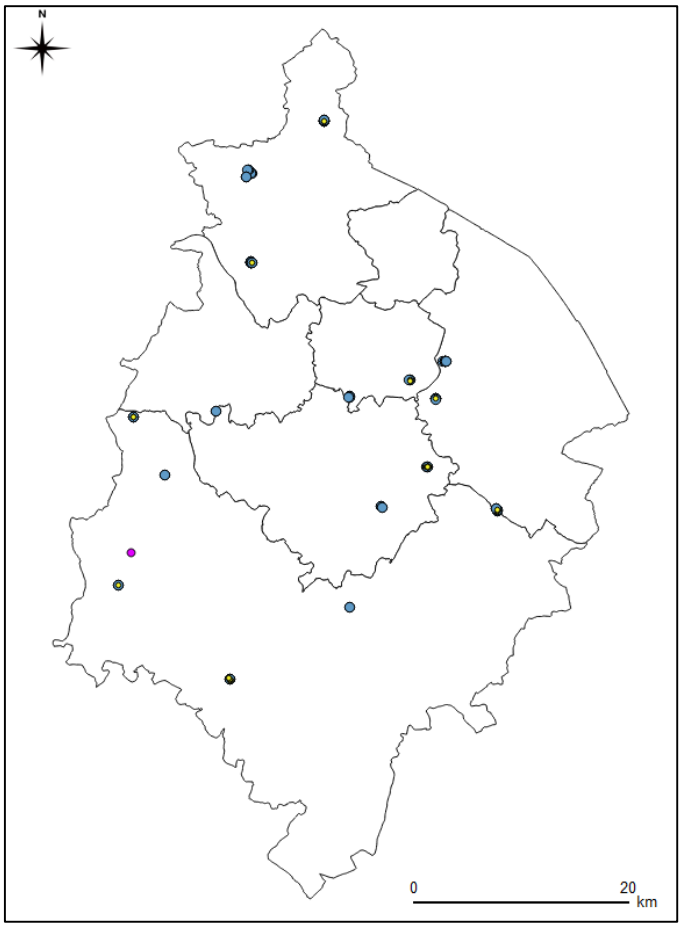

Figure 8. Harvest mouse point records across Warwickshire for project data collected between November 2015 and March 2016. Data obtained from longworth trapping (yellow), nest searching (blue) and owl pellet analysis (pink).

180 harvest mouse records were obtained: 46 from longworth trapping, 133 from nest searching and one from owl pellet analysis (Figure 8). These records cover 21 1km, 19 2km, 16 5km and 11 10km squares of Warwickshire (Figure 9). Importantly, all 16 sites surveyed showed evidence of harvest mice. Nests were found at all sites but harvest mice were only live trapped at nine sites. This is consistent with findings showing that one method of surveying does not necessarily correlate with another, with nest searching often being more successful and preferred over either live trapping or bait tube methods (Bullion, 2012; Poulton and Turner, 2009).

125 other small mammals were also recorded during longworth trapping, including bank vole *Myodes glareolus*, wood mouse, common shrew *Sorex araneus*, pygmy shrew *Sorex minutus* and water shrew *Neomys fodiens*. Over 1200 small mammal and other wildlife remains were also found during owl pellet analysis. Recording all small mammal species, including abundant species, was considered important, because these constitute an important food source for key carnivores and may compete with and affect other mammal species (Muir and Morris, 2013).

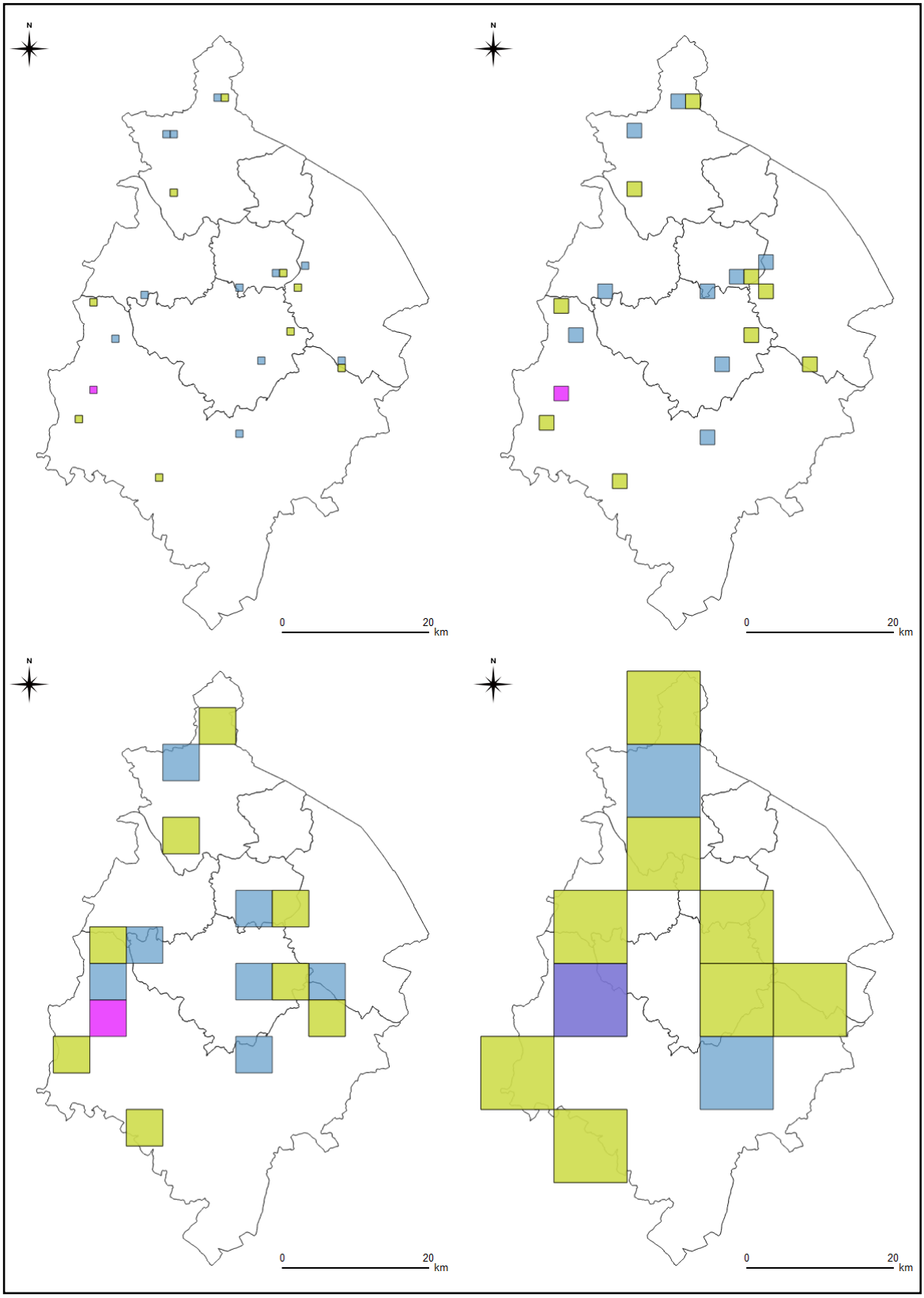

Figure 9. Records covering 1km (top left), 2km (top right), 5km (bottom left) and 10km (bottom right) squares across Warwickshire. Obtained from nest searching (blue), nest searching with longworth trapping (green), owl pellet analysis (pink) and owl pellet analysis with nest searching (purple).

All records were submitted to the Warwickshire Biological Records Centre. Owl pellet results were shared with SVWAG, who were particularly interested in water vole and water shrew remains. Results of individual sites were discussed with involved landowners, local councils, environmental groups, and the Warwickshire Wildlife Trust.

Habitat

The 16 sites surveyed comprised five farms, seven nature reserves, two council parks, one area of college land and one area of urban amenity land. Of the seven nature reserves, there were four meadows, one wetland and two areas of ruderal grassland by rivers. Of the two council parks, one comprised wetland areas and amenity fields and the other comprised a reedbed and neutral grassland.

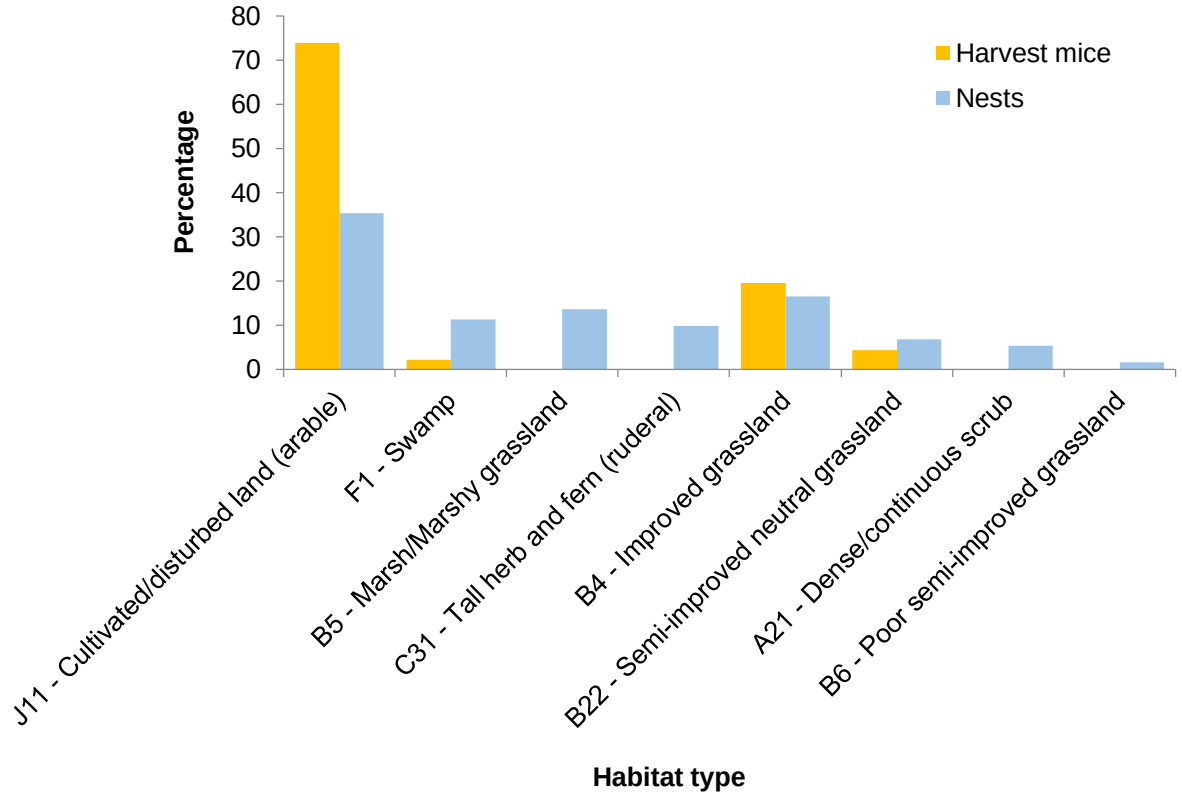

Figure 10. Percentages of harvest mice caught and nests found in HBA habitats.

The grid references of all harvest mice trapped, and nests found, were matched with HBA data. Figure 10 shows that the most of the harvest mice caught, and nests found, were in farmland. This is not consistent with recent research in Suffolk (Meek, 2011), which found low rates in farmland in comparison to wetland sites. However, it should be noted that habitats were not evenly distributed amongst sites. Furthermore, transects surveyed on all five farms comprised field margins rather than crop fields or pastoral land, and four comprised edges by or near to a water corridor and were well

connected within the landscape. High prevalence in farmland was followed by improved grassland, with harvest mice also trapped in areas of swamp (Figure 11) and semi-improved neutral grassland (Figure 12). Nests were also found in marshland, and drier habitats, such as ruderal and poor semi-improved grassland. Harvest mice were commonly found to be using ruderal edges, such as margins and scrub bordering hedgerows.

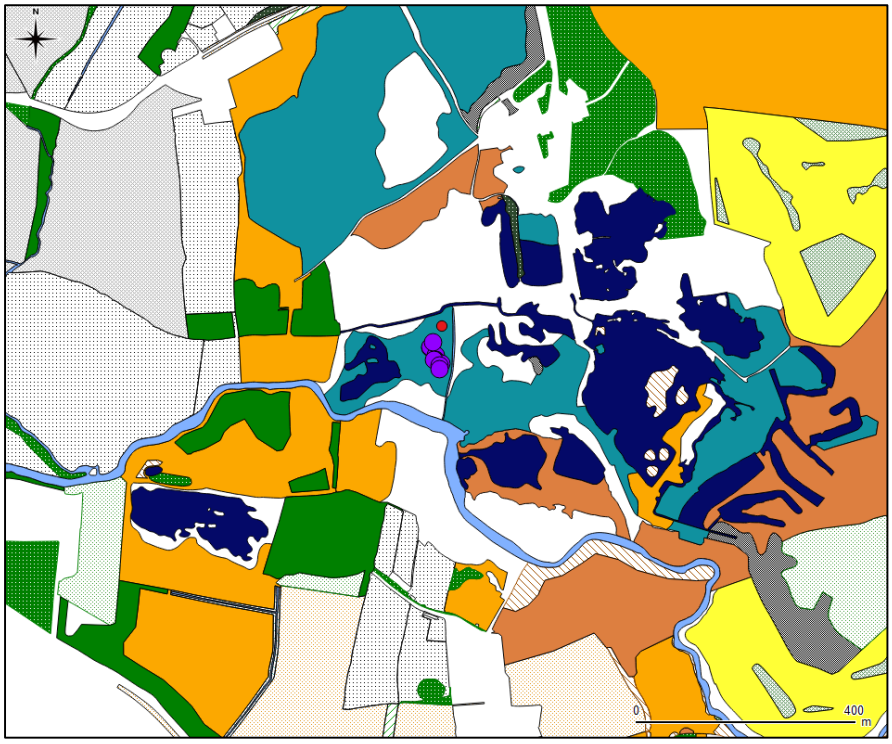

Figure 11. Example wetland site showing nests found (purple) and harvest mice trapped (red) in swamp.

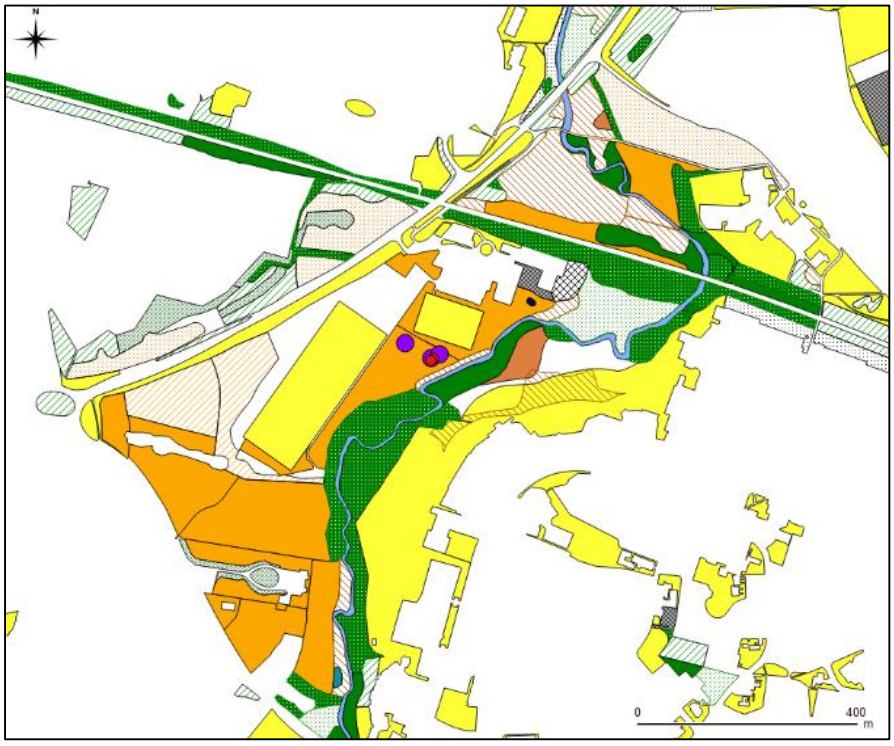

Figure 12. Example urban site showing nests found (purple) and harvest mice trapped (red) in semi-improved neutral grassland amongst amenity grassland.

Figure 13. Nest found in a council park making use of surrounding vegetation for structural support. Photo credit Deborah Wright.

Nests were on average 38cm above the ground in vegetation 88cm high. Nests had an average surrounding vegetation percentage cover of 88%, and were largely hidden amongst dense vegetation. Nests were found in sedges, rushes, reeds, bull rushes and grasses, such as cock's-foot, reed canary and false oat *Arrhenatherum elatius*. Nests were often utilising bramble *Rubus fruticosus*, thistle species, blackthorn *Prunus spinosa*, willowherb species and meadowsweet *Filipendula ulmaria* for structural support (Figure 13). This result is consistent with previous findings across habitats (e.g. Meek, 2011) and in particular farmland, in which bramble and blackthorn have been found to be main nest supporting shrub species (Bence, Stander and Griffiths, 2003).

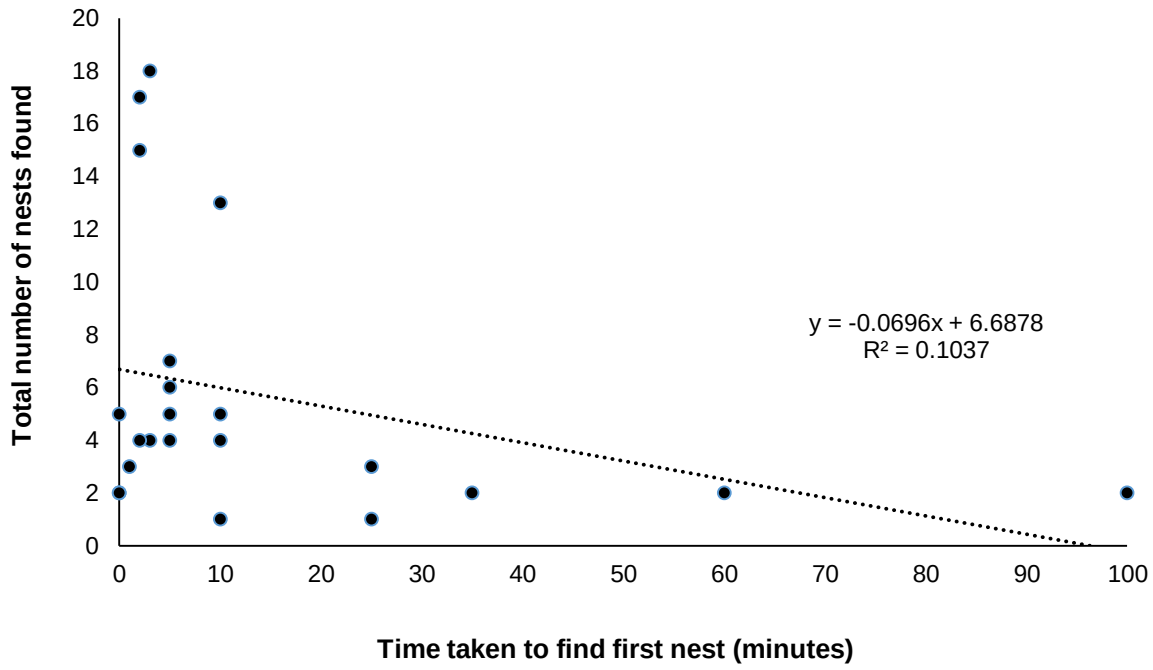

Figure 14. Number of nests found and the time taken to find the first nest in 22 areas across 16 sites.

Nests were found within the first ten minutes of searching at the majority of sites. As Figure 14 shows, there is a trend for first nests taking longer to find, the lower the number of nests found in an area overall, r = -0.32. However, consistent with previous findings (e.g. Meek, 2011), this negative correlation is non-significant.

Training

Figure 15. Author in training with Dr Roger Trout, learning how to catch and handle harvest mice. Photo credit Roger Trout.

Figure 16. Author in training with Dr Roger Trout, learning how to conduct a nest search. Photo credit Roger Trout.

The author received training from expert Dr Roger Trout in harvest mouse ecology and surveying techniques (Figures 15 and 16). Training took place over 3 days in October in Surrey, and additionally included a longworth trapping session with Surrey Wildlife Trust. The author also received additional training from the British Wildlife Centre with captive bred harvest mice. The author took part in running an initial owl pellet workshop and received further training in pellet analysis from Derek Crawley from the Mammal Society.

Figure 17. A volunteer opening a triggered longworth trap. Photo credit Stephen Stroud.

Figure 18. A volunteer proudly showing her first nest find. Photo credit Deborah Wright.

Figure 19. Owl pellet analysis workshop. Photo credit Deborah Wright.

Over the course of the project, six regular volunteers from the Warwickshire Wildlife Trust surveyed sites with the author (Figures 17 and 18). These volunteers were trained in longworth trapping and nest searching surveying techniques. Various other additional groups and volunteers took part throughout the project. Over 15 volunteers were trained in owl pellet analysis during two workshops and went on to analyse donated pellets for harvest mouse remains (Figure 19). These workshops also helped to build relationships with local businesses including Owl Marketing, S&D Falconry and Owl Children's Centre, who sponsored the purchase of seven dissection kits and identification guides.

Community engagement

Figure 20. Nest searching with Warwickshire and Staffordshire Mammal Groups. Photo credit Deborah Wright.

Figure 21. Surveying with staff and volunteers at a Council park. Photo credit Stephen Stroud.

Events were held throughout the project to engage members of local communities and organisations, including:

- A longworth trapping and nest searching day at a Council park with Derek Crawley and the author for both Warwickshire and Staffordshire Mammal Groups (Figure 20).
- A lecture on harvest mouse ecology and surveying techniques by the author to students at Warwickshire College. This was followed by an owl pellet analysis workshop and a full survey of the college site.

- Interested parties and environmental groups such as the Living Environment Trust, Preston Environmental Group and Earlswood Wildlife Partnership, were involved in surveying a variety of local sites with the author.
- Local Council staff and volunteers were involved in surveying Council sites with the author (Figure 21).
- A talk on harvest mouse ecology, surveying techniques and the results of the project by the author to members of the Warwickshire Mammal Group.

Figure 22. Raising awareness through articles and Internet posts.

Throughout the project, articles on webpages, social media and in magazines were used to reach out to local communities and to raise awareness of harvest mice in Warwickshire (Figure 22), including:

- An initial call by the Warwickshire Wildlife Trust for sightings
- An initial article in the Warwickshire Wildlife Trust magazine about the project, to be followed by a secondary article stating the results in the next edition
- A small article about the internship in the PTES Wildlife World magazine and project updates on the website and Facebook page, to be followed by a future magazine article
- Updates about the project on the Warwickshire Wildlife Trust Facebook page
- A twitter post with Coombe Country Park and article written with staff members for Defra's *Biodiversity News*
- A presentation at the Warwickshire Recorder's Meeting
- A poster presentation at the annual Mammal Society Conference

The response from the general public was overwhelmingly positive, to the extent that the PTES provided an additional two months extension funding. Members of one of the environmental groups involved in surveying a site went on to nest search at an additional site, sending in photographs and grid reference records. The group covered the site surveying in their local newsletter and have also invited the author to talk and demonstrate small mammal trapping at a community event in the summer of 2016. A member of the public who manages a Local Nature Reserve has reported a nest sighting and after the scoping the site, the author is likely to conduct trapping and nest searching later in the year with the Warwickshire Mammal Group. The author has also been invited to speak about the project in 2017 to the Coventry & District Natural History & Scientific Society. Members of the public still continue to come forward with sightings.

Limitations

The project was an initial stage to simply determine where harvest are in the county and what habitats they are using. As such, the data provides information on presence or absence of the species, and does not provide an indication of population size. Harvest mice are not often found in widespread surveys for small mammals, and their distribution when surveyed along transects appears significantly clumped, usually resulting in binary rather population data (Poulton and Turner, 2009). It is generally difficult to obtain any reliable population estimates (Bullion, 2012), especially as major fluctuations occur from year-to-year (Trout, 1978b), and efforts to do so need to be frequent, intensive and focussed. However, if possible, these efforts combined with mark-recapture methods could provide useful data to inform conservation plans for the species across the county in the future.

Sites were specifically chosen for having suitable harvest mouse habitat and were not randomly selected. This means that sites were not entirely evenly distributed across the county and that sites

with unfavourable habitat were not surveyed. It would be useful to survey these types of sites in the future to determine the full extent of harvest mouse adaptability to different habitats.

Owl pellet analysis yielded only one harvest mouse data point, potentially because of four reasons. First, generally only 1% of barn owl diet comprises harvest mice, and a larger sample of pellets from each site may have been needed to detect harvest mice adequately (see Meek, 2011). Second, most of the pellets were from late spring and summer, when both owl pellet remains and longworth trapping show minimal findings, suggesting a drop in numbers during this time (Trout, 1978b). Third, harvest mice bone remains are small, easily overlooked, and potentially confused with other mouse species when using a citizen science approach. Fourth, it could be that harvest mice are not particularly prevalent from where the barn owl pellets were collected from, at least relative to other species. Indeed, pellets were only collected from the south of the county and no data were obtained, except for Brandon Marsh pellets, for further north in the county. Future owl pellet analysis for north Warwickshire, and from pellets obtained in the autumn and early winter may provide more information on harvest mouse distribution.

Implications

The most surprising and main finding of the project was that evidence of harvest mice was found at every site surveyed. This was unanticipated given the suspected sharp decline of harvest mouse populations over the past two decades. Harvest mice appear to be more widespread in Warwickshire than previously thought. This mirrors recent findings in other areas, such as East Anglia and the North East of England (e.g. I. Bond *pers comm*, Meek, 2011). It is possible that harvest mice may simply be under-recorded in the county due to a lack of awareness, combined with their elusive nature, and the fact that intensive surveying is often required by experienced personnel to find evidence of them.

Harvest mice were found in a wide range of habitats, including farmland, wetland and grassland. Some local habitats where evidence was found were first considered small and unlikely areas, sometimes only tens of metres in length. A key factor appears to be the connectivity of habitat, and indeed this may actually be more important than the habitat itself (Kuroe et al., 2011). A study in Suffolk found that habitats connected via river valleys were more likely to contain nests than isolated areas of suitable habitat (Meek, 2011). Areas that appear small and unsustainable but may become important stepping stones when the land is connected. An example of this can potentially be seen in the earlier Figure 12, in which harvest mice appear isolated amongst urban amenity areas, but are connected to other sites through a river and woodland corridor. In terms of development mitigation, avoiding isolation by creating corridors is of prime importance, enabling nearby reservoir populations to spread throughout the landscape (Bullion, 2012).

The results of this project can be used to directly influence future habitat management plans. Contrary to a previous study (Meek, 2011) and perhaps owing to strong connectivity in the sites surveyed, farmland should still be considered a valuable habitat and resource for harvest mice, and conservation efforts should not exclude private landowners. Indeed, landowners approached in this study have been enthusiastic as to how they can both maintain and improve their land for the benefit of harvest mice and other small mammals. The author has discussed several strategies, including:

- Keeping vegetation tall, particularly around wet areas.
- Maintaining areas of rough grassland and field margins on a 3-5 year rotation, which also provides food and cover for other small mammals, passerines, game, butterflies, bumblebees and invertebrates.
- Avoiding cutting of suitable areas such as field margins and hedges when populations are most likely to be impacted. Cutting in late winter avoids destroying occupied breeding nests.
- Planting of wild bird crops with millet, which provides a food source and place for nesting, as well as benefiting birds and other wildlife.
- Implementation of agri-environment schemes that encourage field margins.
- Connectivity to prevent isolation of populations and enable escape in the event of flooding. As well as connecting habitats, hedgerows with adjacent grassy margins can provide winter shelter and food.

In particular, the author has been able to discuss surveying outcomes and potential management plans with the Reserves and Survey teams for Warwickshire Wildlife Trust reserves. The author has been able to link the work with other Trust projects, such as the Tame Valley Wetland and Princethorpe Woodland projects, as well as the Living Landscapes Scheme. These projects have facilitated links with landowners and provided local knowledge, and in turn the results of this project can be fed back into those projects.

Figure 23. Site which had been completely flooded less than two weeks prior to surveying. Photo credit Deborah Wright.

As well as showing that harvest mice use a diverse range of habitats that can be managed relatively minimally, the project has shown that the species may also be highly versatile and adaptive. For example, contrary to popular belief, harvest mice were still found to be using areas grazed by cattle. Additionally, the winter of 2015/2016 was unseasonably mild and wet. Although mild temperatures may be beneficial for harvest mice, select cold snaps where temperatures plummeted may have increased mortality rates. The extreme wet conditions and widespread flooding are very likely to have increased mortality rates, especially if harvest mice continued to breed up until December because of mild temperatures. A particularly interesting finding

occurred on a wetland site, in which the area had been completely flooded less than two weeks prior to surveying (Figure 23). Several saturated old nests were uncovered and a live harvest mouse trapped. This suggests that harvest mice may be able to survive flooding events, likely if there is other nearby suitable and connected habitat to escape to and use as a refuge before returning. Harvest mice are known to use transient habitats and move throughout different areas as the seasons change, particularly moving away from wetland areas prone to flooding in the winter (Bullion, 2012). They are also able to colonize new habitats and increase in number rapidly (Bence et al., 2003). Being such a resilient and mobile species provides hope that harvest mice will be able to adapt to likely future climate change and habitat loss.

Conclusions

This project was a first-stage study to determine where harvest mice can be found in Warwickshire and what habitats they are using. Previous data for the county was minimal, and a baseline presence or absence dataset is essential for any future work to conserve this declining species to be successful. Evidence of harvest mice was surprisingly found at all sites surveyed, with presence of the species appearing most prevalent in farmland. Harvest mice were found to be highly versatile and adaptable however, using a variety of other habitats, even those which had experienced recent flooding. It is likely that connectivity is of overriding importance, and therefore that conservation efforts for the species should be considered on a landscape scale. Training and a variety of events have been used throughout the project to raise awareness and engage local communities, with the hope that harvest mouse conservation in Warwickshire will continue after the project ends.

Acknowledgements

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