Spatial distribution of human-wildlife interactions predicts coexistence with a global urban carnivore, the red fox

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Data Availability

All data are provided in the supplementary materials (Dataset S1).

Conflict of Interest Statement

Authors declare no conflict of interest.

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Highlights

- Urban rewilding success depends on public tolerance of wildlife.
- We studied how space and human-fox interactions affected responses in people.
- Bin-raiding was linked to wildlife feeding, negative attitudes, and pest control.
- The role of urbanisation and geography varied among these relationships.
- Spatial context can likely help urban rewilding succeed.

Abstract

Despite growing recognition that spatial factors such as urbanisation and geographic region shape human-wildlife interactions, few studies have examined – on a large geographic scale – how urbanisation and regional variation in animal ecology together influence public attitudes and behaviours towards wildlife. Understanding spatial factors may have implications for urban rewilding, as its success will depend on local tolerance of wildlife and may potentially increase human-wildlife interactions, such as bin-raiding and public wildlife feeding. We examined how urbanisation, geographic region, and public wildlife feeding influence reported bin-raiding, public attitudes, and the use of control measures towards the world's most urbanised terrestrial carnivore, the red fox, *Vulpes vulpes*. Online survey data were obtained from 1,275 participants in the United Kingdom. Fox bin-raiding was associated with increased levels of public wildlife feeding, more negative attitudes towards foxes, and greater use of professional and do-it-yourself pest control measures. However, the role of urbanisation and geographic differences varied among these relationships. Specifically, urbanisation and geographic region significantly predicted reports of fox bin-raiding, with urban residents – particularly those living in London – more likely to report such behaviour. Urbanisation influenced people's use of professional pest control of foxes within their area, and geographic region influenced the use of do-it-yourself control measures. Neither urbanisation nor geographic region significantly predicted public attitudes towards foxes. Together, these findings highlight the complex interactions between spatial context, human attitudes and behaviour, and animal ecology, underscoring the importance of nuanced, context-specific strategies to support human-wildlife coexistence and urban rewilding initiatives.

Keywords: public wildlife attitudes, human-wildlife interactions, pest control, nuisance behaviour, urban rewilding, human-wildlife conflict

Introduction

Urbanisation is currently one of the fastest forms of human-driven landscape change on the planet (Li et al., 2022; Simkin et al., 2022). As the world's global human population continues to rise, 68% of the global population will live in urban areas by 2050 (United Nations, 2019; Li et al., 2022; Simkin et al., 2022). Urban environments create challenging environments for wildlife to inhabit, including high human population density, road density, the loss and fragmentation of natural habitat, light, noise, pollution, and invasive species (McKinney, 2002; 2006; Ramadhan, 2024). Such ecological impacts from urbanisation raise pressing questions about the changing relationship between humans and the natural world (Soga & Gaston, 2016; Cox et al., 2017a; Gaston & Soga, 2020).

Species richness of wildlife in cities varies across urban-rural gradients, but the most heavily urbanised areas often show lower diversity (McKinney, 2002; 2006; Aronson et al., 2014; Sol et al., 2014; Sidemo-Holm et al., 2022; Ramadhan, 2024). Thus, urbanisation typically reduces access and diversity in opportunities for people to physically, cognitively, and emotionally "connect" with nature (Soga & Gaston, 2016; Cox & Gaston, 2018; McEwan et al., 2019; Richardson et al., 2022). Indeed, research shows a global decline in nature connectedness (Soga & Gaston, 2016; Cazalis et al., 2023), and urban residents often experience lower levels of nature connectedness compared to rural residents (Richardson et al., 2022; Kageyama et al., 2024; Barragan-Jason et al., 2025). Declining human-nature connectedness can lead to poorer mental and physical health, such as depression and anxiety (Martyn & Brymer, 2016; Cox et al., 2017b; Sibthorpe & Brymer, 2020; White et al., 2021; Barrable & Booth, 2022). It can also reduce pro-environmental attitudes and behaviour (Otto & Pensini, 2017; Whitburn et al., 2020; Barrable & Booth, 2022; Lengieza et al., 2023; Straka et al., 2025), shifting people's priorities away from engaging with nature, including support for conservation initiatives (Richardson et al., 2020; Barrows et al., 2022). Thus, to help foster deeper connections to nature and support for biological conservation efforts, it is crucial that researchers understand how to improve people's experiences within nature, especially in cities (Soga & Gaston, 2016; Cox & Gaston, 2018; Richardson et al., 2022).

“Rewilding”, the process of restoring key natural processes and missing components of the food web to create self-sustaining ecosystems (Carver et al., 2021), has been suggested as a way to increase people’s access to nature (Lengieza et al., 2025). More specifically, “urban rewilding”, defined broadly as low management initiatives that seek to improve biodiversity in urban environments (Pettorelli et al., 2022), has been proposed as a way to improve access to nature within cities (Pettorelli et al., 2022; Webb & Moxon, 2023; Finnerty et al., 2025). Urban rewilding initiatives can include the installation of green roofs to buildings or the establishment of wildflower meadows to provide valuable habitat for urban wildlife (Griffiths-Lee et al., 2022; Wooster et al., 2022; Marshall et al., 2023). Similarly, adding wildlife-friendly features in gardens, such as ponds and native vegetation, can make space for nature by offering resources and refuge to various species (Hill et al., 2017; Threlfall et al., 2017). Using these strategies to encourage more wildlife to urban areas and gardens can improve nature connectedness and well-being by providing residents with greater opportunities to experience positive interactions with wildlife. For instance, bird watching in residents’ own back gardens for a short period of time (e.g., 30 minutes) can foster deeper connections with nature, promoting better health and well-being in those individuals (White et al., 2023). Given the benefits of rewilding initiatives, urban rewilding is now being actively promoted and is already being implemented in many cities across the world, including major cities such as London, New York, Singapore and Sydney (Arup & C40 Cities, 2022; Finnerty et al., 2025). However, while these interventions aim to foster more positive relationships between people and nature, human-wildlife interactions can be perceived in different ways, and in some instances, these interactions can be negative (Nyhus, 2016).

Negative human-wildlife interactions within urban areas can range from minor conflict such as wildlife digging in gardens, fouling on lawns, vocalising at night, and overturning bins, through to more serious conflict such as damaging structures or injuring people or pets (Soulsbury & White, 2015). Public tolerance of wildlife, which is broadly defined here as the passive acceptance of, and willingness to live alongside, wildlife populations (Bruskotter & Fulton, 2012; Bruskotter & Wilson, 2014) can be reduced by experiencing negative human-

wildlife interactions (Naughton-Treves et al., 2003; Conejero et al., 2019; Hobson et al., 2024; Puri et al., 2024). In turn, reduced tolerance may lead to the use of wildlife control measures, such as the removal or exclusion of animals perceived as problematic (Baker et al., 2020; Puri et al., 2024). Such measures are already commonly employed in many urban areas around the world (McCleery et al., 2012; Vantassel & Groepper, 2015; Sato, 2017; Baker et al., 2020; McPherson et al., 2021; Schell et al., 2021), but they can place significant economic burdens on cities (Soulsbury & White, 2015; Baker et al., 2020) and often run counter to the goals of rewilding which, again, often seek to promote human-wildlife coexistence. Because these economic and ecological challenges are intertwined (Soulsbury & White, 2015), understanding the factors that drive negative human-wildlife interactions is crucial for designing effective strategies that support both urban wildlife management and successful rewilding initiatives.

Despite increasing recognition that spatial context shapes human-wildlife interactions, few studies examine – on a large geographic scale – the interplay between urbanisation and regional differences in animal ecology and how this, in turn, shapes public attitudes and behaviour towards a species. Research has shown that attitudes, and tolerance for wildlife varies across urban-rural gradients (Bjerke et al., 1998; Balčiauskas & Kazlauskas, 2014; Kansky et al., 2014; Kimmig et al., 2020; Tan et al., 2020; Ostermann-Miyashita et al., 2023), with some urban residents reporting greater acceptance of wildlife due to more frequent exposure (Moesch et al., 2024b). However, such patterns are not universal and can depend on many other factors, such as nuisance animal behaviours (e.g., bin-raiding) and other perceived risks (e.g., disease and physical attacks) (Kansky et al., 2014; König et al., 2020; Tan et al., 2020). While studies have examined individual predictors of tolerance, including public attitudes and people's use of pest control (Bruskotter & Wilson, 2014; Kansky et al., 2014; Bruskotter et al., 2015; Dunn et al., 2018; Baker et al., 2020; Hobson et al., 2024; Puri et al., 2024), few have systematically assessed how geographic region and urbanisation levels interact with these variables. Understanding spatial factors may have important implications for urban rewilding, as its success will depend on local tolerance of wildlife and may potentially

increase positive and negative human-wildlife interactions, such as bin-raiding and public wildlife feeding.

The current study investigated how urbanisation, geographic region, and public wildlife feeding influence bin-raiding behaviour, public attitudes, and the use of control measures towards wild red foxes, *Vulpes vulpes.* Red foxes (hereafter foxes) are an ideal case study because they are the most globally widespread terrestrial urban carnivore on the planet (Soulsbury et al., 2010; Soe et al., 2017; Bijl & Csányi, 2022; Castañeda et al., 2022) and have a long and complex history of living within urban areas across many countries (Contesse et al., 2004; Baker et al., 2006; Bridge & Harris, 2020; Basak et al., 2022; Moesch et al., 2024a). Human and urban fox interactions are frequent and varied, including food provisioning by residents and negative interactions such as bin-raiding, noise disturbance, and digging up gardens to find food (Harris, 1981; Baker et al., 2020; Brand & Baldwin, 2020; Scott et al., 2023). Negative interactions have historically reduced public tolerance of foxes, leading some people to advocate for greater use of pest control to manage their populations (Baker et al., 2020; Brand & Baldwin, 2020; Kimmig et al., 2020). Because foxes are often more active within and around urban areas compared to the countryside (Scott et al., 2014; Morton et al., 2023), they are likely to thrive from urban rewilding initiatives due to increased foraging opportunities, shelter, and safer corridors for movement. However, rewilding initiatives could also increase opportunities for negative human-fox interactions. While many people display positive attitudes towards foxes, this is not universally true and may, instead, depend on regional differences and/or the degree of urbanisation in which people live. Thus, understanding how spatial factors shape public tolerance of foxes is important for developing nuanced, context-specific strategies to promote human-fox coexistence and broader urban rewilding initiatives.

The current study hypothesised that individuals who feed wildlife would be more likely to report observing bin-raiding behaviour by foxes, potentially as a consequence of increased fox activity in their area. We also hypothesised that individuals who observed bin-raiding behaviour – regardless of whether or not they fed wildlife – would report lower tolerance of

foxes, including more negative attitudes and greater use of fox control measures. Finally, to understand the spatial context of these relationships, we assessed whether bin-raiding behaviour, public attitudes, and fox control measures was explained by the degree of urbanisation or the particular geographic region in which participants lived.

Methods and materials

Ethical statement

The study was approved by the Faculty of Health Sciences Ethics Committee of the University of Hull (FHS 22-23.37) and followed the research guidelines of the British Psychological Society.

Public attitudes towards foxes

A nation-wide online survey assessing public attitudes about foxes was conducted in Great Britain between March and April 2023. Participants were recruited using a commercial survey company (Survation) to ensure a representative sample using the company's existing participant pool. The survey was originally conducted as part of a study that investigated whether communicating information about the psychology of foxes influenced public attitudes towards the species, and whether this was conditional on how that information was disseminated (i.e., press release or a video) (Morton et al., 2024). Participants' attitudes towards foxes were not significantly influenced by the information or format given to them (Morton et al., 2024), and so we used these attitude scores in the current study. A total of 1,373 people participated in the study, with an average age of 53 ± 18.2 years (range: 18-93 years) and 689 and 684 people identifying as male or female, respectively.

Full details of the survey can be found in Morton et al. (2024). We used data from the final section of that survey, where participants were asked to what extent they agree with 24 statements made about foxes on a 7-point Likert scale (e.g., "I enjoy seeing foxes"). These responses were then used to measure their attitudes towards foxes. Participants' responses were analysed using a Principal Component Analysis (PCA), which suggested that the data

were comprised of a single component characterised by people's attitudes towards the species. Thus, an overall attitude score was determined for each participant by calculating the average score for questions describing positive attitudes, and the average score for questions that described negative attitudes, and then subtracting the negative from the positive. Participants' scores ranged from -6 (very negative) to 6 (very positive) and were classified as being relatively more positive than negative in terms of their overall attitude towards foxes if their score was greater than 0.

Urbanisation, geographic region, and fox experiences

Data on participants' geographic region, level of urbanisation, and experience with foxes from Morton et al. (2024) were used. We used postcode information to categorise participants into 11 regions, including East Midlands, East of England, London, North East, North West, Scotland, South East, South West, Wales, West Midlands, and Yorkshire and the Humber. Level of urbanisation was based on three factors, including urban (i.e., a town or city, lots of people live there, and there are lots of different kinds of buildings close together), suburban (i.e., mostly houses, located just outside a city or town), or rural (i.e., mostly countryside with few houses or buildings).

To assess participants' experiences with foxes, two key variables were derived. First, participants were asked whether they had ever seen a fox eating rubbish from their outdoor bin, or from a public bin owned by their local council. Responses to these two questions were combined into a single binary measure of prior experience with local fox bin-raiding behaviour, classified as yes (1) if they had personally seen a fox raiding either type of bin, or no (0) if they had not seen a fox raiding a bin. Second, participants were asked whether they ever leave food outside for foxes, or for other wildlife (e.g., birds or hedgehogs). Given the relatively small number of participants who fed only foxes (N = 8 people) (Morton et al., 2024), participants' food provisioning activities were based on three factors, including people who fed all wildlife (foxes and other species), people who only fed other wildlife (not foxes), and people who did not feed any wildlife. To further understand the potential impact of observing fox bin-raiding

behaviour on people's tolerance (in addition to evaluating their attitudes), participants were also asked whether they had ever contacted a pest control service to resolve an issue they had with foxes (hereafter "professional services"), and whether they had ever tried to harm or kill a fox themselves (hereafter "do-it-yourself or DIY measures), at their place of residence.

Statistical analysis

All statistical analyses were performed using R version 4.3.3 (R Core Team, 2024). A Type II Wald chi-square ANOVAs were conducted using the "car" package (Fox & Weisberg, 2019), and post-hoc pairwise comparisons were conducted using the "emmeans" package (Lenth, 2025).

Generalised linear models (GLM) with a binomial family and a logit link were used to model the relationship between reports of bin-raiding foxes and participants' level of urbanisation, geographic region, and food provisioning activities. GLMs were also used to examine the likelihood of using fox control measures (professional services and DIY control methods) in relation to participant's level of urbanisation, geographic region, food provisioning activities, experience with bin-raiding foxes in their area (own property and/or neighbourhood), and their overall attitudes towards foxes. Finally, a GLM with a gaussian family and identity link was used to model participants' overall attitudes towards foxes in relation to their level of urbanisation, geographic region, food provisioning, and experience with bin-raiding foxes in their area. To assess the significance of individual predictors within each GLM, Type II Wald chi-square ANOVAs were conducted. For significant categorical predictors, post-hoc pairwise comparisons were performed using Tukey-adjusted p-values to explore differences between levels and the direction of effect within each significant factor.

Results

Participants' level of urbanisation, geographic region, and fox experience

Of the 1,373 people that responded to the survey, 9 people were excluded from the analyses because they were unable to correctly identify a fox when asked to click on the image

306 of a fox from a lineup of different species. A further 89 people were excluded as their prior
307 experience with bin-raiding foxes could not be determined due to missing responses.
308 Information on the level of urbanisation, geographic region, and fox experiences of the
309 remaining 1,275 people are provided in Table 1 and Figure 1.
310
311 **Table 1.** Information on participants' level of urbanisation, wildlife feeding habits, experience
312 with fox bin-raiding, and use of fox control (N=1,275 participants).

Variable	% of participants
Urbanisation	
Urban	32%
Suburban	51.06%
Rural	16.94%
Wildlife feeding	
Only foxes	<1%
Other wildlife (not foxes)	42.4%
Foxes + other wildlife	11.8%
None	45.8%
Fox bin-raiding	
Witnessed	21.7%
Not witnessed	78.3%
Use of fox control	
Professional services	9%
DIY measures	7.1%

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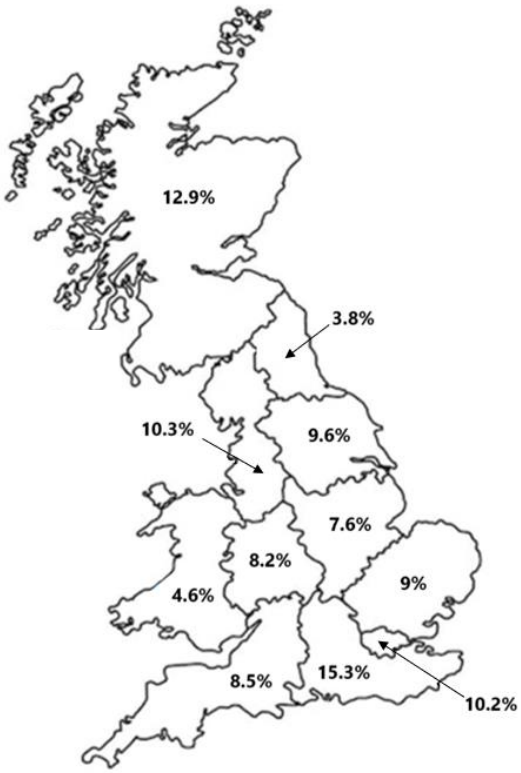

Figure 1. The percentage of people from each of the geographic regions within this study (N = 1,275 participants).

Predictors of fox bin-raiding

There was a significant effect of urbanisation ($\chi^2_2 = 30.879$, $p < 0.001$), public wildlife feeding ($\chi^2_2 = 39.609$, $p < 0.001$), and geographic region ($\chi^2_{10} = 49.707$, $p < 0.001$) on reported bin-raiding by foxes. People from urban areas were more likely to report bin-raiding foxes compared to people from suburban ($Z = -4.004$, $p < 0.001$) and rural ($Z = -4.753$, $p < 0.001$) areas (Figure 2). People who fed foxes (either exclusively or along with other wildlife) were more likely to report bin-raiding than those who fed other wildlife (not foxes) ($Z = 6.307$, $p < 0.001$) and no wildlife at all ($Z = -4.913$, $p < 0.001$) (Figure 3). People from London were significantly more likely to report bin-raiding foxes than those in eight of the other geographic regions (Table S1) (Figure 4).

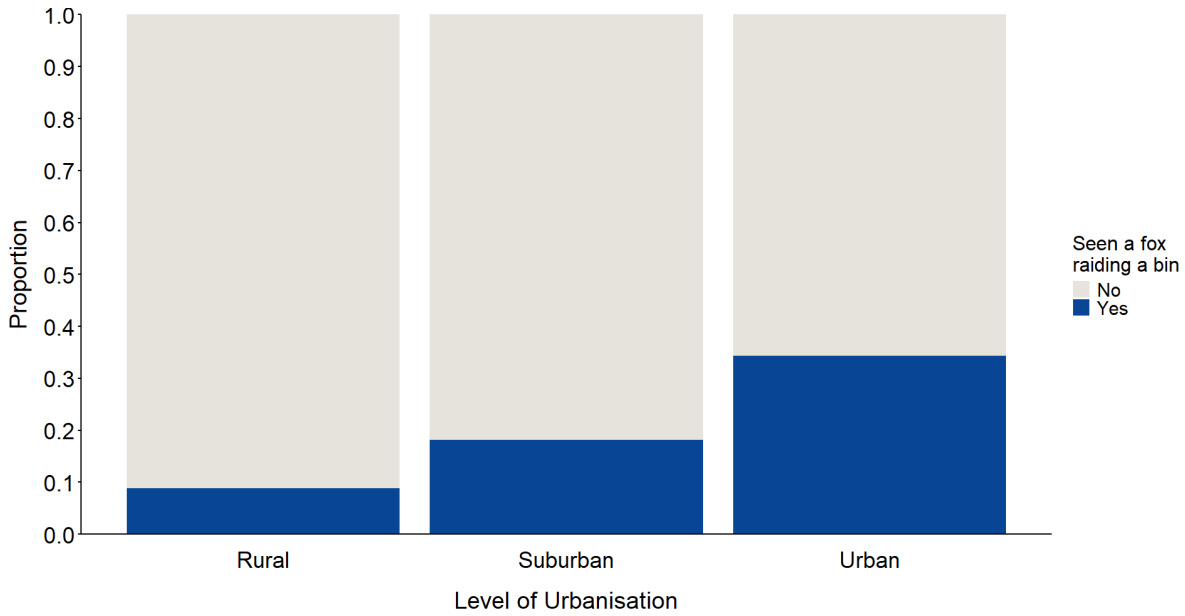

Figure 2. The proportion of people from each level of urbanisation who reported seeing a fox raiding a bin, including rural (N = 216 participants), suburban (N = 651 participants) and urban (N = 408 participants) areas.

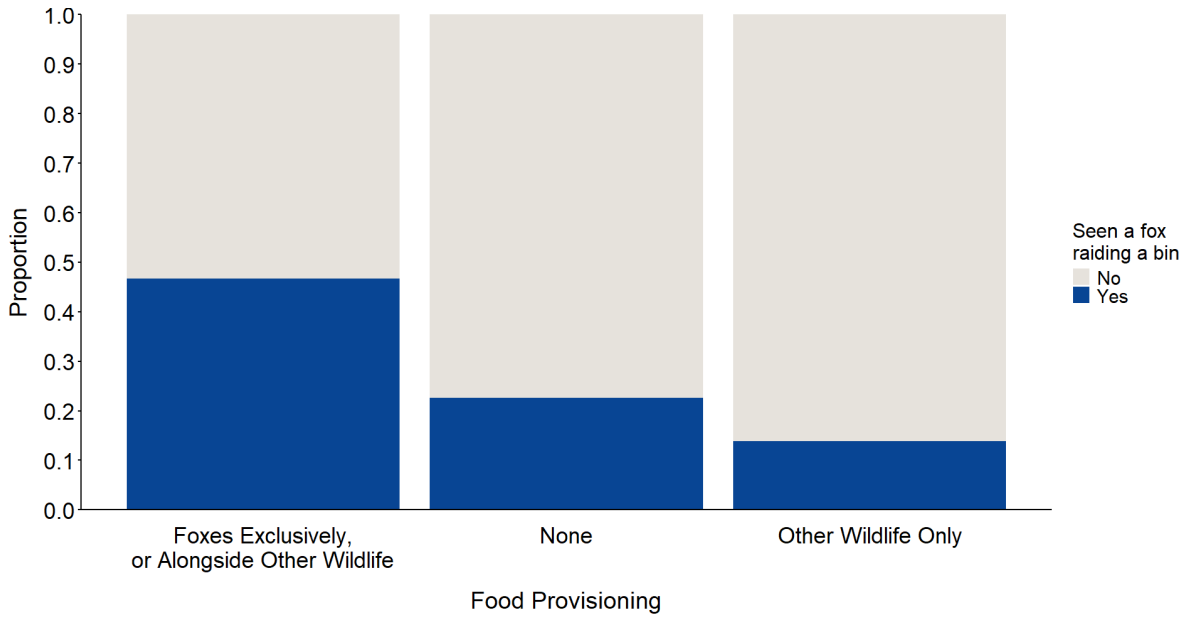

Figure 3. The proportion of people from each wildlife food provisioning category who reported seeing a fox raiding a bin, including people who feed foxes exclusively or alongside other wildlife (N = 150 participants), people who feed other wildlife (not foxes) (N = 541 participants), and people who did not feed any type of wildlife (N = 584 participants).

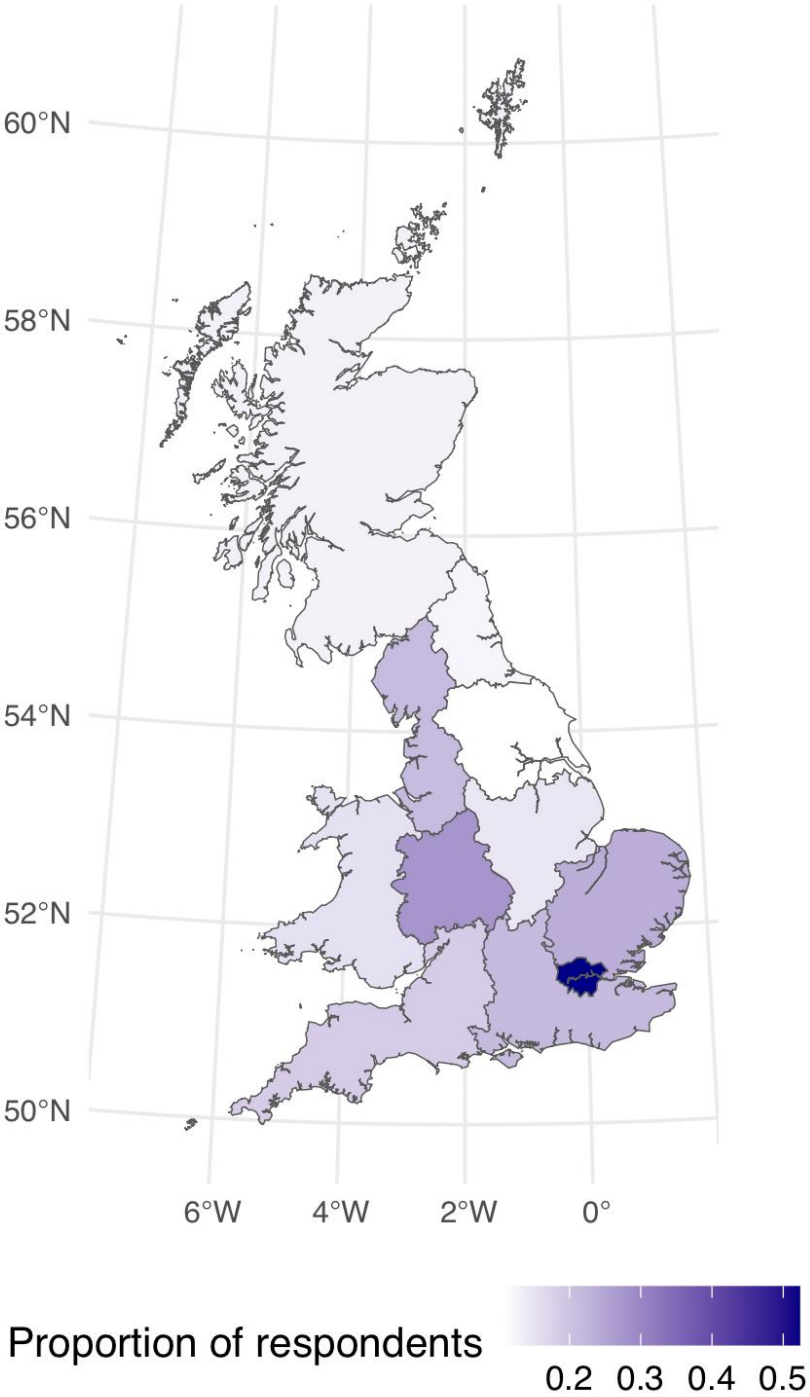

Figure 4. The proportion of people from each geographic region who reported seeing a fox raiding a bin within their local area, including people from the East Midlands (N = 97 participants), East of England (N = 115 participants), London (N = 130 participants), North East (N = 49 participants), North West (N = 131 participants), Scotland (N = 164 participants), South East (N = 195 participants), South West (N = 108 participants), Wales (N = 59

participants), West Midlands (N = 105 participants) and Yorkshire and the Humber (N = 122 participants).

Predictors of attitudes towards foxes

In terms of attitudes, 83.5% of participants were relatively more positive than negative towards foxes. Food provisioning ($\chi^2_2 = 41.095$, $p < 0.001$) and fox bin-raiding experience ($\chi^2_1 = 9.208$, $p = 0.002$) had a significant effect on public attitudes, whereas level of urbanisation ($\chi^2_2 = 0.515$, $p = 0.773$) and geographic region ($\chi^2_{10} = 16.129$, $p = 0.096$) did not. People who fed foxes (either alone or with other wildlife) were more likely to have more positive attitudes towards foxes than people who did not feed any wildlife ($Z = -2.419$, $p = 0.042$); however, their attitudes did not significantly differ from people who fed other wildlife (not foxes) ($Z = -1.683$, $p = 0.212$). People who witnessed fox bin-raiding had poorer attitudes than people who had not ($Z = 3.035$, $p = 0.003$).

Predictors of fox control

Professional pest control services

People's use of professional services to resolve a fox-related issue within their area was significantly influenced by their level of urbanisation (χ^2_2 6.019, $p = 0.049$), degree of food provisioning ($\chi^2_2 = 29.456$, $p < 0.001$), prior bin-raiding experience ($\chi^2_1 = 18.059$, $p < 0.001$) and attitudes towards foxes ($\chi^2_1 = 11.182$, $p < 0.001$). Geographic region did not influence the use of professional services ($\chi^2_{10} = 9.016$, $p = 0.531$).

People from urban areas were more likely to contact professional services than those from suburban areas ($Z = -2.384$, $p = 0.045$); however, comparisons between rural and suburban ($Z = 1.238$, $p = 0.430$), and rural and urban areas ($Z = -0.497$, $p = 0.873$) were not significant. People who fed foxes (either alone or with other wildlife) were more likely to contact professional services than those who fed other wildlife (not foxes) ($Z = 4.720$, $p < 0.001$) and no wildlife at all ($Z = -5.219$, $p < 0.001$; Figure S1). People who had previously witnessed bin-

raiding by foxes were more likely to contact professional services than people who had not ($Z = -4.311$, $p < 0.001$; Figure 5). Finally, people with more negative attitudes were more likely to contact professional services compared to people with more positive attitudes ($Z = -3.373$, $p < 0.001$).

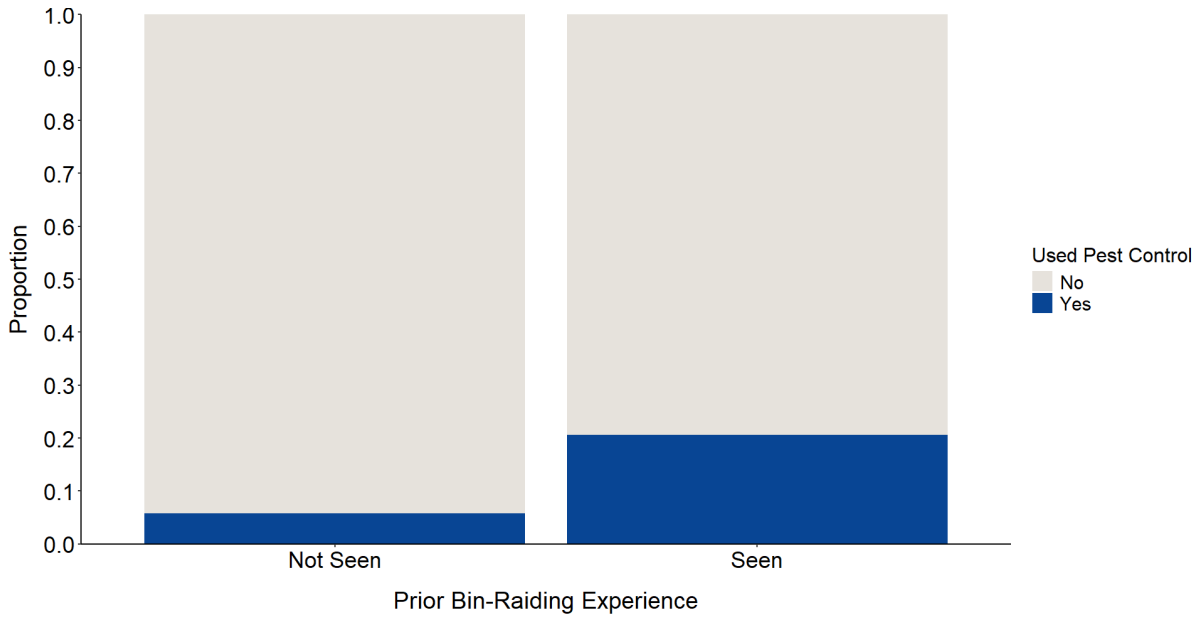

Figure 5. The proportion of people who have (N = 277 participants) and have not (N = 998 participants) seen a fox raiding a bin who reported contacting professional pest control services to resolve an issue related to foxes within their area.

DIY pest control measures

People's use of DIY measures to resolve a fox-related issue within their area was significantly influenced by their degree of food provisioning ($\chi^2_2 = 30.360$, $p < 0.001$), geographic region ($\chi^2_{10} = 19.332$, $p = 0.036$), prior bin-raiding experience ($\chi^2_1 = 12.752$, $p < 0.001$), and attitudes towards foxes ($\chi^2_1 = 13.093$, $p < 0.001$). Level of urbanisation did not influence the use of DIY control measures ($\chi^2_2 = 5.018$, $p = 0.081$).

People who fed foxes (either alone or with other wildlife) were more likely to use DIY control measures than those who fed other wildlife (not foxes) ($Z = 5.255$, $p < 0.001$) and no wildlife at all ($Z = -4.534$, $p < 0.001$) (Figure 6; Figure S2). People who had previously

397 witnessed bin-raiding by foxes were more likely to use DIY control measures than people who
398 had not (Z = -3.621, p < 0.001). People with more negative attitudes were more likely to use
399 DIY control measures compared to people with more positive attitudes (Z = -3.639, p < 0.001).
400 Finally, none of the pair-wise comparisons between different geographic regions of the UK
401 were significant (Table S2).
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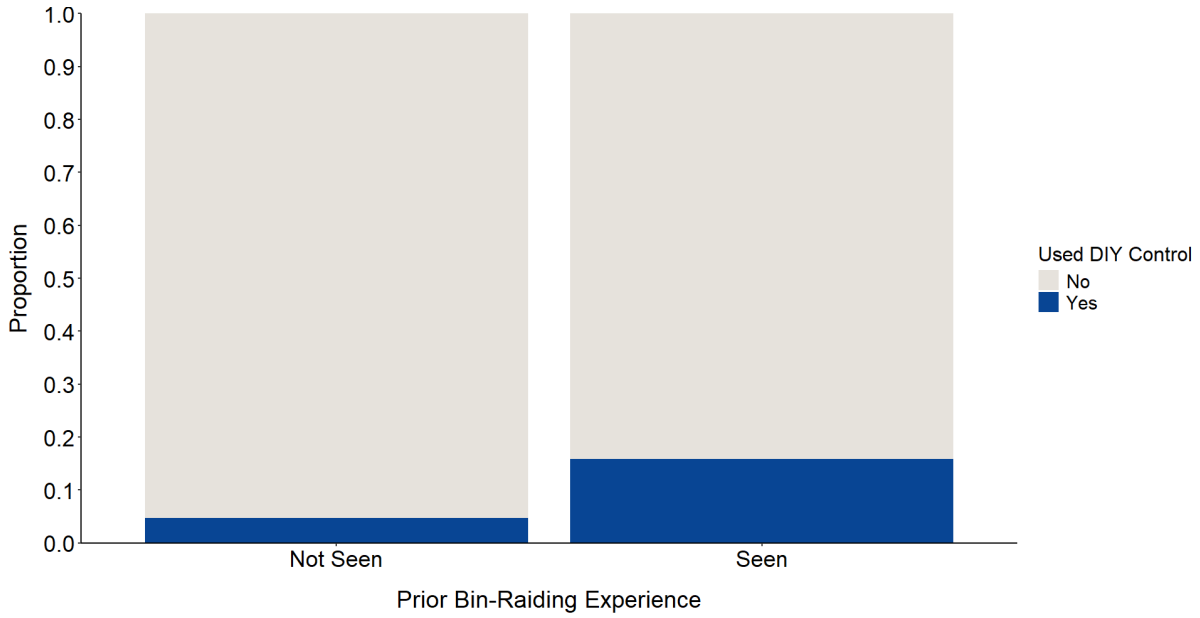

403
404 **Figure 6.** The proportion of people who have (N = 277 participants) and have not (N = 998
405 participants) seen a fox raiding a bin who reported using DIY control measures for foxes within
406 their area.
407

408 **Discussion**

409 This study examined how spatial factors, specifically urbanisation and geographic
410 region, and public wildlife feeding influence reported bin-raiding, public attitudes, and the use
411 of control measures towards wild red foxes. Bin-raiding by foxes was associated with
412 increased levels of public wildlife feeding, more negative attitudes towards foxes, and greater
413 use of professional and DIY fox control measures. However, the role of urbanisation and
414 geographic differences varied among these relationships, highlighting the complex interplay
415 between spatial context, animal ecology, and human behaviour.

Previous studies have found links between feeding wildlife and people's tolerance of those species (Baker et al., 2020; Puri et al., 2024). Consistent with these other studies, the current study found that people who fed wildlife were also more likely to have positive attitudes towards foxes. Feeding wildlife, including foxes, may encourage people to have a closer connection to nature (Cox & Gaston, 2018; White et al., 2023). We encourage future research to test this possibility, ideally using experimentally controlled field tests.

Although people who fed wildlife were more tolerant of foxes, the current study also found that such practices were related to a greater likelihood of experiencing bin-raiding behaviour and using fox control measures. These findings may reflect a complex relationship between feeding behaviour and attitudes. While people who feed foxes often have more positive views of them, feeding may also lead to increase contact and conflict (Cahill et al., 2012; Cox & Gaston, 2018; Kumar et al., 2019; Schell et al., 2021), prompting some to use control measures. It is also possible that feeding serves different functions for different individuals – from expressing affection for wildlife to baiting them for pest control (Cox & Gaston, 2016; Taggart et al., 2023). Thus, people who feed foxes are not a homogenous group and may, instead, represent a myriad of motivations for interacting with foxes. Further research is needed to test these and other possibilities.

Bin-raiding foxes were reported more frequently in urban areas compared to suburban and rural areas, particularly the UK's largest city, London. Such findings may reflect the higher likelihood of encounters and ease of observation of foxes in densely populated urban areas (Scott et al., 2014; Morton et al., 2023). Alternatively, such findings may reflect the fact that urban foxes are typically bolder and therefore more willing to physically explore human-made objects containing food compared to rural populations (Morton et al., 2023). Indeed, increased boldness and activity among urban foxes are both independently related to urbanisation (Morton et al., 2023), further highlighting the nuanced relationship between animal ecology and human-wildlife interactions across urban-rural gradients.

Studies show that people with more positive attitudes and experiences with a species are generally more willing to co-exist with them (Hosaka et al., 2017; Mohamad Muslim et al.,

2018; Baker et al., 2020; Puri et al., 2024; Sweet et al., 2024). Consistent with this notion, the current study found that fox control measures were more common among people with more negative attitudes towards foxes and among those who had observed bin-raiding in their area. These findings also provide support to the notion that negative experiences with wildlife can impact public tolerance (Naughton-Treves et al., 2003; Conejero et al., 2019; Baker et al., 2020; Hobson et al., 2024; Puri et al., 2024). As discussed, experimentally controlled tests are needed to established causality among the associations identified in this study.

Spatial factors contributed to people's likelihood of using professional and DIY fox control measures. Specifically, people living in suburban areas were less likely to use professional services than those in urban environments, aligning with higher reported rates of bin-raiding in urban locations. Human-nature connectedness tends to be weaker among urban residents compared to other people (Richardson et al., 2022; Kageyama et al., 2024; Barragan-Jason et al., 2025), which may lead urban residents to perceive negative interactions, such as foxes bin-raiding, as a more pressing issue in need of control or professional advice. Moreover, people in urban areas have also been found to believe that foxes cause more problems in general (Baker et al., 2020), which could further explain the increased use of professional services. However, in contrast, urbanisation did not significantly predict use of DIY control suggesting that this form of response may be influenced by different contextual or individual factors.

Geographic region did not have a significant effect on people's likelihood of contacting professional services to resolve a fox-related issue within their area, indicating that regional variation play a lesser role than urbanisation in shaping this particular behaviour. This aligns with Baker et al. (2020), who found no association between geographic region and past use of control measures (both professional and DIY) for several problem species. However, in the current study, geographical region was a significant overall predictor of DIY control, though no individual pairwise comparisons reached significance. These results may reflect the lower statistical power of multiple comparisons but could also indicate broad geographic differences that are not fully captured by administrative boundaries. Collectively, these findings suggest

that spatial context does influence the use of control measures, but the strength and nature of these effects may vary depending on the type of action taken. Future research would benefit from exploring alternative spatial configurations, such as ecological or cultural boundaries, which may capture these dynamics better.

Although spatial factors predicted bin-raiding behaviour and people's use of different fox control measures, they did not predict public attitudes, suggesting that public attitudes may be influenced by other factors unrelated to urbanisation and regional variation. One possibility is that public attitudes may be shaped by broader societal narratives about foxes, or social norms shared among UK residents about wildlife more generally (Dickman, 2010). However, the fact that attitudes were still linked to participants' observations of bin-raiding and the use of fox control measures implies that personal experiences could still reinforce or modify these broader perceptions. Further research is needed to better understand how personal experiences and popular culture biases might interact to shape public attitudes towards foxes, which has been found in a number of other species (Bombieri et al., 2018; Sabatier & Huveneers, 2018; Nanni et al., 2020).

Implications for urban rewilding

This study highlights several key findings about how people perceive and respond to urban wildlife, which may be important to consider when designing effective, community-based rewilding initiatives. In particular, public tolerance of foxes appears to vary not only with direct experiences but also with spatial patterns in people's interactions with them, especially whether those interactions are perceived as negative or positive. While feeding wildlife tends to correlate with more positive attitudes towards foxes, it can also coincide with nuisance behaviours from them (e.g., bin-raiding), and may in turn diminish tolerance and encourage the use of control measures. While, again, these relationships are correlational and not necessarily causal, they underscore the potential value of encouraging low-impact, positive engagements with urban wildlife, such as mindful feeding. They also highlight the importance of reducing opportunities for conflict, such as securing outdoor waste bins to avoid bin-raiding

behaviour. Such strategies should be tailored to local conditions, recognising that public behaviour and types of human-wildlife interactions may vary across spatial contexts. However, since public attitudes were not explained by spatial factors, it is also important to consider the role of other factors, such as broader socio-cultural biases, in shaping how people might perceive and relate to urban wildlife.

Conclusion

Public tolerance of species is crucial for urban rewilding to be successful. The findings of this study illustrate that while spatial factors related to urbanisation and geographic region may shape how people interact with wildlife, they do not fully account for how people feel about them. Attitudes toward foxes appear to be shaped by other factors, highlighting the need for rewilding strategies to account for locally-informed, context-specific experiences, as well as broader (potentially socio-cultural) influences. Addressing these factors together to manage human-wildlife interactions and public tolerance of species could help to ensure the long-term success of urban rewilding initiatives.

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