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# Landscape of Fear: How Cats and Dogs Suppress Rodent Pests in Selected Households in Ilorin, Nigeria

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## ABSTRACT

Rodents are major household pests that threaten food security, human health, and infrastructure in many urban and peri-urban communities. Reliance on chemical rodenticides is problematic due to environmental contamination, resistance, and risks to non-target species, underscoring the need for sustainable alternatives. This study applied the landscape of fear (LOF) framework to test whether domestic predators: cats (*Felis catus*) and dogs (*Canis lupus familiaris*), reduce rodent pests in households within Ilorin, Kwara State, Nigeria. Between March and June 2025, 110 households were surveyed and assigned to four predator categories: no predator (n = 24), dog present (n = 35), cat present (n = 49), and both cats and dogs present (n = 2). Sherman live traps were set for three consecutive nights per household, yielding 39 small mammals: *Mus* spp. (79.5%), *Crocidura* spp. (15.4%), and *Rattus* spp. (5.1%). There was a significant association between predator type (excluding the rare category with both predators) and capture outcome (≥1 vs. 0), [df =2, $\chi^2 = 62.43$, $p < 0.001$], with a large effect size (Cramér's V = 0.76). Capture rate was highest in predator-free households (96%) and lowest in cat households (2%), while dog households showed intermediate rates (43%). Species distributions were dominated by *Mus* spp., with *Crocidura* spp. restricted to predator-free households and *Rattus* spp. rare across all sites. These findings demonstrate that domestic predators, particularly cats, generate strong landscapes of fear that suppress rodent activity.

**Keywords:** Rodent pests, cats, dogs, landscape of fear, predator–prey interactions, pest management.

## Introduction

Rodent pests are among the most widespread and destructive vertebrate pests globally, inflicting significant economic, ecological and public health burdens. They are notorious for damaging stored food, crops, and household infrastructure, as well as transmitting zoonotic diseases such as leptospirosis, plague, and Lassa fever (Battersby, 2015; Monadjem *et al*., 2015). In urban and peri-urban areas, commensal rodents thrive in close association with humans, taking advantage of food availability and shelter (Lund, 2015). Their ability to adapt to human-modified environments has made them particularly persistent pests, with infestations commonly observed in households, food storage facilities, and markets (Lund, 2015).

Traditionally, rodent pest management strategies have relied on the use of chemical rodenticides, which provide short-term reductions in rodent numbers and are accompanied by numerous drawbacks. These include risks of poisoning non-target species, contamination of the environment, and the emergence of resistance among rodent populations (Buckle and Smith, 2015). In addition, rodenticides pose hazards to human health, especially in residential areas where children and pets may be inadvertently exposed. As such, there is a need for alternative, eco-friendly approaches to rodent pest control that integrate ecological processes and natural predator–prey dynamics (Soleng *et al.*, 2022; Stuart *et al.*, 2025).

One promising framework for understanding predator influence on rodent pests is the "landscape of fear" (LOF). The LOF concept, originally articulated by Laundré *et al.,* (2001), suggests that prey animals adjust their spatial and temporal behaviors in response to perceived predation risk. This framework has been applied across a range of taxa, showing that predators affect not only prey mortality through direct predation but also prey activity, habitat use, and foraging decisions through fear-mediated responses (Davies *et al.*, 2016; Gaynor *et al.*, 2019). For small mammals such as rodents, predator presence may suppress activity through cues including odors, sounds, and visual signals (Apfelbach *et al.*, 2005; Bedoya-Pérez *et al.*, 2019). Importantly, these non-lethal effects of predators can contribute significantly to pest management by discouraging rodents from inhabiting or foraging in risky areas (Apfelbach *et al.*, 2005; Bedoya-Pérez *et al.*, 2019).

Among domestic predators, cats (*Felis catus*) are well known as effective hunters of small mammals and have exerted strong evolutionary pressures on rodent behavior and physiology (MacDonald, 2006; Mori *et al.*, 2019). Studies have shown that rodents exposed to cat odors display heightened neural and behavioral responses, avoiding areas marked by cat scent (Dielenberg *et al.*, 2001). Dogs (*Canis lupus familiaris*), although less specialized as rodent hunters, may also influence rodent activity indirectly through movement, vocalization, and scent cues (Lenth *et al,*, 2006). While evidence of dogs' impact on rodents is mixed, their presence can still contribute to a perceived risky environment that reduces rodent activity (Lenth *et al.*, 2006). Notably, the combined presence of cats and dogs may amplify these effects, creating a synergistic effect that strengthens the LOF (Mahlaba *et al.*, 2017).

In many African households, particularly in Nigeria, domestic cats and dogs are common companions and are often believed to deter rodent infestations. However, empirical data to support this belief remain limited. Understanding whether and how these predators reduce rodent activity is crucial for developing sustainable, community-level pest control strategies that rely less on chemical inputs.

This study therefore investigated the role of domestic cats and dogs in influencing rodent pest activity in Ilorin, Kwara State, Nigeria. It specifically aimed to (i) test whether predator presence reduces rodent captures compared to predator-free houses, (ii) identify which predator type (cats, dogs, or both) exerts the strongest deterrent effect, and (iii) determine whether these effects are consistent across household environments. By situating these findings within the LOF framework, this study contributes to ecological literature on predator–prey interactions in human-dominated landscapes and offers practical insights for environmentally friendly rodent management.

## Materials and Methods

### Study Area

The study was conducted between March and June 2025 in 110 randomly selected households across Ilorin, Kwara State, Nigeria. Sampling was concentrated along the Tanke axis (Lat. 8° 29′ 30.5″ N, Long. 4° 32′ 35.2″ E), a densely populated residential neighborhood situated along University Road in Ilorin South Local Government Area. Additional sites included Ganmo (Lat. 8° 25′ 35.0″ N, Long. 4° 34′ 44.8″ E), Olunlade (Lat. 8° 29′ 49.9″ N, Long. 4° 33′ 32.8″ E), and Oko-Olowo (Lat. 8° 27′ 18.4″ N, Long. 4° 30′ 25.9″ E), representing a mix of urban and peri-urban environments. These locations are characterized by heterogeneous housing conditions, including fenced and unfenced compounds and residences bordered by gardens or bushy vegetation, providing suitable ecological variation for assessing predator effects on rodent activity.

### Ethical Consideration

This study did not involve experimentation or manipulation of live animals by the researchers; therefore, formal institutional animal ethics approval was not required. Data were obtained from household trapping activities conducted independently by residents. Participation was voluntary and all household data were collected anonymously.

### Selection of households

Households were approached individually, and only those where occupants granted verbal consent were included. Before entry, the objectives of the study, trapping procedure, and its potential benefits in reducing household rodent populations were clearly explained. Assurances of confidentiality and non-interference with household activities were provided to minimize concerns and ensure voluntary participation.

### Experimental Design

This study employed an observational cross-sectional design based on household-level data. The study was non-experimental and did not involve manipulation of animals or household environments; instead, it examined naturally occurring variation in predator presence and small mammal capture outcomes. The 110 participating households were grouped into four predator treatment categories based on the presence of domestic predators:

1. Cat – at least one cat present (n = 49).
2. Dog – at least one dog present (n = 35).

3. None – no cats or dogs present (n = 24).
4. Both – both cats and dogs present (n = 2).

**Trapping Procedure**

Following the presence or absence of cat and/ or dog, rodent activity was monitored using Sherman live traps of two sizes (7.6 × 8.9 × 22.9 cm and 5.08 × 6.35 × 16.51 cm), chosen for their effectiveness in capturing small mammals. Traps were baited daily with freshly prepared peanut butter–maize flour mixture to maximize attractiveness (McCleery *et al.*, 2021). Within each household, traps were set in areas with visible signs of rodent activity (e.g., faecal droppings, holes), including kitchens, storerooms, gardens, fence lines, or wall bases. Trapping was conducted for three consecutive nights per household, with traps inspected each morning. Captured small mammals were identified to genus level using standard morphological features (Monadjem *et al.*, 2015).

**Determination of capture rate**

Capture rate was based on trapping results from participating households. Rather than quantifying the number of individuals captured per unit effort, the analysis focused on capture occurrence at the household level. Each household was therefore classified as having recorded at least one capture (≥1) or no captures (0) during the study period. This binary metric was chosen to allow consistent comparison across households with varying trapping effort. The percentage capture rate was computed using the formula:
Percentage capture rate (%) = (Number of small mammals captured / Number of houses surveyed) × 100.

**Data Summary and Analysis**

Capture data were aggregated by predator category (cat, dog, both, none). For each treatment, total captures and capture rates (captures per household) were calculated. For the inferential statistical analysis, a Chi-square test of independence was used to examine the association between predator type and capture outcome (≥1 capture vs. 0 captures). Because only two households reported having both cats and dogs, this category was excluded from the analysis to avoid low expected frequencies (< 5) that would violate the assumptions of the test. The final analysis therefore compared three predator categories (cat, dog, none). Effect size was reported using Cramér's V to assess the strength of association.

For species-level comparisons (*Mus* spp., *Crocidura* spp., and *Rattus* spp.), a Chi-square test of independence was considered. The chi-square test was performed using IBM SPSS Statistics (version 21) software, and a p-value of <0.05 was considered statistically significant. However, inspection of the contingency table revealed that several expected frequencies were very low (some < 1 and most < 5), violating the assumptions of the test. To avoid unreliable inference, we did not perform a Chi-square analysis for species composition. Instead, raw frequency distributions were presented descriptively to illustrate patterns.

**Results**

**Predator Presence and Rodent Captures**

A total of 39 small mammals were captured across the 110 households surveyed. Captures varied markedly depending on predator presence (Table 1). Rodent captures were most frequent in predator-free houses, where 23 individuals were trapped in 24 houses (95.8% capture rate). Houses with dogs only showed intermediate activity, with 15 captures across 35 houses (42.9% capture rate). By contrast, houses with cats recorded just 1 capture out of 49 houses (2.0% capture rate), while no rodents were captured in

the two houses where both cats and dogs co-occurred.

The statistical analysis revealed a significant association between predator type and capture outcome, ($\chi^2 = 62.43$, $df = 2$, $N = 108$), $p < 0.001$, with a large effect size (Cramér's $V = 0.76$).

**Table 1. Captures and number of houses by predator presence**

| Predator | No. of Small mammal Captured | No. of Houses/households | Capture Rate (%) |
|---|---|---|---|
| Cat | 1 | 49 | 2.0 |
| Dog | 15 | 35 | 42.9 |
| Both | 0 | 2 | 0.0 |
| None | 23 | 24 | 95.8 |
| Total | 39 | 110 | 35.5 |

**Species Composition of Captures**

Three small mammal taxa were identified from the captures: *Mus spp.*, *Crocidura spp.*, and *Rattus spp.* (Table 2). Of the 39 captures, *Mus* spp. dominated the assemblage with 31 individuals (79.5%), followed by *Crocidura* spp. (15.4%) and *Rattus* spp. (5.1%). *Crocidura* spp. were found exclusively in predator-free houses, suggesting high sensitivity to predator presence. *Mus* spp. were captured mainly in dog-only and predator-free houses, but were almost absent where cats were present. *Rattus* spp. were rare overall, with only two individuals captured, one in a dog-only house and one in a predator-free house.

**Table 2. Species distribution of small mammals captured by predator presence**

| Species | Cat | Dog | Both | None | Total | Relative Frequency (%) |
|---|---|---|---|---|---|---|
| *Crocidura* spp. | 0 | 0 | 0 | 6 | 6 | 15.4 |
| *Mus* spp. | 1 | 14 | 0 | 16 | 31 | 79.5 |
| *Rattus* spp. | 0 | 1 | 0 | 1 | 2 | 5.1 |
| Total | 1 | 15 | 0 | 23 | 39 | 100 |

**Discussion**

This study provides compelling evidence that domestic predators, cats and dogs, substantially influenced rodent activity in households within Ilorin, Kwara State. The high number of captures in predator-free houses compared to the near absence of captures in predator-present households underscores the strong behavioral responses of rodents to predation risk. These findings are well explained by the Landscape of Fear (LOF) framework, which argues that predators shape prey

behavior not only through direct predation but also through the perception of risk mediated by olfactory, visual, and auditory cues (Laundré *et al.*, 2001; Suraci *et al.*, 2016; Bleicher, 2017). In this case, rodents were significantly less likely to be trapped in environments marked by the presence of cats or dogs, suggesting that fear-mediated deterrence plays a key role in reducing rodent activity around human dwellings (Suraci *et al.*, 2016).

The effects of predators, however, were not uniform across categories. Cats exerted the strongest influence, nearly eliminating captures. This result aligns with previous studies demonstrating that rodents show heightened avoidance of felid-related cues. For example, cat odors have been shown to activate specific neural pathways in rodents, triggering defensive behaviors such as freezing or avoidance (Dielenberg and McGregor, 2001; Nguyen *et al.*, 2023). Beyond active hunting, the constant presence of cats in and around households likely creates a pervasive chemical and visual landscape of fear that suppresses rodent foraging and movement (Nguyen *et al.*, 2023).

Dogs, in contrast, showed a more moderate effect. Although houses with dogs recorded fewer captures than predator-free homes, the deterrent effect was not as strong as that of cats. This is not surprising, as dogs are not specialized hunters of small mammals (Morin *et al.*, 2018). Their impact may derive from indirect cues—such as scent marking, movement, and barking—rather than from predation pressure (Bytheway and Carthey, 2013); such cues can create disturbance that discourages rodent presence. Prior work has also noted that rodents respond variably to dogs or their cues, sometimes showing no avoidance (Mahlaba *et al.*, 2017) or strong avoidance through decreased foraging (Carthey and Banks, 2015).

The absence of captures in households where both cats and dogs co-occurred suggests a potential synergistic deterrent effect. In such environments, rodents may be exposed simultaneously to multiple predator cues such as olfactory signals from cat scent, auditory disturbances from dog barking, and visual stimuli from predator movements. The combination of these sensory threats likely creates a highly unpredictable and risky environment, amplifying the perception of danger and discouraging rodent activity. Comparable findings were reported by Mahlaba *et al.,* (2017), who observed that rodent suppression was greatest in areas where both predator types were present, supporting the idea that predator diversity intensifies landscapes of fear. Nevertheless, because only two households in the present study contained both cats and dogs, this outcome should be interpreted cautiously. While the pattern is consistent with theoretical expectations of additive or synergistic predator effects, the limited sample restricts the strength of inference and highlights the need for further studies with larger representation of dual-predator households.

Species-level patterns in captures may reflect underlying population abundances in households rather than strong differential responses to predator presence. *Mus* spp. dominated captures across all predator categories. The lower number of captures recorded in cat households is therefore likely to reflect reduced encounter rates in the presence of cats, rather than evidence that *Mus* spp. are uniquely more sensitive to felid cues than other taxa (Apfelbach *et al.*, 2005). *Crocidura* spp. were detected only in predator-free households, but this may also reflect their naturally lower densities in the study area, which reduced the likelihood of detection in predator-present environments. Similarly, *Rattus* spp. were rare overall, with only two individuals captured, suggesting that their low representation is

more likely tied to population scarcity in the sampled communities than to active predator avoidance. Taken together, these capture patterns underscore that observed differences among species may be shaped primarily by relative population abundance within households, with predator presence acting as one of several interacting factors influencing community composition (Apfelbach *et al.*, 2005).

These findings carry important practical implications. Rodent infestations remain a chronic challenge in many Nigerian households, with serious consequences for food security, public health, and the integrity of household structures. Traditional reliance on rodenticides has become increasingly problematic, given the risks of environmental contamination, the development of resistance in rodent populations, and the threat posed to non-target species, including humans and domestic animals (Buckle and Smith, 2015). In contrast, domestic predators offer a natural, sustainable, and culturally familiar form of biological control. The present study shows that households with cats, and to some extent those with dogs, experience markedly lower rodent activity, underscoring the value of predator presence as an effective and ecologically sound management strategy.

## Conclusion

This study provides some evidence that domestic predators contribute significantly to the suppression of rodent activity in Ilorin households. Cats were identified as the most effective deterrent, dogs offered moderate suppression, and the co-occurrence of both predators resulted in a complete absence of captures, pointing to potential synergistic effects. These outcomes reinforce the relevance of the landscape of fear framework in human-dominated environments, demonstrating that predator presence can alter rodent behavior and distribution. Beyond theory, the findings highlight a practical, environmentally friendly, and culturally appropriate strategy for rodent management that reduces dependence on chemical rodenticides.

## Limitations of the study

This study was constrained by differences in housing conditions, the small sample size for some predator categories, particularly households with both cats and dogs, and the limited trapping duration of three nights per household. Future work should incorporate larger and more balanced samples, extend trapping across multiple seasons, and standardize assessments of housing environments. Such improvements will provide a stronger basis for understanding predator–prey dynamics in human settlements and for advancing sustainable, predator-based approaches to rodent pest management.

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## Conflict of Interest
The authors declare no conflict of interest.

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## Author contributions
OJA and AAO conceived and designed the study, performed the statistical analysis, drafted the manuscript and revised the manuscript. ODB, YCM, PAF, FOF, ESK and IBA contributed to field data

collection and provided input during manuscript preparation. All authors read and approved the final manuscript.

**References**


Apfelbach, R., Blanchard, C. D., Blanchard, R. J., Hayes, R. A., and McGregor, I. S. (2005). The effects of predator odors in mammalian prey species: A review of field and laboratory studies. *Neuroscience and Biobehavioral Reviews, 29*(8), 1123–1144. https://doi.org/10.1016/j.neubiorev.2005.05.005

Battersby, S. A. (2015). Rodents as carriers of disease. In A. P. Buckle and R. H. Smith (Eds.), *Rodent pests and their control* (2nd ed., pp. 81–100). Wallingford, UK: CABI.

Bedoya-Pérez, M. A., Smith, K. L., Kevin, R. C., Luo, J. L., Crowther, M. S., and McGregor, I. S. (2019). Parameters that affect fear responses in rodents and how to use them for management. *Frontiers in Ecology and Evolution, 7,* 136. https://doi.org/10.3389/fevo.2019.00136

Bleicher, S. S. (2017). The landscape of fear conceptual framework: Definition and review of current applications and misuses. *PeerJ, 5,* e3772. https://doi.org/10.7717/peerj.3772

Buckle, A. P., and Eason, C. T. (2015). Control methods: Chemical. In A. P. Buckle and R. H. Smith (Eds.), *Rodent pests and their control* (2nd ed., pp. 123–154). Wallingford, UK: CABI.

Bytheway, J. P., Carthey, A. J. R., and Banks, P. B. (2013). Risk vs. reward: How predators and prey respond to aging olfactory cues. *Behavioral Ecology and Sociobiology, 67,* 715–725. https://doi.org/10.1007/s00265-013-1494-9

Carthey, A. J. R., and Banks, P. B. (2015). Naiveté is not forever: Responses of a vulnerable native rodent to its long-term alien predators. *Oikos, 124*(5), 001–009. https://doi.org/10.1111/oik.02723

Davies, A. B., Tambling, C. J., Kerley, G. I., and Asner, G. P. (2016). Limited spatial response to direct predation risk by African herbivores following predator reintroduction. *Ecology and Evolution, 6*(16), 5728–5748. https://doi.org/10.1002/ece3.2312

Dielenberg, R. A., Hunt, G. E., and McGregor, I. S. (2001). "When a rat smells a cat": The distribution of Fos immunoreactivity in rat brain following exposure to a predatory odor. *Neuroscience, 104*(4), 1085–1097. https://doi.org/10.1016/S0306-4522(01)00150-6

Gaynor, K. M., Brown, J. S., Middleton, A. D., Power, M. E., and Brashares, J. S. (2019). Landscapes of fear: Spatial patterns of risk perception and response. *Trends in Ecology and Evolution, 34*(4), 355–368. https://doi.org/10.1016/j.tree.2019.01.004

Laundré, J. W., Hernández, L., and Altendorf, K. B. (2001). Wolves, elk, and bison: Reestablishing the "landscape of fear" in Yellowstone National Park, U.S.A. *Canadian Journal of Zoology, 79*(8), 1401–1409. https://doi.org/10.1139/z01-094

Lenth, B., Brennan, M., and Knight, R. L. (2006). *The effects of dogs on*

*wildlife communities*. Final research report submitted to Boulder County Parks and Open Space. https://pitkincounty.com/DocumentCenter/View/1156/Dog-Impact-to-Wildlife-Study-PDF?bidId=

Loss, S. R., Will, T., and Marra, P. P. (2013). The impact of free-ranging domestic cats on wildlife of the United States. *Nature Communications, 4,* 1396. https://doi.org/10.1038/ncomms2380

Lund, M. (2015). Commensal rodents. In A. P. Buckle and R. H. Smith (Eds.), *Rodent pests and their control* (2nd ed., pp. 19–32). Wallingford, UK: CABI.

MacDonald, D. W. (Ed.). (2006). *The encyclopedia of mammals* (New ed.). Oxford: Oxford University Press.

McCleery, R., Monadjem, A., Conner, L. M., Austin, J. D., and Taylor, P. J. (2021). *Methods for ecological research on terrestrial small mammals*. Baltimore, MD: Johns Hopkins University Press.

Monadjem, A., Taylor, P. J., Denys, C., and Cotterill, F. P. D. (2015). *Rodents of Sub-Saharan Africa: A biogeographic and taxonomic synthesis*. Hamburg, Germany: PI Books GmbH.

Morin, D. J., Lesmeister, D. B., Nielsen, C. K., and Schauber, E. M. (2018). The truth about cats and dogs: Landscape composition and human occupation mediate the distribution and potential impact of non-native carnivores. *Global Ecology and Conservation, 15,* e00413. https://doi.org/10.1016/j.gecco.2018.e00413

Mori, E., Menchetti, M., Camporesi, A., Cavigioli, L., Tabarelli de Fatis, K., and Girardello, M. (2019). License to kill? Domestic cats affect a wide range of native fauna in a highly biodiverse Mediterranean country. *Frontiers in Ecology and Evolution, 7,* 477. https://doi.org/10.3389/fevo.2019.00477

Nguyen, Q. A. T., Rocha, A., Yamashita, Y., Chhor, R., Stadler, C., Pontrello, C., and Haga-Yamanaka, S. (2023). Hypothalamic representation of the imminence of predator threat detected by the vomeronasal organ in mice. *eLife, 12,* RP92982. https://doi.org/10.7554/eLife.92982.2

Smith, R. H., and Meyer, A. P. (2015). Rodent control methods: Non-chemical and non-lethal chemical, with special reference to food stores. In A. P. Buckle and R. H. Smith (Eds.), *Rodent pests and their control* (2nd ed., pp. 101–122). Wallingford, UK: CABI.

Soleng, A., Edgar, K. S., von Krogh, A., and Seljetun, K. O. (2022). Suspected rodenticide exposures in humans and domestic animals: Data from inquiries to the Norwegian Poison Information Centre, 2005–2020. *PLoS ONE, 17*(12), e0278642. https://doi.org/10.1371/journal.pone.0278642

Stuart, A. M., Jacob, J., Awoniyi, A. M., Costa, F., Bosma, L., Meheretu, Y., Htwe, N. M., Williamson, S., Eddleston, M., Dalecky, A., and Willis, S. (2025). Alternative domestic rodent pest management approaches to address the hazardous use of metal phosphides in low- and middle-income countries. *Journal of Pest Science,*

*98*(1), 89–111. https://doi.org/10.1007/s10340-024-01825-7

Suraci, J. P., Clinchy, M., Dill, L. M., Roberts, D., and Zanette, L. Y. (2016). Fear of large carnivores causes a trophic cascade. *Nature Communications, 7,* 10698. https://doi.org/10.1038/ncomms10698