Original Research

# Domestic cat – the unspoken threat to wildlife in the sub-urban location of Maribor

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**Abstract**

The monitoring of domestic cats' prey brought home was conducted between the 13th of March and the 1st of May 2023 in two residential areas near Maribor, Slovenia. This study aimed to provide information about the amount, diversity, and frequency of prey that the cats captured to identify the predatory impact of domestic cats in peri-urban areas. We present the results of the prey return, whether the prey was brought alive or not, and whether it was eaten or not. We further provide information about the predation frequency of domestic cats concerning circadian activity according to weather conditions and air temperature. The frequencies of various taxonomic groups of prey captured were described in relation to land use in a location and species' biology. Our results include a total of 50 records of 12 species (3 species of birds and 9 of mammals). Domestic cats were more active during the mornings and on days without rain, and the frequency of bringing home prey increased with higher temperatures.

**Keywords**

domestic cats, cat predation, wildlife, indoor-outdoor cat, survey

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## Domača mačka – tiha grožnja prostoživečim vrstam živali v primestni lokaciji Maribora

**Izvleček**

Med 13. marcem in 1. majem 2023 smo v dveh stanovanjskih naseljih v bližini Maribora v Sloveniji izvajali popis plena domačih mačk, prinesenega domov. Namen te študije je bil pridobiti informacije o količini, raznolikosti in pogostosti plena, ki so ga mačke uplenile, ter s tem ovrednotiti plenilski vpliv domačih mačk v primestnih območjih. Predstavljamo rezultate o prinesenem plenu ter ali je bil plen prinesen lastnikom živ ali ne in ali je bil konzumiran ali ne. Nadalje podajamo informacije o plenilskih aktivnostih domačih mačk čez dan, glede na vremenske razmere in temperaturo zraka. Opisane so bile pogostnosti različnih taksonomskih skupin ulovljenega plena glede na rabo tal na lokaciji in biologijo vrste. Naši rezultati kažejo, da je bilo uplenjenih 50 živali, ki so pripadale 12-im vrstam (3 ptice in 9 sesalcev). Domače mačke so bile bolj aktivne zjutraj, v dneh brez dežja, pogostost prinašanja plena pa se je z višjimi temperaturami povečala.

**Ključne besede**

domača mačka, plenilska aktivnost mačk, prostoživeče živali, notranje-zunanja mačka

## Introduction

Domestic cats (*Felis catus* Linnaeus, 1758) are the most widely embraced pets across the globe. In the United States, one-third of households include feline companions, and over 600 million cats share their world with humanity (Driscoll et al., 2009). As they are beloved and widely cherished animal companions, bringing substantial joy to their human caretakers, we tend to overlook their primal nature as carnivorous mesopredators and the threat they pose to wildlife. Even though owned cats are fed, their hunting instinct is not lost, and they often kill wild animals. What is more, because cat owners provide care for domestic cats, their populations are not regulated by natural selection (e.g. diseases, parasites, food, shelter). Even though a domestic cat is a species that has been present in Central Europe since the expansion of the Roman empire (Krajcarz et al., 2022), its population has never in our history been higher (Lepczyk et al., 2010). Domestic cats in our society assume unique and strange roles. On the one hand, we regard them as domesticated pet animals; however, they are mostly capable of surviving in the wild on their own. This is why many owners allow their cats to fully or partially freely live outside of their home. It is often regarded as proper care and an ideal lifestyle for these pets if they have the opportunity to roam outdoors freely. However, as commented by Lepczyk et al. (2010), these norms do not apply to any other domestic animal species, such as dogs, ferrets, livestock, or others.

Owned domestic cats that are granted outdoor access represent an anthropogenic threat to smaller wild animals from different taxa of vertebrates (Blancher, 2013; Loss et al., 2013; Loss & Marra, 2017) and invertebrates (Medina & García, 2007; Eisenhauer, 2018; Li et al., 2021). Loss et al. (2013) estimated in their study that 1.3–4.0 billion birds and 6.3–22.3 billion mammals are annually lost due to predation by free-roaming domestic cats in the United States alone. Li et al. (2021) estimated that the predation by all free-roaming cats in China is at least 2.69-5.52 billion birds and 3.61-9.80 billion mammals, but also 1.61-3.58 billion fishes, 1.13-3.82 billion amphibians, 1.48-4.31 billion reptiles, and 1.61-4.95 billion invertebrates annually. In areas where free-roaming domestic cats are an introduced species and the local native prey is naïve, the predation rates can have a more devastating impact, even causing extinctions (Medina & García, 2007; Nogales & Medina, 2009). Unrestrained cats living on islands have played a role in causing or contributing to 33 (14%) of the recent extinctions of birds, mammals, and reptiles documented on the International Union for Conservation of Nature (IUCN) Red List (Medina et al., 2011). Besides predation, free-roaming domestic cats impact biodiversity by causing disturbances and indirect fear effects (Loss & Marra, 2017), representing a competing species for wild mesopredators, acting as a vector for diseases and parasites (Loss & Marra, 2017), and hybridization with wildcats Felis silvestris (Todesco et al., 2016).

While meaningful controls are being pursued for feral and stray cat populations in various countries, hardly any strategies were designed for free-roaming domestic cats (Trouwborst et al., 2020). As a response, we can observe the rise of animal welfare organizations and conservation scientists in recent years, raising appeals to owners and governments to implement changes to prevent the biodiversity impacts of free-roaming domestic cats. The most desired policy seems to be restricting the outdoor access of owned cats (Trouwborst et al., 2020). In countries where domestic cats are listed as an invasive alien species (IAS), many national and international laws on IAS apply to owned domestic cats. In the European Union, some international legal obligations indirectly address the threats of free-roaming domestic cats to wildlife (e.g. The EU Birds and Habitats Directive). However, in the Slovenian legislature - Animal protection law (Zakon o zaščiti živali, 1999), there are restrictions on having owned animals in public, only for dogs – use of leashes in public spaces, and owned cats are addressed only within welfare factors (feeding, adequate shelter, health care, freedom of movement, socialization).

Given the considerable success of domestic cats as predators, characterized by significant variations in catch rates across different locations and a discernible reliance on environmental and landscape factors, there is an imperative need for more comprehensive and refined local assessments. This necessity is particularly underscored by the ongoing initiatives for state-level biodiversity protection. It is crucial to avoid formulating legislation based on broad generalizations and instead prioritize the integration of specific, localized data. By conducting meticulous and site-specific evaluations, we can ensure that regulatory measures are grounded in a nuanced understanding of the intricate interactions between domestic cats and local ecosystems, thus fostering more effective and targeted conservation efforts.

As such evaluation has not been conducted in our area, this study sought to offer insights into the quantity, variety, and occurrence frequency of prey captured by cats to discern the predatory influence of domestic cats in peri-urban regions. Because this is a very crowd-splitting theme, we wanted to put forth for owners who allow their cats to roam outside an alternative to keeping them inside for the sake of wildlife conservation. Therefore, our prey return survey also included the need for abiotic factors to be noted, such as the temperature, the time of the day the prey was brought, and what type of weather was on that day. With this, we wanted to find the appropriate time of the day when owners could let their cats roam free with the least negative impact on wildlife. With spatial analysis, we also wanted to identify land uses and connect them to the preferred habitat of prey species. This would enable us to predict what prey is present in each land use, which could be a foundation for establishing outdoor cat-free zones if vulnerable species are present in that area.

## Materials and Methods

The research participants were selected based on location and the knowledge that individual households have cats that were allowed to go out freely. Cat owners were requested to meticulously document the prey items that each of their cats brought home.

The monitoring took place in the spring of 2023 for seven weeks, starting on the 13th of March. This timeframe was chosen because that is when the reproductive period begins for most vertebrates and marks the return of migratory species to the observed area.

The household in location 1 is located outside the housing community on the border between cultivated areas and natural forest – showing more rural habitats (Fig.1a). The household in the 2nd location is on the outer edge of a compacted community bordering on arable land, characterizing this as more urban habitats (Fig.1b). Both locations have surface watercourses nearby. In location 2, where two cats resided in the same household, it was not always feasible to attribute the items brought home to a particular cat. For that reason, we assumed that the frequency of cat predation is similar; therefore, the number of prey brought home was divided between both cats.

We compiled a survey form in such a way that the cat owners could document the days at which the prey was brought home. Prey items were recorded, a photograph was taken, and we identified preyed animals to the highest taxonomic level possible allowed by the condition of the prey remains. We used the Key for determining the vertebrates of Slovenia (Janžekovič et al., 1999) for prey identification. Cat owners recorded information about the

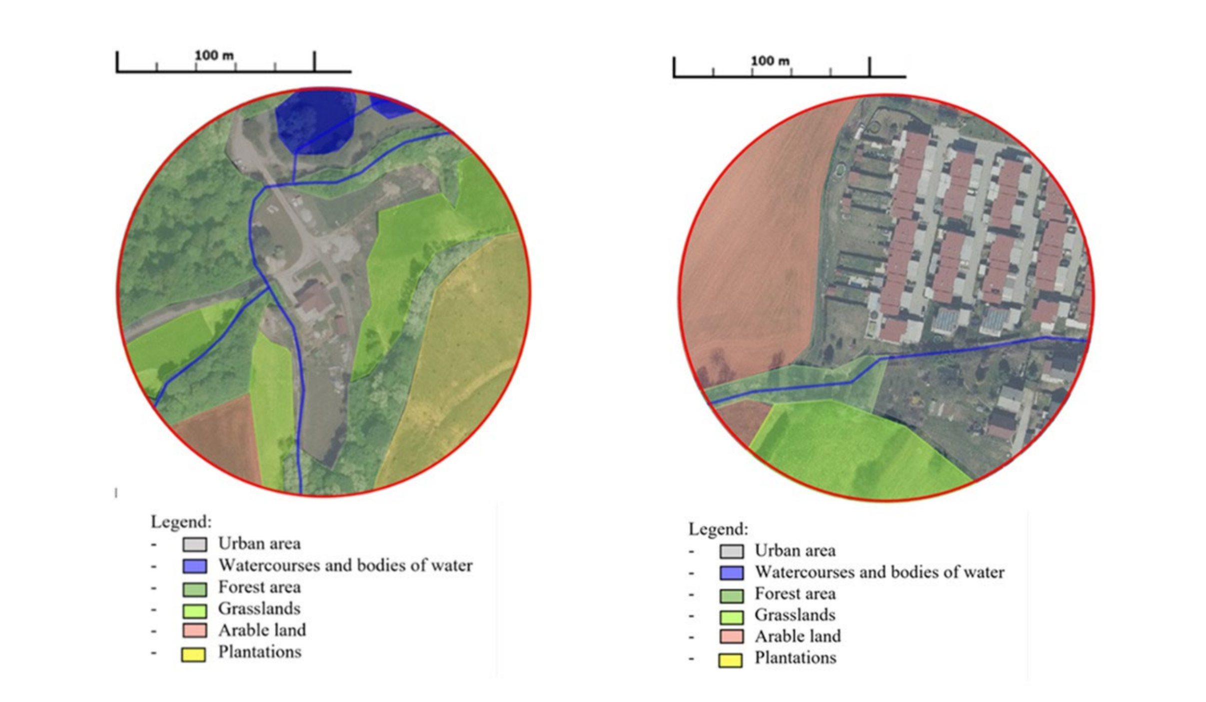


**Figure 1.** a) land use at location 1 – rural area; b) land use at location 2 – urban area.

**Slika 1.** a) Raba tal na lokaciji 1 – ruralno okolje; b) raba tal na lokaciji 2 – urbano okolje.

prey – whether the animals brought by the cats were alive or dead, and for the latter, if there was any consumption (marked as complete or partial or not consumed). Additionally, cat owners recorded the weather conditions according to four categories proposed: 1 - clear weather, 2 - partially cloudy, 3 - cloudy, and 4 – rainy; and the time of the predation according to three categories: 1 - morning, 2 - midday and 3 - evening. For more details on the weather, we obtained average daily air temperature data available freely at the government online archives of the Environmental Agency of the Republic of Slovenia (ARSO, 2023). This would enable us to examine if the probability of the prey being brought back is dependent on the temperature.

We also studied the habitats in which cats move. We summarized the results for area size from Pirie et al., 2022 where their results showed that the outdoor cats have a mean home range of 3.42 ha. We utilized the obtained result to visually depict the spatial distribution of areas of locations 1 and 2 and assessed land use in each location. We classified different land use types: urban areas, watercourses and bodies of water, forest areas, grasslands, arable land, and orchards. From the base map, we were able to calculate percentages for each category and compare them between the locations.

## Statistical analysis

We employed various methods to assess biodiversity and investigate correlations between environmental variables and prey return frequencies. For alpha diversity, we calculated Shannon and Simpson diversity indexes using an online calculator, Omnicalculator (https://www.omnicalculator.com/). This analysis provided insights into the within-sample diversity of our study area. To explore the potential correlation between the average temperature over a 5-day period and prey return frequency, we conducted Pearson's correlation analysis using the software PAST (Version 4.14, 64-bit Windows) (Hammer et al., 2001).

Furthermore, we employed chi-square tests to analyze variations in prey return frequencies across different parts of the day and under different weather conditions. For this analysis, we utilized an online calculator, GraphPad (https://www.graphpad.com/quickcalcs/chisquared1.Chi-square/).

# Results

## Prey diversity

The results of the survey give us information on the frequency and consumption patterns of prey return in two locations, each with different environmental characteristics, with location 1 having more rural habitats and location 2 having more urban habitats. A total of 50 prey items were recorded, with 24 in the household on location 1 and 26 in the household on location 2. Notably, location 2 had two cats, while location 1 had a single cat. Overall, 12 species were identified, 9 in rural and 9 in urban (Table 1).

The species distribution varied between the locations, with notable differences in the preyed-upon species returned to the households (Table 1). In rural locations, the yellow-necked mouse (*Apodemus flavicollis* Malchior, 1834) and the wood mouse (*Apodemus sylvaticus* Linnaeus, 1758) were prominent, representing 67% of prey return in location 1. In contrast, urban locations saw higher numbers of the wood mouse (*Apodemus sylvaticus*) and the common shrew (*Sorex araneus* Linnaeus, 1758), representing 65% of total prey return to that household. The three most preyed-upon species—*A. sylvaticus*, *A. flavicollis*, and *S. araneus*—comprised 66% of the overall prey return.

Species were categorized taxonomically, revealing that three species belong to the order Passeriformes, one belongs to the order Eulipotyphla, and eight belong to the order Rodentia (Fig. 2). Thus, we can see that the most represented order of prey is Rodentia, as it has not only the highest species diversity but also the highest frequencies of brought prey, which amounts to 74%.

We compared the α-diversity of prey return for each location and calculated β-diversity between our two sampling locations (Table 2). Only identified species were included in the calculations (Table ). The Shannon Diversity Index for location 1 (rural) was calculated to be 1.49, indicating a moderate level of species diversity. The Simpson Diversity Index for the same location was found to be 0.26, suggesting a certain degree of dominance by a few species.

Location 2 (urban) exhibited a higher Shannon Diversity Index at 1.75, reflecting a marginally more even distribution of species. The Simpson Diversity Index for location 2 was 0.20, indicative of a relatively low dominance of specific species.

These indices collectively underscore moderate diversity within both locations, with location 2 showcasing a somewhat more even distribution of prey species returned.

The Sørensen-Dice Index is 0.375 and signifies a moderate degree of similarity in species composition between the two samples (Table 2). Approximately 33% of species were found to be shared between the samples, while 25% were unique for rural and 42 for urban samples.

**Table 1.** Frequency of prey return species by location and total number of prey.

**Tabela 1.** Število osebkov prinesenih vrst plena glede na lokacijo in skupno število plena

| Prey species | Rural (1 cat) | Urban (2 cats) | Rural + urban |
|---|---|---|---|
| *Apodemus sylvaticus* | 6 | 9 | 15 |
| *Apodemus flavicollis* | 10 | 0 | 10 |
| *Mus musculus* | 0 | 2 | 2 |
| *Rattus norvegicus* | 0 | 1 | 1 |
| *Arvicola amphibius* | 1 | 1 | 2 |
| *Microtus arvalis* | 1 | 2 | 3 |
| *Microtus agrestis* | 2 | 0 | 2 |
| *Microtus subterraneus* | 1 | 0 | 1 |
| Rodentia sp. | 1 | 0 | 1 |
| *Sorex araneus* | 0 | 8 | 8 |
| Sorex sp. | 1 | 0 | 1 |
| *Parus major* | 1 | 1 | 2 |
| *Poecile palustris* | 0 | 1 | 1 |
| *Phoenicurus ochruros* | 0 | 1 | 1 |
| **Total number of prey** | **24** | **26** | **50** |

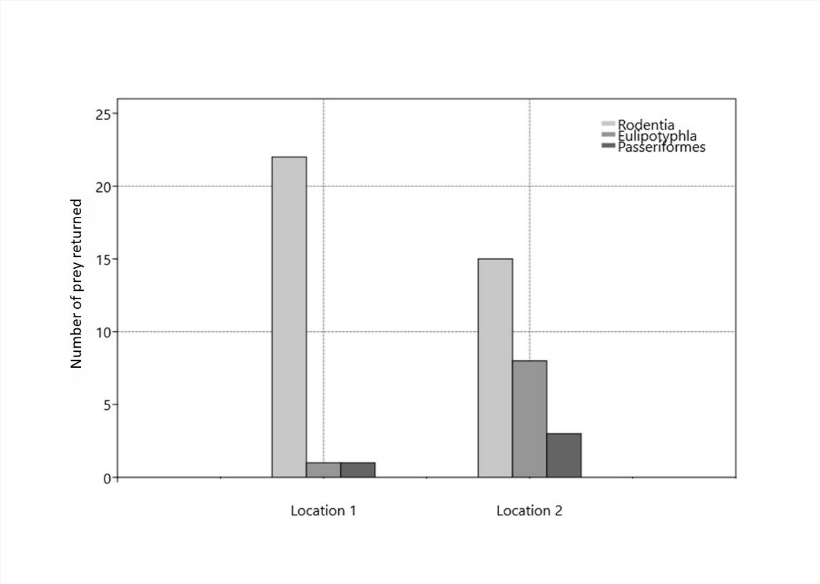


**Figure 2.** Frequencies of prey return according to taxonomic orders and location (location 1 = rural, location 2 = urban).

**Slika 2.** Število osebkov prinesenega plena glede na taksonomski red in lokacijo (lokacija 1 = ruralna, lokacija 2 = urbana).

**Table 1.** Frequency of prey return species by location and total number of prey.

**Tabela 1.** Število osebkov prinesenih vrst plena glede na lokacijo in skupno število plena

| Location | Evenness | Shannon's Index | Simpson's Index | Sørensen-Dice Index |
|---|---|---|---|---|
| 1 | 0.767 | 1.49 | 0.26 | 0.375 |
| 2 | 0.797 | 1.75 | 0.20 | |

## Prey consumption

Owners were asked to note prey consumption, revealing that in rural locations, three prey items brought home were consumed, two were partially consumed, and 19 were not consumed. In urban locations, three were consumed, five were partially consumed, and 18 were not consumed. Therefore, leading to an overall consumption of 12%, partial consumption of 14%, and no consumption of 74%. Notably, in rural locations, all 24 prey items were brought home dead, while in urban locations, four were brought alive.

**Temperature and predation**

The results of the correlation analysis between the average temperature over five days in 10 intervals and the frequency of brought prey (Fig. 3) yielded a statistically significant positive correlation ($r(8) = 0.79$, $p = 0.007$). The p-value associated with the correlation coefficient indicates that the observed correlation is unlikely to have occurred by random chance. This positive correlation suggests a strong positive linear relationship between the average temperature and prey return frequency. In other words, as the temperature increases, there is a tendency for an increased prey return.

**Weather and predation**

Out of 49 surveyed days, 17 had clear weather, seven were partially cloudy, 16 were cloudy, and 9 had rainy conditions. The frequency of brought prey was influenced by distinct weather conditions (Fig. 4). The highest frequency of prey return was observed in clear and cloudy weather, and the lowest was in rainy conditions.

On days without precipitation, the total abundance of prey return was 44, indicating that the cats brought in 44 prey items over 40 days without precipitation. Out of 9 days with precipitation, only six prey items were brought home, thus indicating a reduced frequency of brought prey.

Similarly, when we looked at the abundance of the three most commonly preyed upon species, contributing 67% of data (*Apodemus sylvaticus*, *Apodemus flavicollis*,

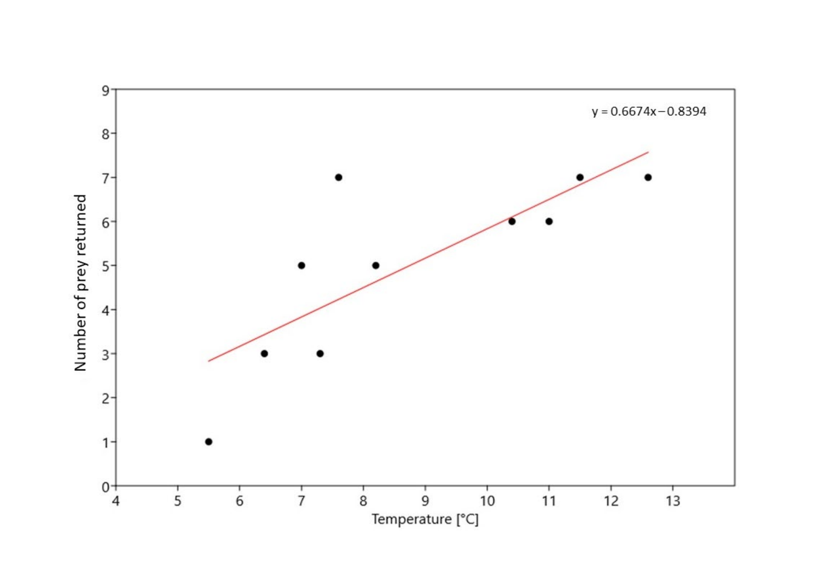


**Figure 3.** Correlation between 5-day average temperature [°C] and prey return frequency (r(8) = 0.79, p = 0.007).

**Slika 3.** Korelacija med 5-dnevnim povprečjem temperature [°C] in pogostost prinesenega plena (r(8) = 0.79, p = 0.007).

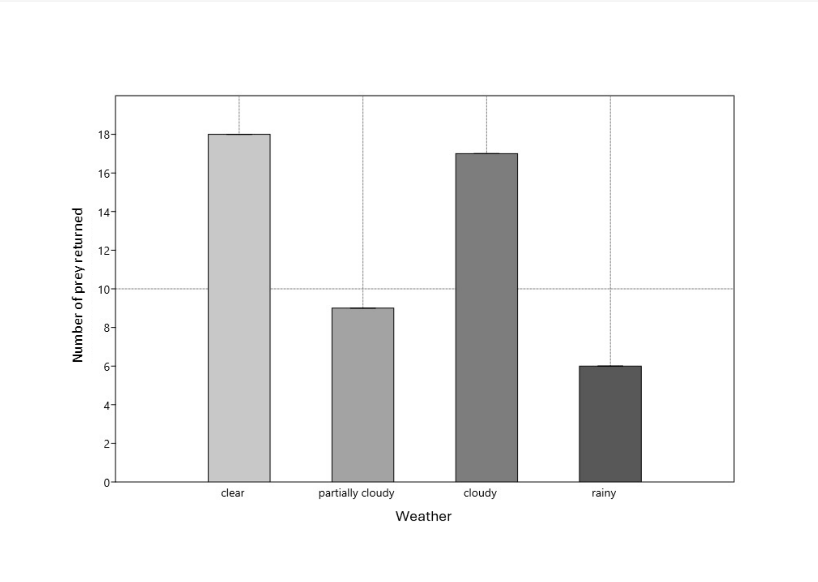


**Figure 4.** The frequency of prey return depends on the type of weather.

**Slika 4.** Število prinesenega plena glede na tip vremena.

and *Sorex araneus*), the result showed a similar pattern as the overall abundance (Fig. 5).

The chi-square test for goodness of fit was conducted to determine whether the proportion of prey return was equal between all four types of weather. Observed frequencies for prey abundance were clear weather 18, partially cloudy 9, cloudy 17, and rainy 6. The chi-square value was calculated $\chi 2$ (3, N = 50) = 8.4, p = 0.038, indicating that the weather type may influence prey return.

**Predation by time of the day**

A distinct pattern in prey frequencies emerged when examining in which part of the day the prey was brought, showing noteworthy variations in prey return numbers (Fig. 6). During the morning hours, a substantial combined total of 29 brought prey items (location 1 and location 2) was observed, reflecting heightened predator activity and successful hunts during this period. However, as the day progressed into midday, the overall total abundance

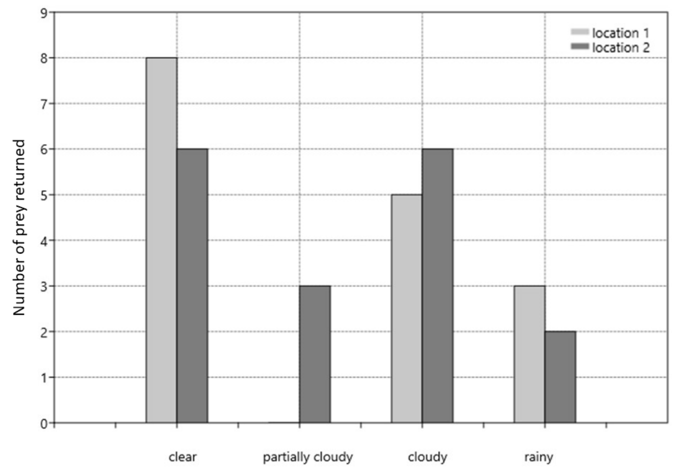


**Figure 5.** Abundance of 3 most frequently brought prey species: *Apodemus sylvaticus*, *Apodemus flavicollis*, and *Sorex araneus* combined depending on weather type in rural location (location 1) and urban location (location 2).

**Slika 5.** Abundanca 3 najpogosteje prinesenih vrst: *Apodemus sylvaticus*, *Apodemus flavicollis* in *Sorex araneus* sešteto glede na vrsto vremena na ruralni (lokacija 1) in urbani lokaciji (lokacija 2).

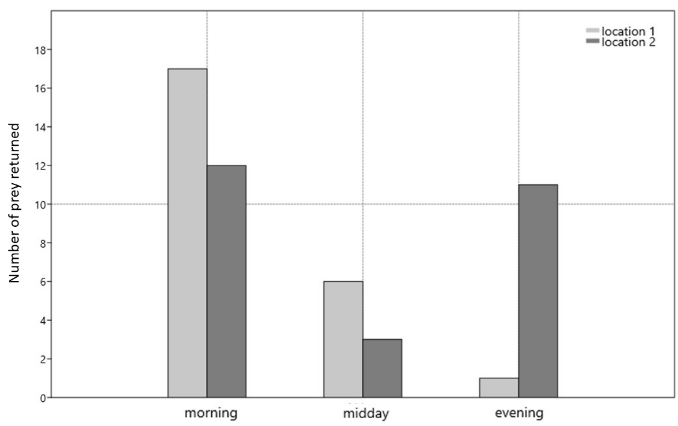


**Figure 6.** The frequency of prey brought depends on the part of the day the prey was caught in a rural location (location1) and urban location (location2).

**Slika 6.** Pogostost prinešenega plena glede na del dneva, ko je bil plen ulovljen na ruralni (lokacija 1) in urbani lokaciji (lokacija 2).

sharply decreased to 9 prey return items, suggesting potential changes in predator behaviour or prey availability during these hours.

The chi-square test for goodness of fit was applied to examine if the distribution of brought prey frequency across three groups of times of the day is equal. Observed frequencies were as follows: 29 in the morning, nine at midday, and 12 in the evening. The chi-square value was computed as $\chi 2$ (2, N = 50) = 16.7, $p < 0.001$, indicating uneven prey return throughout the day.

As we looked at the frequency of brought prey in different parts of the day and included the weather factor, a similar pattern appeared (Fig. 7). Prey brought in the morning was the most abundant throughout all weather types, while prey brought in the midday was the least abundant, recorded only in 3 out of 4 weather types.

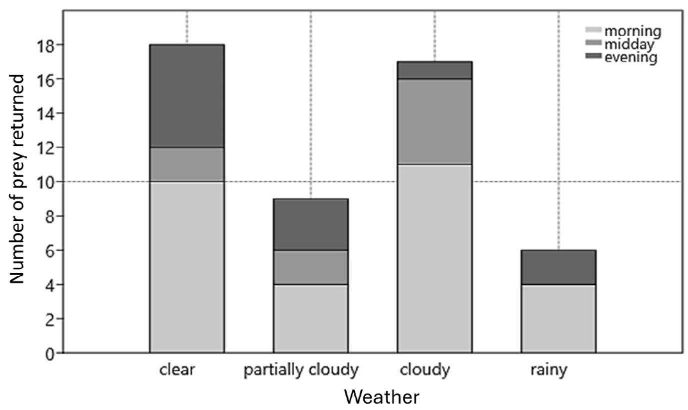


**Figure 7.** The frequency of prey brought depends on the combination of the part of the day and the weather.

**Slika 7.** Število osebkov prinesenega plena glede na kombinacijo dela dneva in vremena.

## Discussion

Although our study included a small sample of studied cats and considering that only a small portion of captured prey is brought to households (Loyd et al., 2013), our results offer a brief insight into domestic cats' predation effect on wildlife in Slovenia. Our investigation into the predatory habits of domestic cats in peri-urban areas has unveiled nuanced patterns that have significant implications for wildlife conservation and pet ownership practices. The detailed examination of prey diversity, climatic influences, and temporal dynamics contributes to a more comprehensive understanding of the complex interplay between domestic cats and local ecosystems.

One of the earliest research projects that surveyed a large sample of prey return by outdoor cats that were owned was done by Churcher and Lawton (1987). In their study, 70 cats were included. Though a one-year period, 1090 items of prey were noted, with an average of about 14 items per cat. They especially noted the impact of cat predation on house sparrow (*Passer domesticus* Linnaeus, 1758) since their results, based on initial counts of house sparrows in the village at the beginning of the breeding season and the documented number of sparrows caught by cats, showed that it was evident that a minimum of 30% of sparrow fatalities in the village could be attributed to cat predation. They find that domestic cats emerge as significant predators in their study area. In later years, further researches were conducted including more factors that could affect cat predation such as if the cats were equipped with collar bells and if they were kept indoors at night (Woods et al., 2003), estimating cats' hunting area and comparing different rates of predation by where the cat's home is located – in inner suburbs or the edge of suburban area (Pirie et al., 2022) and even if the owners characterization of their cats' personalities could correlate to number of returned prey (Cecchetti et al., 2022).

Observing the variations in prey return species composition between rural and urban settings provides a glimpse into the intricate dynamics between domestic cats and their local habitats. In our case, specific species' prevalence in each location reflects the influence of habitat characteristics on feline prey return. For instance, rural areas exhibit a preference for species indigenous to natural or semi-natural landscapes, such as the yellow-necked mouse and wood mouse, while urban environments see the influence of human settlements, evident in the presence of the wood mouse and common shrew. However, we must acknowledge that these species are common and found in various habitats. While yellow-necked mouse prefers forests and closed habitats, wood mouse often uses habitats within their ranges at random, including cropped areas (Tattersall et al., 2001). The common shrew can be found in habitats like grasslands, woodlands, arable land, and hedges (Wang and Grimm, 2007).

The alpha diversity indices, encompassing the Shannon and Simpson Diversity Index, offer a quantitative lens through which to view the distribution of prey return species within each location. The moderately diverse nature of both settings indicates that, despite differences in habitat, both areas support a varied array of prey species. This information is pivotal for devising conservation strategies that are not only effective but also tailored to the inherent biodiversity of each specific locality.

The observed correlation between average temperature and prey abundance introduces a compelling dimension to our understanding of cat predation. The statistically significant positive correlation suggests that temperature acts as a key determinant of predatory activities, providing potential insights into seasonal variations. The interpretation of the results implies that temperature may play a significant role in influencing prey return frequency; however, our study was limited to early spring and under the influence of prey activities. The positive correlation may suggest that higher temperatures are associated with higher prey abundance, possibly due to increased activity, breeding, or availability of food sources for the prey species.

The examination of the frequency of prey return under different weather conditions provides additional depth to our understanding. The higher number of prey that is brought in during clear weather and reduced numbers during precipitation align with established behavioural patterns of domestic cats (Geary et al., 2022). The aversion to hunting in adverse weather conditions, as evidenced by the lower frequency of prey return during rainy periods, reflects the adaptive nature of cat behaviour. In our study, we employed the chi-square test for goodness of fit to investigate potential disparities in prey return frequencies across distinct weather types. With the null hypothesis assuming a random distribution of prey return across weather types, the p-value (0,038) suggests that there is statistical evidence to reject the null hypothesis. Therefore, we conclude that the distribution of prey return is not uniform across the different weather types. The observed frequencies of prey return in each weather category are significantly different from what would be expected if the prey return were randomly distributed. The results indicate that weather types have a significant impact on the distribution of prey return, supporting the notion that cats may exhibit different (hunting) behaviours under varying weather conditions. This information is particularly relevant for owners and policymakers alike, as it suggests that weather conditions can influence the ecological impact of outdoor cats.

The distinct temporal patterns in predation, with heightened activity during the night until morning hours when the prey was found, present valuable insights into the diurnal dynamics of cat behaviour. The statistical significance of these temporal variations, confirmed by the chi-square test, underscores the importance of considering daily activity patterns when evaluating the impact of domestic cats on local prey populations. Interpreting the results, we rejected the null hypothesis, indicating that the observed distribution of prey abundance across different times of the day is significantly different from what would be expected if prey return were evenly distributed. These findings highlight the influence of temporal factors on prey capture, with mornings being particularly prolific in terms of abundance.

While our study has provided valuable insights into the predatory behaviours of domestic cats in peri-urban areas, it is crucial to acknowledge certain limitations that warrant consideration for future research. The current investigation was conducted with a specific focus on two locations and a relatively short sampling period of 7 weeks. To enhance the robustness and generalizability of our findings, it is recommended that future research endeavours encompass a larger and more diverse sample of owned cats across various geographical locations. Additionally, extending the sampling period over a more prolonged duration could yield a more comprehensive understanding of seasonal variations and potential changes in predation patterns over time. For a better understanding of the entire ecological picture, future studies should also aim to gather information on the total population of cats in the studied areas and the proportion of those cats that are owned and allowed outside. Although some studies suggest that around 50%–80% of owned cats are allowed outdoors (Loss et al., 2018; Loss et al., 2013; Loyd et al., 2013), further research should be conducted for specific areas. Studies confirm that typically, only a fraction of hunted prey is brought back to the house or the farm, for instance, 23% (Loyd et al., 2013) or 10% (Krauze-Gryz et al., 2019). A more extensive and prolonged study is currently ongoing and was launched as an MSc work of the first author, coupled with a broader demographic perspective, which will not only contribute to the refinement of our current insights but also facilitate a more nuanced comprehension of the intricate dynamics between domestic cats and their surrounding ecosystems.

## Author Contributions

The authors confirm their contribution to the paper as follows: study conception and design: LB, NŠ; data collection: LB; analysis and interpretation of results: LB, NŠ; draft manuscript preparation: LB, NŠ. Both authors reviewed the results and approved the final version of the manuscript.

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## Data Availability

All raw or analyzed data are available from the corresponding author upon reasonable request.

## Conflicts of Interest

The authors declare no conflict of interest.

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