Nepalese Journal of Zoology

ISSN: 2705-4403 (Print) & 2705-4411 (Online)
www.cdztu.edu.np/njz

Volume 7 | Issue 1 | June 2023

https://doi.org/10.3126/njz.v7i1.56308

Research article

Diversity and habitat associations of non-volant small mammals in forest patches of Kathmandu Valley, Nepal

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Suggested citation: Budhathoki, S., Adhikari, J. N., Bhattarai, B., Adhikari, D. and Bhattarai, B. P. 2023. Diversity and habitat associations of non-volant small mammals in forest patches of Kathmandu Valley, Nepal. Nepalese Journal of Zoology **7**(1):26–35. https://doi.org/10.3126/njz.v7i1.56308

Article History:
Received: 24 May 2023
Revised: 28 June 2023
Accepted: 28 June 2023

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Abstract

Forest patches in urban areas can have the potential to provide shelter, resources, and breeding space for small mammals. This study aimed to explore the diversity, abundance, and habitat associations of non-volant small mammals in forest patches of Kathmandu Valley. Three sites were selected for the study: Ranibari Community Forest, Swayambhunath Hillock, and Coronation Garden of Tribhuvan University. The roost survey, line transect survey and direct observation methods were used for the study. The field survey was conducted in June–July 2019. In those selected sites, 250 m transects were laid and 25 live traps (Local, Sherman, and Tube) were set for capturing small mammals. Trapped individuals were measured, marked, and released at the site. From a survey of 600 trap nights, 61 individuals representing six species, four families and three orders were identified. Asian house shrew (*Suncus murinus*) was the most dominant species. Abundance of small mammals was higher in Ranibari Community Forest whereas Coronation Garden had the lowest abundance of non-volant small mammals. Small mammal distribution pattern was clumped in study areas owing to the uneven distribution of resources in the natural environment. Species response to five environmental parameters (distance to settlement, road, water, open canopy and closed canopy) showed significant relation in Ranibari Community Forest (F=2.446, P=0.018) and Coronation Garden (F=2.75 P=0.05), whereas it was insignificant in Swayambhunath Hillock (F=1.60 P=0.17). These results suggested that diversity, distribution, and abundance of small mammals in urban forest patches are influenced by habitat types and environmental parameters.

Keywords: Animal handling; Baits; Environmental parameters; Trapping; Urban forests

1 | Introduction

Small mammals indicate small-bodied animals weighing less than five kilograms, however, there is no strict taxonomic criteria to classify the mammals as small or large (Golley et al. 1975; Njoroge et al. 2009; Erena 2022). Despite their small sizes, these animals have immense roles in biodiversity as they help in nutrient cycling, habitat modification due to burrowing, seed dispersal (Vander Wall 2010), and creating a link between producers and secondary consumers by consuming plants and serving as a prey base for carnivores (Lacher et al. 2019). These terrestrial species are widely distributed as they are found in a diverse habitat, ranging from sea level to the high Himalayan pastures up to an elevation of 5000 m (Adhikari 2001).

Globally, Small mammals constitute over 2800 species, out of which 437 are listed as threatened with extinction in the IUCN Red List of the Threatened Species (Amori & Gippoliti 2000; SMSG 2011; Burgin et al. 2018). In South Asia, a total of 185 species of non-volant small mammals are known, of which 62 are endemic to the region (Molur et al. 2005). In the context of Nepal, a total of 213 mammal species were recorded among which 79 species are small mammals (Baral & Shah 2008; Bista et al. 2021). Among the reported mammals, 48% of species are still data deficient, 43% are least concern and 9% species are considered threatened (Amin et al. 2018). Globally, small mammals are given little emphasis on study, research and conservation compared to other charismatic species (Amori & Gippoliti 2000). These mammals are often regarded as agricultural pests and their unpopularity often overshadows the threats, they face due to habitat destruction, modern agriculture practices, disease, predation, and competition. It is also acknowledged that even biodiversity-rich countries in Asia often conduct limited research for collecting detailed information of small mammals' status, habitat, threats, and conservation efforts (Molur et al. 2005).

In the context of urban areas, there is a higher degree of fragmentation in natural as well as semi-natural habitats owing to the construction of roads and infrastructures (Riley et al. 2014). Unfavorable management practices, for instance, application of chemicals, periodic removal of shelter, vegetation, and greater predation pressure from domestic cats also affect non-volant small mammals in an urban setting (Baker et al. 2000). This results in alteration in plant and animal communities, and the mammals living in such conditions are compelled to roam around man-made modifications such as road surfaces, which lie at a closer distance to forest margins. Dispersal is primarily aided by corridors of vegetation, whereas hampered by roads, buildings, and areas devoid of vegetation. Thus, such corridors in urban environments also help to retain the population of small mammals (Mahan & O'Connell 2005). On the other side, closer proximity to residential areas exposes small mammals to practices of householders like plantation of fruit and seed-bearing plants, use of compost manure, and less dependence on chemical fertilizers, which can also provide an appropriate habitat for small mammals in city areas (Good 2000).

A review on the biological diversity and distribution of small mammals reported 118 species from 10 terrestrial ecoregions and 16 protected areas of Nepal (Pearch 2011). A total of eight species of non-volant small mammals have been reported from the Chandragiri Hillscape of Kathmandu (Shakya 2019) and Katuwal et al. (2020) reported 30 species of mammals, 119 species of birds and 34 species of herpetofauna from the Chandagiri area. Many researchers (e.g., Katuwal et al. (2018), Upadhyaya et al. (2022) and Jha & Sharma (2019)) have been focused on the birds in the Kathmandu valley than mammals. Small mammals in the Kathmandu (habitat patches in the urban areas) are less studied. Hence, this study aims at exploring the diversity, abundance, and distribution pattern of non-volant small mammals in three forest patches of Kathmandu Metropolitan City namely Ranibari Community Forest, Swayambhunath hillock, and Coronation Garden. It also focuses on determining the impact of environmental parameters on the abundance of non-volant small mammals.

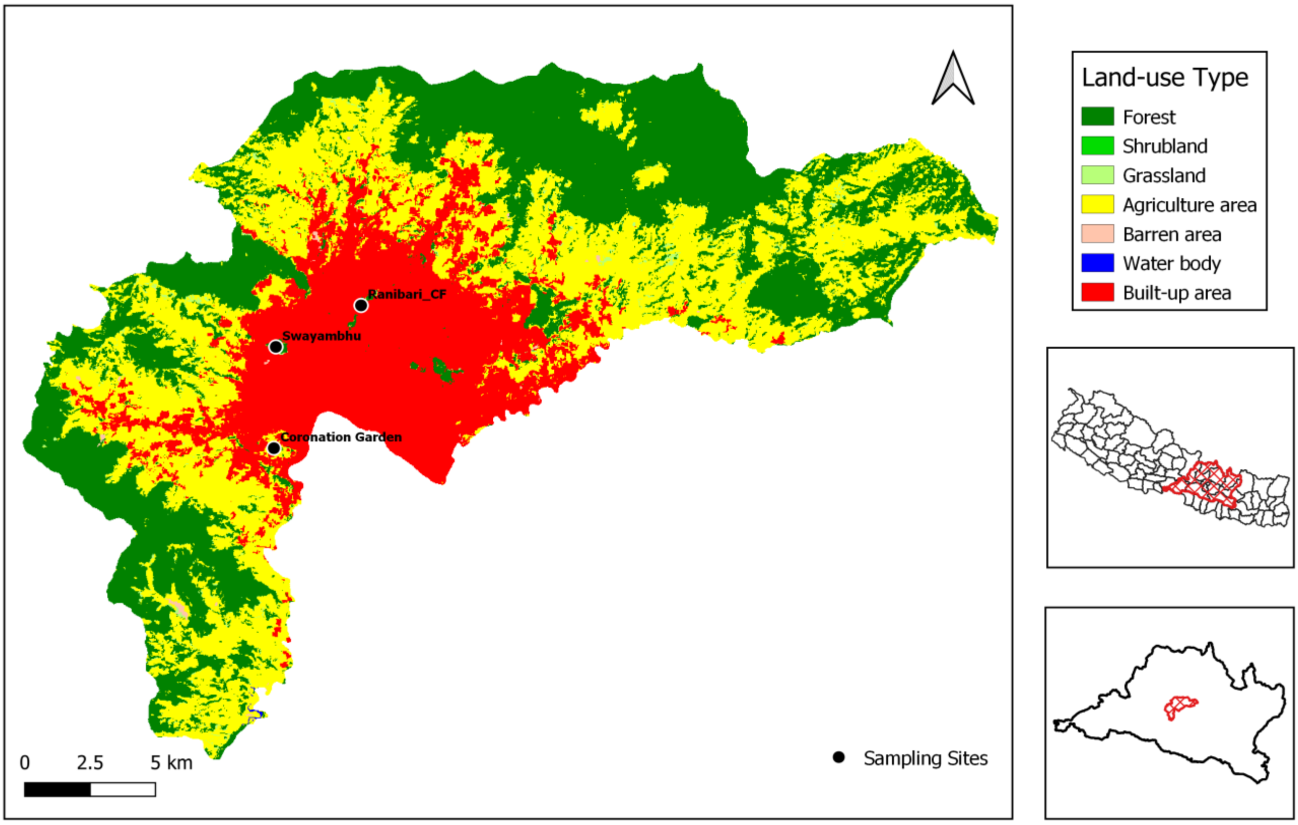

Figure 1. Location of three sampling sites within Kathmandu valley. Black rounded dots indicate the sampling sites *Ranibari_CF= Ranibari Community Forest *Swayambhu= Swayambhunath Hillock

2 | Materials and methods

2.1 | Study area

The study sites are located inside Kathmandu Valley within 85°22'E and 27°42'N above 1339 m asl. Bagmati and Bishnumati are the major rivers of the valley. The valley has a sub-tropical climate with high humidity, rainfall, and precipitation in summer. The mean maximum temperature ranges between 20°C in December and 29°C in April, while the mean minimum temperature varies between 2°C in January and 20.1°C in July. The average annual rainfall of Kathmandu valley is about 1407 mm, which is mainly by the summer monsoon (Shrestha 2007).

We focused our study on three forest patches of Kathmandu Metropolitan City (Fig. 1) namely Ranibari Community Forest, Swayambhunath Hillock, and Coronation Garden of Tribhuvan University which are very close with human settlement areas.

The Ranibari Community Forest (north-western region of the valley), occupies an area of 6.95 ha and located at an altitude of 1303 m asl. Though the site is a natural forest, it is modified at times due to human interference and plantation management. A total of 108 vascular species including 54 trees belonging to 58 families and 92 genera were recorded from this site (Maharjan et al. 2006). Swayambhunath hillock, the western region of Kathmandu valley, has an area of 35 ha. As it is a cultural heritage, it is a crowded place that receives domestic and international visitors. Altogether, this region has 104 species with a higher contribution of Angiosperm reported at 98 species and lesser evidence of Gymnosperm species (Ranjitkar & Chaulagain 2004). Coronation garden, southwest of the center of Kathmandu valley, covers an area of 276 ha and is situated between 1280-1400 m asl. A total of 54 species belonging to 38 genera and 19 families were reported from this region (Shrestha et al. 2007).

2.2 | Research design

This study was conducted by selecting a single transect in each of the selected study sites, such that each transect was 250 m long. Altogether, 25 live traps were used for the study which included 5 Local Traps, 10 Sherman Traps and 10 Tube Traps set along the transect line (Fig. 2). Twelve sets of traps were placed parallel to each other having a difference of 10 m from the midline. The width of the transect was up to 20 m wide, such that each trap was set 10/10 m left and right from the midline. Similarly, the 13th trap was set on the midline at 250 m to mark the end of the transect (Hero et al. 2010; Adhikari 2014).

2.3 | Small mammals sampling

The field survey was conducted from June 15 -July 12, 2019. For collecting quantitative data on non-volant small mammals, a trapping period of 8 consecutive days per site were allocated. Therefore, a total of 600 trap nights were considered for the study (25 traps × 8 days × 8 sites) (Fig. 3A). During this period, an interval of one day was allocated to clean and maintain trapping equipment to prevent bad odor and dirt before shifting to the next study site. Traps were set before the sunset. As each trap was placed, leaf litter was used along to form a firm base as well as to cover the visible parts of traps except the entrance opening. Red color ribbons were tied on twigs of shrubs and branches of tree nearby trapping stations to locate each trap. Each trap was baited using 5 varieties of baits such as fried fish, oatmeal flavored with peanut butter, carrots and breads, and the traps were checked and rebaited each morning.

During field survey, non-volant small mammals such as mongoose that were observed while setting traps, walking on transects and checking of traps were noted on a notebook. Binoculars were used to scan bark, branches and trunk of trees during daytime to locate arboreal small mammals such as squirrels.

2.3 | Animal handling and study of captured animal

During animal handling, the trapped animal was transferred to a clear, strong plastic bag. Then, both animal and bag were weighed together, after which the weight of bag was subtracted to get an accurate measure of the animal's body weight. Bags were reweighed quite often due to presence of moisture and detritus, which added extra weight to the bag. For taking other measurements, the animal was taken out from bag by firmly grasping the nape of neck and tail region on the dorsal side to restricted the movement. Besides, to minimize stress in animal, only required hand pressure was used to hold the animal while approaching them calmly (TVP 2013). Following this, the ventral surface of animal's body was exposed. Other measurements included head and body length, tail length, ear length, sex determination, and reproductive condition in females (pregnant or lactating) (Fig. 3). Abundant photographs of species were clicked in to ease the identification procedure. Then, captured animal was individually marked by fur clipping with the help of scissors and released immediately at the same place from where they were captured (Gurnell & Gipps 1989). All the captured animals were identified up to the species level based on the morphological characters (Baral & Shah 2008; Menon & Daniel 2003).

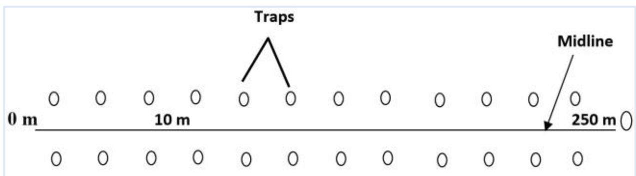

Figure 2. Positioning of Traps in 250 m transect (Hero et al. 2010; Adhikari 2014).

Figure 3. A. Capturing the Lesser Bandicoot-rat (*Bandicota bengalensis*) inside a trap, the trap was used to capture non volent small mammals using baits, B. morphometric measurement of Asian house shrew (*Suncus murinus*), C. Observing the morphometic characteristics of Asian house shrew (*Suncus murinus*), D. Handling and observing the morphometric features of House rat (*Rattus rattus*), E. Measurement of morphometric features of the different body parts of Eastern house mouse (*Mus musculus*), F. Irrawaddy squirrel (*Callosciurus pygerythrus*).

2.4 | Environmental variables

Microhabitat measurements were obtained where each live trap was placed. Five environmental parameters such as Distance to settlement (DTS), Distance to road (DTR), Distance to water (DTW), Open canopy cover and Closed canopy cover. First three parameters were obtained manually with a tape measure and divided into scales, which were equivalent to: 1(0-50 m); 2(51-100 m), and 3(>100 m). In case of DTW, as there was no natural source of water in the study regions, nearby ditches were considered as water sites during the monsoon season. Similarly, canopy cover was estimated by using a spherical densiometer (Lemmon 1956). The presence of up to 30% of canopy cover at trapping station was classified as Open canopy cover, whereas canopy that exceeded 30% was classified as moderately closed canopy cover (Freitas et al. 2002).

2.5 | Data analysis

The diversity of species was measured by using Shannon Weiner diversity index (H). Similarly, species abundance was analyzed by dividing the total number of each species per transects in which it occurred (Krebs 1985). The distribution pattern of non-volant small mammals was analyzed by calculating the variance-mean ratio ($S^2/\bar{X}$), where $S^2/\bar{X} < 1$, $S^2/\bar{X} = 1$ and $S^2/\bar{X} > 1$ implies that distribution is uniform, random, and clumped, respectively. Furthermore, species' responses to different environmental parameters and habitats were analyzed by using CANOCO version 4.56 (Braak & Šmilauer 2002). First of all, we performed the Detrended Correspondence Analysis (DCA) of species to judge the appropriate multivariate test to see the relation of small mammals with environmental variables. DCA found more than 3.5 gradient lengths therefore we chose Canonical Correspondence Analysis (CCA) to measure the associations of the species with habitat using CANOCO v. 4.56 (Ter Braak & Šmilauer 2009). The data are presented in the form of a biplot. CCA helps to check a complex relationship between species and environment variables. We also applied a Monte-Carlo permutation test (using 499 unrestricted permutations) to identify the variables that are significantly associated with the species.

3 | Results

3.1 Assemblage of small mammals

Table 1. Abundance of non-volant small mammals in Ranibari Community Forest (RB), Swayambhunath Hillock (SW) and Coronation Garden (CG), Kirtipur

Species	Scientific name	Number of individuals	Plots			No of plot species occurred	Abundance per plot
			RB	SW	CG		
Small Asian mongoose	*Herpestes javanicus*	10	5	2	3	3	3.34
Irrawaddy squirrel	*Callosciurus pygerythrus*	3	3	0	0	1	3
House rat	*Rattus rattus*	6	2	2	2	3	2
Lesser bandicoot-rat	*Bandicota bengalensis*	8	4	2	2	3	2.67
Asian house shrew	*Suncus murinus*	33	11	16	6	3	11
Eastern house mouse	*Mus musculus*	1	0	1	0	1	1
Total		61	25	23	13		23

During 600 trap nights, 61 individuals of small mammals belonging to six species from three orders and four families (Table 1) were recorded. Asian house shrew (*Suncus murinus)* had the highest abundance (11) with a count of 33 individuals followed by small Asian mongoose (*Herpestes javanicus*) (10), and Eastern house mouse, had the least abundance (1) (Table 1). Comparatively, Ranibari Community Forest had the highest and Coronation Garden had the lowest diversity of small mammals (Table 1, Fig. 3). Shannon-Weiner diversity indices of small mammals in Ranibari Community Forest was 1.43, that for Coronation Garden was 0.94 and for Swayambhunath Hillock, it was 1.42. Similarly, distribution pattern of small mammals in Ranibari Community Forest, Swayambhunath Hillock and Coronation Garden were clumped with variance to mean ratio 3.4, 9.43 and 2.3 respectively.

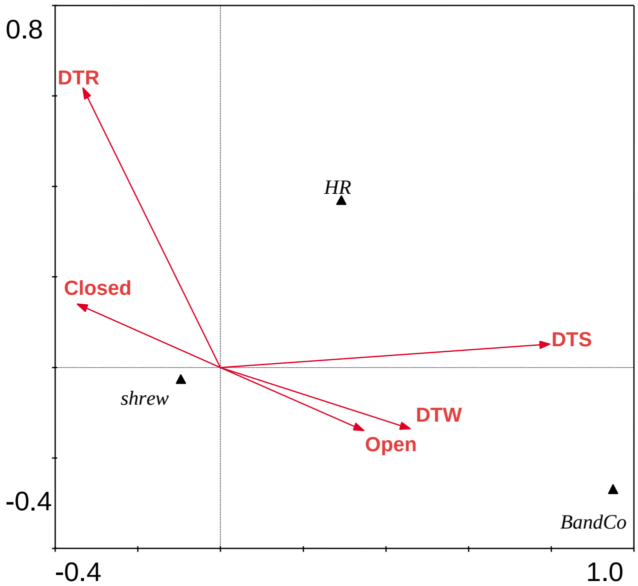

Figure 4. CCA ordination diagram (biplot) in Ranibari Community Forest showing species (BandCo: Lesser Bandicoot-rat, HR: House rat, shrew: Asian house shrew) response to different environmental parameters (DTR: Distance to road, DTS: Distance to settlement, DTW: Distance to water, Open: Open canopy cover, Closed: Closed canopy cover). Monte-Carlo permutation test of significance of all canonical axes. Trace = 0.8, F-ratio = 2.446, P = 0.018. The first two axes are displayed. The first axis accounts for 77.4% and the second axis 22.6% of the variability.

3.2 | Species-environmental parameters relation

The assessment of species-environment relation in Ranibari Community Forest showed that Bandicoot rats had a positive correlation with open canopy cover and habitat nearby water sources. Similarly, House rat showed the affinity with distance settlement and roads, whereas Asian house shrew showed affinity towards closed canopy cover (Fig. 4).

Analysis of CCA in Swayambhunath Hillock interpreted that Lesser Bandicoot-rat had a positive correspondence to open canopy areas. Likewise, Asian house shrew was showed the close association with distance to water sources than distance to settlements whereas House rat was associated with distance to roads or tracks (Fig. 5).

For Coronation Garden, the CCA diagram represents that Open canopy showed the weak relation of Lesser Bandicoot-rat. Similarly, Asian house shrew and Eastern

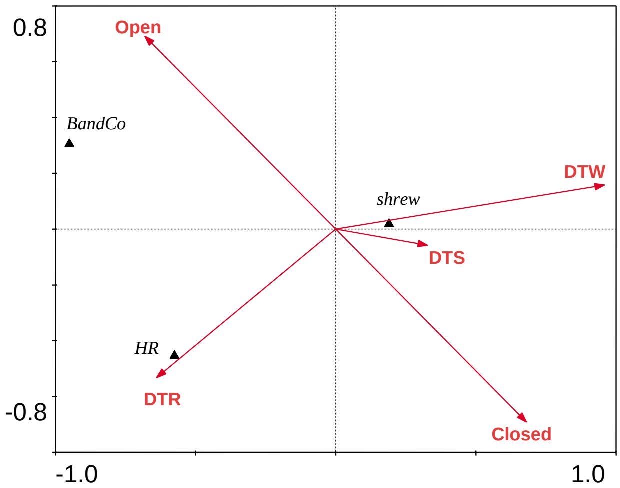

Figure 5. CCA ordination diagram (biplot) in Swayambhunath hillock showing species (BandCo, HR, shrew) response to different environmental parameters (DTR, DTS, DTW, Open, Forest). Monte-Carlo permutation test of significance of all canonical axes. Trace = 0.304, F-ratio = 1.604, P = 0.176. The first two axes are displayed. The first axis accounts for 83.5% and the second axis 16.5% of the variability.

house mouse had positive link with settlement and road. House rats were seen to forage nearby water source and Closed canopy cover (Fig. 6).

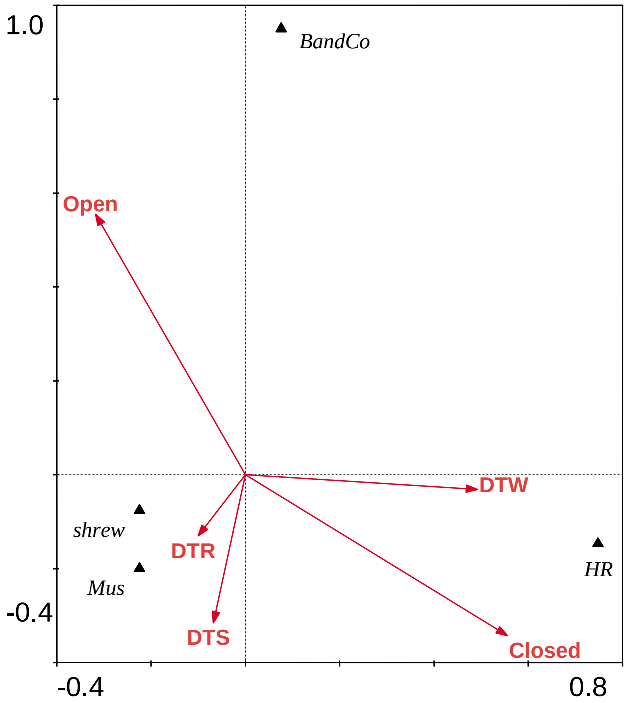

Figure 6. CCA ordination diagram (biplot) in Coronation Garden showing species (BandCo, HR, shrew) response to different environmental parameters (DTR, DTS, DTW, Open, Forest). Monte-Carlo permutation test of significance of all canonical axes. Trace = 2.1, F-ratio = 2.755, P = 0.05. The first two axes are displayed. The first axis accounts for 47.6% and the second axis 32.9% of the variability.

4 | Discussion

This study identified six species of small mammals, among them four species (i.e., Asian house shrew, Small Asian mongoose, Lesser Bandicoot-rat, and House rat) were reported in all studied forest patches. Asian house shrew was dominant in all forest patches. The forest cover and presence of vegetation cover increase the chances of occurrence of animals to that area. The reason associated can be its year-round breeding potential (Khanam et al. 2017; Nakano & Mekada 2018) with females producing two litters every year (Chang et al. 1999). Availability of fruiting trees, grains and other food items increase the probability of occurrence of these species. These species (both male and female) have highly developed scent gland behind the ears and on the throat (Dryden & Conaway 1967) that produces a strong smell thereby restricting predators to detect their presence (Pickett 1995). They are typically identified as insectivores, fulfilling their dietary requirement by mostly feeding upon insects (about 80%) (Prakash & Singh 1999); however, they are also opportunistic foragers and feed on available plant resources along with invertebrates (Brown et al. 2014; Temple 2004). Similarly, Irrawaddy squirrel was observed only from Ranibari community forest. As an arboreal species, it prefers tall trees and dense vegetation that provides it with food options (flowers, fruits, seeds, nuts, bark, and insects) as well as protection from predators. The seeds and food availability were comparatively higher in Ranibari than other habitat patches. The presence of tall bamboo trees *(Bambusa vulgaris)* along with sufficiently planted flowering and fruiting trees such as *Bombyx ceiba (*silk cotton tree*)* might have suited the flourishment of this species (Thapamagar et al. 2021).

Similarly, Eastern house mouse was only recorded from Coronation Garden. These commensal species can easily adapt to new environments, and they are considered to live even in disturbed habitats, around croplands, and urban habitats (GISD 2014). There was a presence of cropland around Coronation Garden which provided them with food sources (stem, leaves, roots, grains, and insects), and this might be the reason behind their presence there. However, the remaining study sites do not have any cultivated lands adjacent to them, which might have led to null capture from those areas.

The study showed that the abundance of non-volant small mammals was slightly greater in Ranibari community forest than in Swayambhunath hillock and Coronation Garden. The reason for their higher occurrence in Ranibari Community Forest could be its richness in floristic constituents. This inclination of these species towards dense vegetation cover is because it provides them a safer place to hide from potential predators (Mohr et al. 2003; Muñoz et al. 2009). In Ranibari community forest, the presence of tall bamboo clumps and trees like Pipal tree (*Ficus religiosa*), etc., as well as fruiting plants such as White mulberry (*Morus alba*) and Honeyberry (*Caltis australis*) had provided good cover as well as foraging sites for these species. Likewise, in Swayambhunath hillock, small mammals were mostly captured from an area rich in vegetation covers such as Chilaune (*Schima wallichi*), Ashuro (*Justicia adhatoda*), Cannabis (*Cannabis sativa*), Taro (*Colocasia* sp.), etc. and nearby unused houses, however, capture was null from the trapping stations with little or no ground cover. Coronation garden was the site from where the least number of animals were trapped. Livestock grazing was seen as a common practice in this area. Johnston and Anthony (2008) studied the response of non-volant small mammals to livestock grazing and it was revealed that these species were less abundant in heavily grazed sites in comparison to lightly grazed sites This suggests the dependance of small mammals on herbaceous material for foraging, cover, and nests, and when these resources are trembled or consumed by cattle, it affects them negatively (Schieltz & Rubenstein 2016; Horncastle et al. 2019). Consequently, reduced quality of habitat and less availability of vegetation cover makes them more vulnerable to potential predators (Moser & Witmer 2000). Furthermore, there was presence of dense cover of invasive species such as Mug-wort (*Artemisia vulgaris*), Catweed (*Ageratina adenophora*) as well as thorny plants such as Wild eggplant (*Solanum surattense)*. The invasive bushes present at the study site have unpleasant odor and bear inedible seeds and fruits. Therefore, non-volant small mammals tend not to forage in regions that are rich in these plant species. It is suggested that dominance of non-native species is only beneficial to such creatures if they have palatable fruits and seeds; however, the same species become problematic in their habitat when their abundance restrict the growth of native shrubs and woody vegetation, that provided them better cover and food (Bartowitz & Orrock 2016; Lambrinos 2000; Orrock et al. 2008; Ostoja & Schupp 2009). For instance, the abundance of invasive species tends to displace native species due to their increased competency for obtaining resources and herbivory on native plants (Holt 1977; Noonburg & Byers 2005; Orrock et al. 2010). Bartowitz and Orrock (2016), on the other hand, suggested through their research that invasive species namely European Buckthorn (*Rhamnus cathartica*) had a positive impact on non-volant small mammals as its seeds were highly preferred by the mammals and provided a good cover too.

The distribution pattern of non-volant small mammals (NVSM) was found to be clumped in this investigation. Due to the availability of resources like food, water, cover, and suitable microhabitat conditions, some areas of natural habitat within an area may be more suitable than others. Consequently, the distribution of animals in space is influenced by competition for food and other resources. Many organisms tend to assemble in an area where resources are clumped, even if they do not interact. Due to this phenomenon, species distribution is unequal (Patten 1997). Rich ground cover and vegetation structure also provide niche types, which play a crucial role in determining the composition of the small mammal community and the diversity of the forest ecosystem (Solo 2020) .

Another reason why species tend to clump together is because of weather or seasonal variations, which limit resources necessary for survival to just some places, causing species to congregate closer to the resources (Wells et al. 2007). Odum and Barrett (2005) justified this tendency regarding social factors and the reproductive phenomenon of species. Particularly, prey species use it as a mechanism to protect themselves from predators, where staying in a group greatly reduces their chances of being eaten by predators. NVSM exhibit clumped distribution during the reproductive stage because their young are immobile and reliant on their parents for nutrition. As a result, females must account for energy expenditure, such as foraging and thermoregulation. During such conditions, a habitat with rich availability of plant-based food as well as prey species is preferred by females for attaining reproductive success (Temple 2004).

As represented by the analysis of environmental variables, the road which is generally considered to be a restricting factor for the mobility of species, has shown a positive influence on NVSM such as House rat in Swayambhunath hillock, and Asian house shrew and Eastern house mouse in Coronation Garden respectively. NVSM may correspond positively to disturbances such as roads only when the surrounding environment is supported by vegetation, which provides a foraging ground as well as shelter for them (Bellamy et al. 2000). By contrast, the same parameter acts as a barrier to survival if the adjacent land is not supported by plant species (Debinski & Holt 2000). Since these regions had no sharp boundary such as walls to separate roads and forest, the mentioned NVSM might have exhibited this tendency to forage on the vegetation nearby roads.

Likewise, house rat captured from Ranibari Community Forest, Asian house shrew from Swayambhunath Hillock and Coronation Garden displayed a common pattern where they responded positively to human settlement. A potential reason for this scenario might be the availability of appropriate habitat for NVSM in closer proximity to the settlement, which offered them spaces (shaded locations, basements, abandoned spaces) with suitable microhabitats and an opportunity to have access to various human food as an easy option (Nakamoto & Nakanishi 2013).

The capture of Lesser Bandicoot-rat, Asian house shrew, and House rat from all three sites responded positively to water availability. There is evidence that increased availability of water reduced the use of dense cover along with the preference for open patches by NVSM thus, altering the suitability of certain microhabitats (Benedek et al. 2021; Christian 1980). Energy and water requirements of NVSM during pregnancy and lactation also explain the inclination of rodents towards water-rich sites (Krug 2004). During lactation, mother rats and shrews require more water as they lose water by providing milk to their pups (Friedman et al. 1981).

In this study, reduced canopy cover in the vicinity of the trapping station was associated with the capture of Lesser Bandicoot-rat (Püttker et al. 2008). Generalist foragers such as Bandicoot rats can exploit the wide range of habitats, including the openness of canopy and disturbed habitats (Garden et al. 2007; Wells et al. 2007). These species have powerful claws, which enable them to dig into hard ground for feeding on insects and subterranean plant parts (Keiper & Johnson 2004). This enables them to survive in a wide array of habitats including natural and urban forest patches, which is quite vulnerable to fragmentation and increase their tolerance of disturbance (Garden et al. 2007).

5 | Conclusions

This study reported six species of non volent small mammals from three different sites of Kathmandu Valley, an urbanized area. It demonstrates that habitat types play an important role in shaping NVSM abundance. Particularly, the distribution of NVSM was greatly affected by the distribution of resources in the natural environment and environmental variables. This study may be the baseline for planning further research and management of urban small mammals. Furthermore, to depict the clear status of NVSM in Kathmandu, this study recommended research on NVSM and their relation with environmental variables in the several potential forest fragments.

Acknowledgements

Small mammals were trapped under the permission of Department of Forests and Soil Conservation and the management bodies of forest patches for encouraging the study. We are equally thankful to Small Mammals Conservation and Research Foundation (SMCRF) for aiding and valuable guidance for conduction of the research.

Authors' contributions

Budhathoki, S. and Bhattarai, B. P. conceptualized the study, collected and analyzed the data, and prepared the first draft of manuscript. Bhattarai B. and Adhikari D. analyzed the data and reviewed the draft; Adhikari D. Adhikari J.N. analyzed the data, prepared the draft and improved it. All authors revised and finalized the manuscript.

Conflicts of interest

Authors declare no conflict of interest.

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