

## Small mammals of the Mongolian mountain steppe region near Erdensant: insights from live-trapping and bird pellet remains.

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### Abstract

Relatively little is known of the distribution, abundance and ecology of small mammals in Mongolia and as a result there is scant knowledge of the effects of environmental and anthropogenic factors on small mammal populations. The aim of this study was to assess the occurrence of small mammals in mountain steppe habitat from live-trapping and analysis of mammal remains from raptor pellets and below nests. During live-trapping, root voles (*Microtus oeconomus*) were the most commonly caught species accounting for 47.5 % of captures, striped hamsters (*Cricetulus barabensis*) and pika (*Ochotona hyperborea*) accounted for 30 % and 22.5 % of captures respectively. Temperature influenced trapping success, with small mammals appearing to avoid being active at temperatures over 20°C. The three species caught on the trapping grid appeared to avoid competition for resources through both temporal and spatial differences in the use of available habitat. Mammals identified from raptor pellets and other remains included the grey hamster (*Cricetulus migratorius*), Siberian marmot (*Marmota sibirica*), red fox (*Vulpes vulpes*), long-tailed souslik (*Citellus undulatus*) and the Daurian mole (*Myospalax aspalax*). Results are discussed in terms of their relevance to the conservation of mammals in Mongolia and their co-existence with livestock and humans.

**Key words:** grazing, livestock, live-trapping, mammal, Mongolia, niche overlap.

### Introduction

Relatively little is known of the distribution, abundance and ecology of small mammals in Mongolia (Clarke *et al.* 2006) and as a result there is scant knowledge of the effects of environmental and anthropogenic factors on small mammal populations. More than 25 % of Mongolia is classified as mountain-steppe (Mallon, 1985) and a variety of small mammals occur in this habitat type. However mountain steppe regions are also increasingly occupied by humans, resulting in wildlife being threatened by competition with livestock for pasture and water and illegal hunting.

Globally, many studies have found a decrease in the abundance and diversity of small mammals with an increase in grazing intensity (e.g. Schmidt *et al.*, 2005). In Mongolia, livestock stocking rates are increasing at a rapid level in the mountain steppe regions and this can result in grass on the steppes

being shorter and sparser, with reduced soil moisture content, which is predicted to alter small mammal diversity and species composition (Wang *et al.*, 2003). Outbreaks of Brandt's vole (*Microtus brandti*), in conjunction with grazing pressure, can drastically defoliate grasslands. However, poisoning to control Brandt's vole can also negatively impact on other native mammals and birds (Natsagdorj & Batbayar, 2002). A number of small mammals in the steppe regions are hunted for food and fur, such as the Siberian marmot (*Marmota sibirica*) and some species of ground squirrel (*Citellus* spp.).

The aim of this study was to assess the occurrence of small mammals in the mountain steppe region near Erdensant, Töv aimag, from live-trapping and analysis of mammal remains from raptor pellets and below nests. We also collected some preliminary ecological data on species overlap and discuss possible mechanisms which allow species

to co-exist.

## Materials and Methods

### Study Area

The study area (around N 47° 07', E 104° 20') was located in a valley adjacent to the Batchan Protected Area, Töv aimag, approximately 8 hours drive south-west of Ulaanbaatar. Vegetation included mixed birch (*Betula platyphylla*) forest patches on north facing slopes, with rocky outcrops and steppe vegetation on other slopes, e.g. Siberian needlegrass (*Stipa siberica*), foot-like sedge (*Carex pediformis*) and bluegrass (*Poa attenuate*). *Salix* spp. scrub occurred in drainages and valley bottoms. The study took place between the dates of 15<sup>th</sup> June – 4<sup>th</sup> July 2005. Livestock present in the valley and nearby included horses, cattle and sheep.

### Live-trapping

The trapping study ran from 28<sup>th</sup> June – 1<sup>st</sup> July. A trapping grid was set up with a total of 50 traps in rows of 10, spaced at 5 m intervals. The trapping grid was set in various plant communities in the valley bottom, including shrubs, grasses and sedges. Traps were standard small mammal traps made by Elliott<sup>®</sup> and Sherman<sup>®</sup> and were baited with peanut butter and millet, rolled into small balls, with bedding material provided. Traps were checked approximately every 2 hours during the day from 0600h – 2200h, and were also left set overnight. On capture, all animals were identified and sexed, then released at their place of capture. Other details recorded were time of capture and temperature. Trapping effort was defined as the

number of trap nights x traps (i.e. 50 x 3).

In order to investigate temporal differences in habitat use between small mammals at the study site, time checks were pooled into four time blocks for analysis – 1 (0600-1400); 2 (1400-1800); 3 (1800-2200); 4 (2200-0600). The vegetation in a 1 metre square around each trap site was assessed; microhabitat descriptors taken included % total vegetation cover, average vegetation height (cm), % grass cover, average grass height (cm), % shrub cover, average shrub height (cm) and % total bare ground.

### Mammal remains from raptor pellets

Raptor pellets were collected *ad hoc* during the study. Where raptor nests (most commonly of the black kite, *Milvus migrans*) were identified, the area below the nest was extensively searched for pellets and other remains, which were taken back to camp for identification. Pellets were soaked in water overnight to aid in the removal of small bones. Mammal remains were identified using the key from Dulamtseren (1970).

## Results

### Live-trapping

We caught three species of small mammal during the trapping study. Trapping effort totalled 150 trap nights, with a total of 40 captures and a capture success of 27 %. Species captured were *Cricetulus barabensis* (striped hamster), *Microtus oeconomus* (root vole) and *Ochotona hyperborea* (northern pika). Root voles were the most commonly caught species, accounting for 47.5 % of

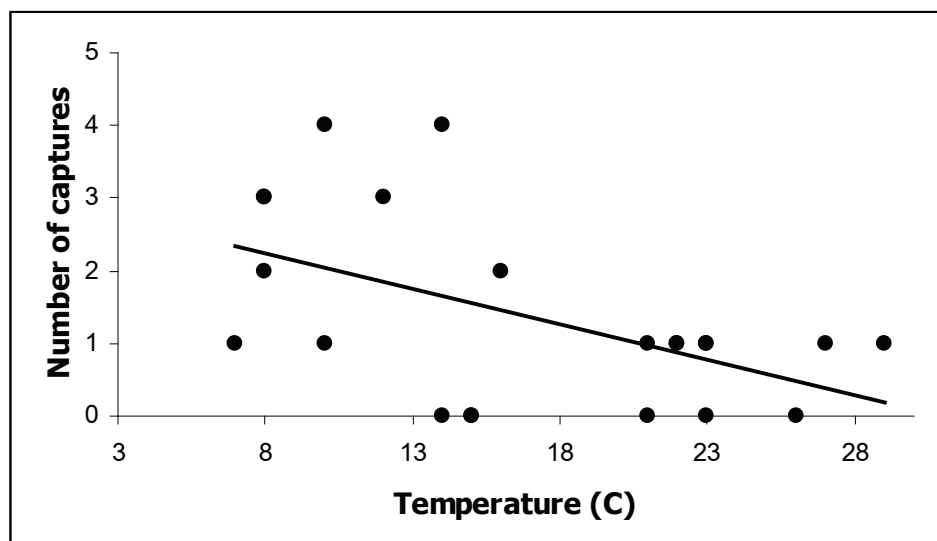


Figure 1. Regression showing the relationship between the number of animals caught in traps and temperature at the time of trap checking. Statistics are shown in the text.

all captures, while hamsters and pika accounted for 30 % and 22.5 % of captures respectively. There was a negative relationship between the number of animals caught and the temperature at the time of trap check (Figure 1;  $R^2 = 0.27$ ;  $n = 22$ ;  $p = 0.01$ ). The majority of animals (>70 %) were caught at temperatures between 7-14°C.

We found some evidence of a difference in the temporal use of the habitat by the three species caught (Figure 2). Pika and voles were most active in the mornings and were active at similar times during the day; neither species appeared to be active at night. No hamsters were captured during the day: they appeared to be strictly nocturnal, with activity restricted to the hours of 2200-0600.

There was evidence of spatial differences in microhabitat use between pika and voles on the trapping grid. There was no overlap in the microhabitats where pika and voles were trapped (Fig. 3), suggesting they avoid overlap by using different areas. Due to the small sample sizes of animals caught, there were no significant relationships with any of the microhabitat variables measured. However, preliminary regressions indicate that more voles were caught where there is less overall vegetation cover ( $R^2 = 0.61$ ,  $n = 6$ ,  $p = 0.06$ ), while pikas were caught in areas with more grass cover ( $R^2 = 0.71$ ,  $n = 4$ ,  $p = 0.15$ ).

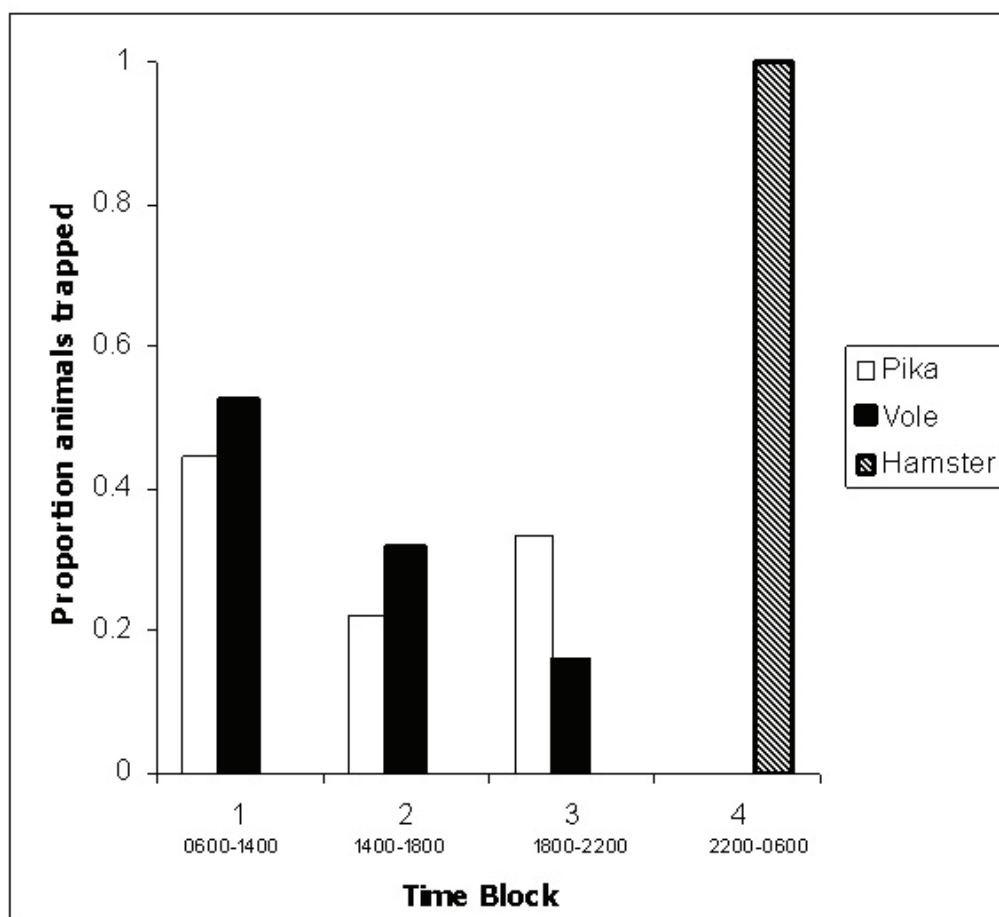


Figure 2. Bar chart showing the proportion of each small mammal species caught during each time block. Pikas are denoted by open bars, voles by filled bars and hamsters by hatched bars.

#### Mammals identified in raptor pellets and remains

Six species of mammal were identified from raptor pellets or remains found below raptor nests, these are summarised in Table 1. The most commonly occurring remains came from the Siberian

marmot, with smaller rodents, most commonly grey hamster and root vole, being the next most frequent prey remains found.

Two additional skulls found at the study site, not obviously associated with raptor nests, were identified as *Myospalax aspalax*, the Daurian mole.

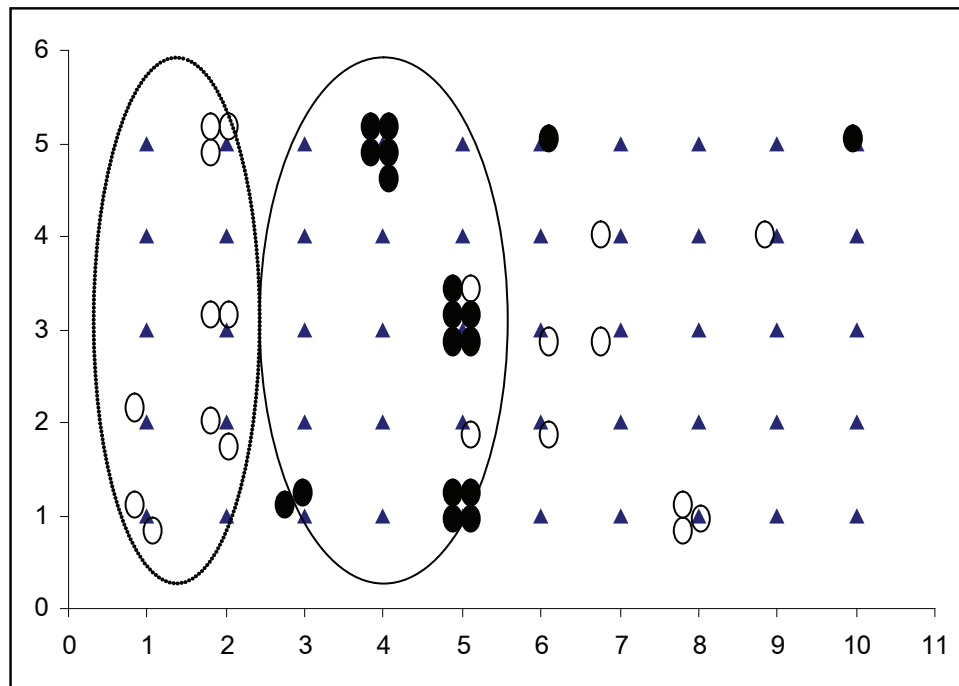


Figure 3. Grid representing the 10 m x 5 m trapping grid showing the distribution of trapping records for each of the three mammal species caught. Pikas are denoted by open circles, voles by filled black circles and hamsters by hatched circles. The dashed circle shows the clustering of records for pika and the black circle the records for voles.

Table 1. Species identified, and percent of their total remains identified, from raptor pellets

Species Identified	% of Total Identified Remains
<i>Marmota sibirica</i> (Siberian marmot)	34
<i>Cricetus migratorius</i> (grey hamster)	15
Unidentified rodent incisors	13
Unidentified avian bones	13
Unidentified <i>Microtus</i> jaws	11
<i>Microtus oeconomus</i> (root vole)	8
<i>Vulpes vulpes</i> (red fox)	4
<i>Citellus undulatus</i> (long-tailed souslik)	2

### Discussion

This study identified three species of small mammal occurring at the study site during trapping studies and a further four small mammals from remains around raptor nests, along with red fox (*Vulpes vulpes*) remains. The occurrence of these species in this area is in agreement with distribution maps given in Mallon (1985) and Tinnin *et al.*, (2002), except for *C. migratorius*. As well as being identified from remains found in raptor pellets, *C. migratorius* was caught in traps set at the camp (kitchen) and was seen foraging during the day around the study area. *C. migratorius* is generally considered a desert and steppe species (Krasnov *et al.*, 2005), so it is not unlikely that the species was identified here. It is however possible, but highly unlikely given the

large number of remains identified in raptor pellets, that the species was misidentified.

Although the data were insufficient for formal analyses to be carried out, there was some evidence of niche partitioning in the three rodent species caught on the trapping grid. While data are clearly preliminary in this study, some interesting patterns were highlighted which suggest ways in which these species may avoid direct competition over resources. Hamsters were found to use areas of the trapping grid utilised by both of the other species, but appeared to avoid competition by temporal separation: being strictly nocturnal while the other two species were strictly diurnal. Voles and pika, although active at similar times of the day, were found to use different areas of the trapping grid,

avoiding the potential for spatial overlap with each other. All three of the species caught on the grid are burrowing rodents with overlapping diets to some degree. However, their diet preferences do differ – root voles are specialist herbivores, tending to prefer sedges and grasses, predominantly *Carex* spp. (Steen *et al.*, 2005), pikas are more generalist herbivores, eating grasses and other vegetation (Dearing, 1997), while striped hamsters are largely granivorous (Wang *et al.*, 2003). Thus these rodents may also, to some degree, use food partitioning as another mechanism of coexistence. The preliminary data on microhabitat preferences on the trapping grid indicates that hamsters showed no preference for particular microhabitat features, pikas showed a trend to select areas with more grass cover and voles tended to be caught in areas with less overall vegetation cover. The grey hamster was not caught on the trapping grid, suggesting it prefers different habitats and does not directly compete for resources with the other three rodent species.

Other studies have found that grazing can influence community dynamics and niche overlap in small mammals. Steen *et al.* (2005) found that sheep grazing had a negative effect on field vole (*M. agrestis*) density, but no effect on bank vole density (*Clethrionomys glareolus*). The authors suggest this is because sheep and field voles are primarily grass eaters, while bank voles eat more bilberry (*Vaccinium myrtillus*). Thus the prevalence of grazing on the grasslands of the Mongolian steppe may have consequences for small mammal diversity and interactions. Given the trend for pikas to prefer areas with more grass cover, and their dependence upon a grass diet, grazing may have a more negative effect on pikas than the other species identified in our study.

The high presence of marmots as a prey item for raptors suggests that this area recently held high densities of marmots. However, no marmots were seen, and marmots were heard calling only once in the three weeks of the study. Local herders confirmed that hunters commonly shoot large numbers of marmots in the valley, and it is likely marmots are declining elsewhere due to hunting pressure. There was evidence from scats that both pika and long-tailed souslik (*Citellus undulatus*) had taken over the abandoned burrows of marmots. Thus the reduction in marmot density is likely to have repercussions for small mammal community dynamics and interactions. Finally, the negative relationship identified in this study between tem-

perature and trapping success suggests that small mammals avoid being active at higher temperatures. A reduction in vegetation cover, due to grazing, may mean that rodents are forced to become inactive earlier in the day and reduce foraging, or else be active at higher temperatures, increasing their risk of dehydration and exposure. Any reduction in vegetation cover due to grazing may also affect soil moisture content, which has been shown to negatively influence small mammal communities (Wang *et al.*, 2003).

### Acknowledgements

Joanne Isaac would like to thank the Steppe Forward Program for an invitation to visit Mongolia and conduct this study. The Steppe Forward Programme is funded by the Darwin Initiative (UK DEFRA) and administered by the Zoological Society of London. M. Amartuvshin, M. Bakhatgul and P. Erdenechimeg, students from the National University of Mongolia, contributed to this study by conducting small mammal trapping and helping with identification of remains from raptor pellets.

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