A survey of small mammals on the UNDERC property

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Abstract

There is little current information on small mammals of the UNDERC property. The aim of my research was to complete a survey of small mammals on the UNDERC property and to determine how they were distributed across six different habitats. In four weeks of trapping, six habitats per week were surveyed. Each site consisted of 30 trap stations of which included one Sherman live-trap, one snap-trap, and one pitfall. In all, 15 species of small mammals were identified on the UNDERC property. Of these, only the deer mouse (*Peromyscus maniculatus)* and red squirrel (*Tamiasiurus hudsonicus)* showed significantly different abundance levels at different habitat sites. Deer mouse abundance differed between the creek and no open-water bog, and the creek and open-water bog. Red squirrel abundance differed between the creek and all other habitats: no open-water bog, bottomland, lake, open-water bog, and upland. Correlation analysis showed a significant relationship between total vegetation volume and species richness (Shannon-Weiner Index of Diversity), but no relationship between individual species abundance and vegetation volume.

Introduction

With the continual growth of the human population, there is an equal escalation of the degradation of our natural environment and habitats. Because of this, we must be aware that many species of plants and animals face the risk of extinction. With this in mind, it has been the goal of current researchers to determine the biodiversity of species in different habitats throughout the country and world (Wilson, 1996).

To achieve this task, researchers have done animal surveys which measure species richness and diversity. A microhabitat study of small mammals in southern Appalachian fens (Rossell and Rossell, 1999) was conducted to examine what kinds of wildlife inhabited the mountain wetlands; a habitat continually degraded by construction and development. In a similar study (Silva et al, 2000), small mammal abundance was measured across habitat types in Prince Edward Island National Park.

Projects such as these have greatly helped our understanding of the biology and ecology behind habitat types and their roles in biodiversity. Mammal surveys across habitat types can illustrate the classical ecological concepts of competition, niche, and limited resources. Results from the Appalachian fen study showed that deer mice (*Peromyscus*) and golden mice (*Ochrotomys*) preferred different microhabitats, based on intraspecific competition between the two species, occurrence of predators, and distribution of food (Rossell and Rossell, 1999).

Unfortunately, surveys such as the aforementioned have not been conducted in this area. Because the UNDERC property lies within the Great Lakes drainage basin, we can expect there to be suitable conditions and resources for the survival of numerous species of small mammals. My research project attempts to determine what species of small mammals make their home on the UNDERC property and to decide whether abundance levels differ across habitat types.

My study examines six different habitats: river, lake, wetland with water, wetland with no open water, upland hardwood, and bottomland mixed. By setting trap stations at each of these sites, we can determine the distribution of species across the different habitats.

## Materials and Methods

We trapped in six habitats over a four week period: river, lake, wetland with open water, wetland with no open water, upland hardwood, and bottomland mixed habitats. Each week we surveyed new trapping sites, one in each of the 6 habitats (Figure 1). Trapping and sampling for this study was modeled after similar methods used in Francl et al.'s (in press) study. To minimize trap bias, the study used Sherman live traps, Museum Special snap-traps, and pitfalls. At most trapping sites, a grid of 28m by 28m was marked off and a total of 30 trap stations were equally spaced apart within the grid. This grid system was not applicable in stream and lake corridors and some wetlands, so we conformed to the topography and habitat edges. Trap stations were placed along stream edges in rows of 15 on each side of the stream. Lake and wetlands with open water were similarly arranged with two lines of 15 that wrapped around the water's edge. Each trap station consisted of one Sherman trap, one Museum Special, and one pitfall, separated by about a meter's distance. Up to 30 snap traps were also placed in the trees at each of the upland and lowland sites. In all, there were up to 600 traps set each week.

For each live animal trapped, we identified, sexed, aged, weighed, and released it near the point of capture. All dead animals were returned to the lab for the same measurements and were then placed in a freezer for future educational use. A number of the dead animals were skinned and prepared as museum specimens and preserved in Notre Dame's museum.

Upon completion of each trap week we calculated the number of trap-nights, which was the total of number of traps set times the number of nights trapped (5). Using this, we then determined the overall captures per trap-night for each species with the equation:

Captures per trap-night = # of individuals captured in all 5 days / # of trap-nights

We also calculated the Shannon-Weiner Index of Diversity for each site, using the equation.

$$H= -\sum p (\ln p)$$

This index is a measure of species richness and evenness for each site (MacArthur and MacArthur, 1961).

For each trap site we also measured the vertical stratification of vegetation. This was done by measuring where vegetation crossed at 0.5m increments on a 4.5m pole. Measurements were taken at 20 random points throughout the trap site, which were determined by using a random numbers table. Upon completion, we were then able to calculate Total Vegetation Volume, using the equation:

$$TVV = h/10v$$

where "h" was the number of vegetation hits that crossed the pole and "v" was the number of 0.5m intervals on the pole (Millis, et al, 1991).

When all data was pooled, we then ran a series of tests in the computer program SYSAT. For each species captured, we ran a one-way ANOVA between each species' captures per trap-night and the 6 habitats, followed by a Tukey's post-hoc test to determine if a particular species was captured more frequently in certain habitats. We also ran Pearson's correlations between Total Vegetation Volume versus captures per trap-night for each species and Total Vegetation Volume versus the Shannon-Weiner Index of Diversity for each site.

Results

In all, my study identified 15 different species of small mammals on the UNDERC property (Table 1). Specific numbers of captures per trap night are in Table 2. Of the 15 species trapped, only 2 showed a significant difference in relation to habitat type when using a *p*-value of 0.100. ANOVA showed that the *Peromyscus maniculatus* and *Tamiasciurus hudsonicus* had significant differences with *p*-values of $p=0.019$ and $p=0.034$. A post-hoc Tukey's test revealed that the deer mouse abundance differed between the creek and bog-no open water, and between the creek and bog-open water with p-values of p=0.061 and p=0.069. The red squirrel abundance significantly differed between the creek sites and all other habitats; bottomland and creek (p=0.051), creek and lake (p=0.051), creek and bog-no open water (p=0.051), creek and bog-open water (p=0.106), and creek and upland (p=0.099). The other 11 species showed no obvious preference across the 6 different habitats.

Correlation analysis showed a positive relationship between total vegetation and Shannon-Weiner Index of Diversity ($r$=0.521). This means that as vertical vegetation increased, species richness also increased (Table 3).

Discussion

Our results showed that deer mice abundance had a significant difference between the creek and no open-water bogs, and creek and open-water bogs. This difference can most likely be attributed to tree density and canopy cover. In a microhabitat study of Appalachian fens (Rossell and Rossell, 1999), results showed that the deer mouse was never found in open areas of the fen, but only highly wooded microhabitats. This trend holds true for our study because the creek sites had a fairly high tree density, while the bogs and fens were characteristically more open with only a dense grass ground cover.

The red squirrel showed significant abundance differences between the bottomland and creek, creek and lake, creek and bog-no open water, creek and bog-open water, and creek and upland habitats. These differences are probably due to the type of tree stands that encompassed the trap sites. The red squirrel prefers an extensive stand of evergreens or a mixed coniferous/deciduous forest (Kurta, 1995). The Tenderfoot Creek site at the north end of the UNDERC property had the highest capture per trap night for the red squirrel of all the sites (Table 2). This trap site had extensive evergreen stand along the west bank of the stream which was where we consistently captured the red squirrel. The bog, lake and bottomland sites did not have the preferred forest habitat for the red squirrel.

Past small mammal studies have shown that increased habitat complexity and vegetation resulted in an increased richness of species (Silva et al, 2000). This trend also held true for our investigation. As vertical stratification of vegetation increases, the amount of space for small mammals to inhabit also increases. Because of this, small mammals are able to utilize living in trees in areas with high vertical vegetation (Francl, personal communication). Despite this, it was noticed that the deer mouse was one of the few species of mammals captured in high abundance at the lowland and upland hardwood sites (Table 2); areas of high vertical vegetation stratification. This can be explained by the fact that there was very little groundcover at some of these sites, which limits the amount of safe microhabitats for many small mammals. Of the mammals captured in this study, only the deer mouse is capable of living in trees, an adaptation to the absence of a dense undergrowth and groundcover (Francl, personal communication).

A very exciting point of interest for this study was the successful capture of the water shrew (*Sorex palustris*). The water shrew is a species of concern because not much information is known on it due to the fact that they are very difficult to catch or observe. In our study we were not only able to collect several dead water shrews, but we actually captured a live individual; a feat reserved for only the top and most esteemed researchers in the small mammal field. The water shrews were found at two no open water bogs and Morris Lake. These habitats may rouse interest for future research because the fens lacked open water and the lake was larger than the preferred water habitat of the water shrew (Kurta, 1995).

This area of the Great Lakes region is know to support around 23 different species of small mammals. My study was successful in capturing and identifying 15 species on the property. We can therefore conclude that the UNDERC property has a fairly healthy species richness.

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