Small Mammals of the Guthrie-Bancroft Farm - Year 2
Colby Hill Ecological Project, Lincoln and Bristol, Vermont

2001 Final Report

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Introduction

In 2000 we began a general small mammal inventory of the Guthrie-Bancroft land sampling ten different ecosystems (Decher and Kilpatrick, 2000). During the summer of 2001 the inventory focused on three of the original sites sampled in 2000 (Ecosystem 14, 20 and 25) and three new sites (ES 1, 9 and 18; see Fig. 1). The objective is to eventually narrow down the selection to three sites sampled by all monitoring teams of the different taxonomic groups which would allow a long-term monitoring and comparison of changes in flora and fauna presence and, for some taxa, abundance.

Materials and Methods

Between 19 June and 13 July 2001 we set between 28 and 32 Sherman live and Museum Special snap traps in linear traplines in 6 ecosystems. This year traps were set for four instead of three trapnights (exception: ES 20 - 3 nights) totalling 692 trapnights (Table 1.1). Additionally a driftfence connecting seven pitfall traps was set up in each ecosystem. All captured animals were identified, sexed and weighed and then released, except for a few voucher specimens. Saliva samples ("mouth washes") were taken from all *Peromyscus* captured for identification to species level. This year, we also recorded some microhabitat data at all trap stations where an animal had been caught. Data recorded were: canopy cover, distance and diameter of nearest tree, distance and diameter of nearest fallen log, slope (three grades: level - slight incline - steep incline), and a percent estimate of ground cover types (herbaceous, bare soil, rock, grass, and leaf litter) taken at every trap where a mammal was captured.

As before, bat nets, including one canopy net, were placed during 3 nights in presumed flyways, across forest trails perpendicular to the forest edge or in hedgerow opening on the meadow part of the Guthrie-Bancroft parcel. Two additional attempts at netting bats had to be abandoned due to unfavorable weather conditions.

Results

Small Mammal Captures and first two-year Trends

Table 1.1 shows an overview of the 2001 results. 2000 results are included for the re-trapped ecosystems. 251 captures (including recaptures) were made during 692 trapnights. Overall trapping success of 36% was significantly higher than in 2000 (20.6 %). In all three resampled ecosystems (ES 14, 20 and 25) trapping success in 2001 was significantly higher than in 2000. Except for the meadow jumping mouse (*Zapus hudsonius*; ES 20 (very poorly drained alder-willow shrub swamp/sedge meadow complex)) all species encountered in 2000 were also found in 2001. Only one additional species, the red squirrel (*Tamiasciurus hudsonius*) was added to the list of trapped rodents with one specimen captured in ES 20. However *T. hudsonius* was also frequently observed in other ecosystems in both years. After the addition of *T. hudsonius* the species accumulation curve in 2001 leveled out again at 11 trapped species (Fig. 2).

Small mammal diversity (Table 1.2) calculated with Simpson's Index (1-D) was greatest in Ecosystem 18 (poorly drained red maple-yellow birch swamp) with 5 species caught. Diversity calculated with the Shannon-Wiener Index was greatest in ES 25 (small, intermittent, cold, mountain stream and poorly drained open/woodland seep) also with 5 species caught. The diverging results probably stem from the differential weighing of abundances of individual species when using one or the other diversity index. Note that two habitats (ES 9 and 14) actually had 6 species but did not register as high in the Simpson's and Shannon-Wiener diversity indices because they had one or two very dominant species.

Small mammal biomass (Table 1.3) based on average weights of species caught was again used as a measure of productivity in the ecosystems. The highest biomass was calculated for ES 9 (somewhat excessively drained, acid knoll, red spruce-hardwood forest) (893.9 g / 100 trapnights) the lowest in ES 25 (556.5 g / 100 trapnights).

Pitfall traps yielded only two shrews in 2001, despite a more consistent effort to establish pitfalls and driftfences in every ecosystem. One *Sorex cinereus* was caught in a pitfall in ES 9 on 22 June and one *Blarina brevicauda* in ES 14 (poorly drained spruce northern hardwood forest) on 19 June 2001. The northern short-tailed shrew (*B. brevicauda*) was caught in two of the resampled ecosystems (ES 14 and 20), where we had not caught it in the previous year, indicating considerable fluctuations of this

species between years (Fig. 3 and Appendix II). Figure 3 reveals that overall patterns were retained in the two years in resampled ES 14, 20 and 25. Dominant or characteristic small mammal species remained the same, although *Peromyscus* sp. captures almost doubled in 2001. In ES 25 that was most certainly due to the second perpendicular trap line we added, which would also account for the appearance of *Clethrionomys* in 2001.

Microhabitat data summarized by Ecosystem

Microhabitat data are summarized by ecosystem in Table 2. Ground cover percentages are also illustrated in Figure 4. ES 1 (well-drained, south/west-aspect, red oak-northern hardwood forest) had the densest leaf litter ground cover (79.5%) and tied with ES 9 (-somewhat excessively drained, acid knoll, red spruce-hardwood forest) for highest trapping success (42%). ES 9 had the highest canopy cover (53.4%), steepest slope and largest percentage of rocky ground due to the rocky outcrop that partly characterizes this ecosystem. ES 9 tied with ES 14 (poorly drained red spruce-northern hardwood forest) for the highest number of species trapped (6). ES 14 had the largest average diameter of downed logs (16.8 cm) and the highest percentage of bare soil ground cover. There are many fallen trees with overturned rootballs in this ecosystem. ES 18 (poorly drained red maple-black ash swamp) had the second highest leaf litter density (47.4%) and second highest canopy cover (45%). Because of its open wetland nature, ES 20 (alder swamp/sedge meadow (former beaver pond)) had the highest percentage of herbaceous ground cover (70%), the lowest canopy cover (10%) and the widest log dispersion (5m). Finally, ES 25 (small, intermittent, cold, mountain stream and poorly drained open/woodland seep) had the highest percentage grass/sedge ground cover (13.3%) and the smallest downed log diameters (8.5%).

Microhabitat Data Summarized by Species

Microhabitat data are summarized by species in Table 3. Average groundcover percentages are illustrated in Figure 5. The shrews *Blarina brevicauda* and *Sorex cinereus* tie for being associated with the largest downed logs (12.95 cm average diameter) and with the second-highest percentage of bare soil (12.91%) at their trap sites. Deer and white-footed mice (*Peromyscus* sp.) appear to be found most often close to trees (0.85 m) and are associated with the highest leaf litter density of all species (56.4%). The woodland jumping mouse, *Napaeozapus insignis,* was caught in places with the largest percentage of bare soil (14.6%; e.g. creek bed in ES 25). The meadow vole (*Microtus pennsylvanicus)*, as its common name implies, was associated with the

highest percentage of grass (18.57%) or other herbaceous cover (65%) at its trap sites. The red-backed vole (*Clethrionomys gapperi*) had the highest percentage of rocky groundcover (7.5%), the second highest leaf litter (51.25%) and canopy cover (43.3%) on its trap sites. The chipmunk (*Tamias striatus*) was the species captured closest to trees (0.4 m) and displayed the second highest association with leaf litter (51.3%).

Correlations Between Habitat and Animal Data in the Ecosystems

Table 4 indicates that there is a strong positive correlation ($r^2 = 0.929$) between the percentage of grass ground cover and the Shannon-Wiener diversity index. There are strong negative correlations between the abundance of mice of the genus *Peromyscus* and Simpson's or Shannon-Wiener index of diversity and between *Peromyscus* and the percentage of grass ground cover. Leaf litter shows a strong positive correlation with *Peromyscus* abundance and a fairly strong negative correlation with small mammal diversity. There were no strong predictors for the presence or absence of the shrew *Blarina brevicauda,* which occurred in all habitats, although this shrew is somewhat more common in habitats ES 14 and ES 25 that seem to have higher soil moisture. According to Whitaker and Hamilton (1998) *B. brevicauda* requires 100% saturation in its burrows.

Bats

No bats were captured in 2001 possibly because of unfavorable weather conditions during serveral nights when nets were set. However, during annual winter surveys of hibernation sites on 28 January 2002 one of us (CWK) found 159 individuals of the endangered Indiana bat *(Myotis sodalis)* in an abandoned mine near Brandon, Vermont. In June 2001 five Indiana bats were fitted with transmitters in Cornwall and Salisbury townships. 25 individuals were captured in July at Orwell near Vergennes. All these occurrences not far from Lincoln give rise to the hope that this species will eventually be found foraging on the study site.

Other observations

A bull moose (*Alces alces*) was sighted for the first time by this survey team at the edge of the open meadow on 17 July 2001 (see Figure 1). On 20 June 2001 a female red backed vole *(Clethrionomys gapperi)* was caught in ecosystem nine who had given birth to five young in the Sherman live trap. All six were released and a digital recording was made of the female retrieving her young into the safety of a rotted log (see movie footage at: http://www.uvm.edu/~jdecher/ RedbackedVole.mov). On the same day a young

porcupine (*Erethizon dorsatum*) was observed and filmed climbing a leaning poplar tree in Ecosystem 14 (see movie footage at: http://www.uvm.edu/~jdecher/Porcupine.mov). We also verified the presence of beaver in ES 20 by finding newly clipped branches and small trees. No bears were observed by the small mammal team in 2001.

Discussion

A comparison of the resampled ecosystems (ES 14, 20 and 25) in Table 1.1 shows that there are considerable fluctuations in capture rates and trapping success between years, and some species (e.g. *Zapus hudsonicus* in ES 20) are not caught every year. Fluctuations may be due to differences in seasonal weather from year to year. Snowfall, for example, may protect small mammals from predators such as weasels, thus seasonally influencing population cycles (Merritt *et al.*, 2001).

Microhabitat data recorded at all capture sites this year are a first attempt to correlate some microhabitat features with the presence or abundance of certain small mammal species. Most of the correlations appear weak because they are based on only six ecosystem averages. A long-term objective should be to begin to use more detailed vegetation, physiographic,and edaphic data gathered by the ecosystem classification team on some of the same sites, to obtain stronger correlations.

The "well-drained, steeply sloping beech-maple-red oak-sweet birch forest" (ES 1) has less small mammal diversity, perhaps because of its "less extensive herb species richness and herb coverage" (Lapin, 2000) compared to areas with more diverse microhabitat due to rocky outcrop (ES 9) or due to "impeded drainage and hummock-hollow microtopography" such as in ES 14 (Lapin, 2000), which are related, perhaps, to a more intense natural disturbance dynamic.

Some patterns already begin to emerge from our 2-year effort that allow for a more precise description of the small mammal communities than those recently published for the "Natural Communities of Vermont" (Thompson and Sorenson, 2000). Appendix 1 summarizes some of these relationships.

Acknowledgements

Funding for this study was provided by the Colby Hill Fund. Thanks to Elissa Arnheim for field assistance in 2001. We are once again grateful to land owners Lester and Monique Anderson for allowing us to use their cabin and garden shed at Well's Place.

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Appendix I

Descriptions and summary comments of small mammal findings for ecosystems sampled in 2001

Ecosystem descriptions are based on M. Lapin (2000) with the nearest equivalent natural community from Thomson and Sorenson (2000) in parentheses.

ES 1 = Well-drained, steeply sloping, fine sandy loam spodosol beech-maple-red oak-sweet birch forest (*mesic red oak hardwood forest*). - This habitat had by far the highest leaf litter ground cover (79.5%) and the highest density of mice of the genus *Peromyscus*, but lowest small mammal diversity.

ES 9 = Somewhat excessively drained, acid knoll, fine sandy loam spodosol, red maple, red oak-red spruce forest. (*northern hardwood forest.*). - This habitat had the highest canopy cover, highest percentage of rocky groundcover (15.5%) the highest number of species (6), highest mammalian biomass and highest number of red-backed voles (*Clethrionomys).*

ES 14 = Somewhat poorly drained, gently sloping, stony silt loam to fine sandy loam inceptisol, red spruce-balsam fir-hemlock-yellow birch (*spruce-fir northern hardwood forest).* - High number of species (6), highest percentage of bare soil (16.7%), and highest number of the large shrew *Blarina* (which was absent the first year!) characterize our findings in this habitat.

ES 18 = Poorly drained, level, mucky silt loam to loam inceptisol, red maple-yellow birch swamp forest. (*red maple-black ash swamp).* - This habitat had a relatively high diversity, and the second highest number of red-backed voles.

ES 20 = Very poorly drained, level, muck over stony sandy loam inceptisol, alder-willow shrub swamp/sedge meadow (*Alder swamp/sedge meadow complex*). - This edge of a former "beaver pond" with abundant touch-me-not (*Impatiens*), and goldenrod (*Solidago* sp.) had the highest herbaceous cover and lowest canopy cover making this the most open habitat with a constant presence of the meadow vole (*Microtus pennsylvanicus*) in both years.

ES 25 = Intermittent, small, mid-elevation, cold, headwater mountain stream and open/woodland seep. - We used two perpendicular traplines here this year with one trapline reaching into the neighboring Ecosystems 16 at the south end and 2 to the east of this stream/wetland area. ES 25 is somewhat characterized by the abundance of *Napeozapus insignis* which was most often caught along the stream bed confirming habitat characterizations in the literature (Whitaker and Hamilton, 1998). *Microtus pennsylvanicus* was in the more extensive open herbaceous or grassy areas (ES 16).