Small Mammals of the Guthrie-Bancroft Farm - Year 16

Colby Hill Ecological Project, Lincoln and Bristol, Vermont

2024 Report – Christopher R. Gray

Summary

Small mammals were sampled from ecosystems ES1, ES6, ES14 and ES20 on the Guthrie-Bancroft Farm in Lincoln, VT between 18 July 2019–13 August 2024. A total of 101 captures from 948 trap nights were recorded with overall trap success at 10.7%. Seven different species of small mammals were captured. The *Peromyscus* spp. individuals captured are likely of the two species (*P. maniculatus* and *P. leucopus*) that are known in Vermont, but unable to morphologically distinguished in the field. The *Sorex* sp. individuals are likely a several species (*S. cinereus*, *S. fumeus* and *S. hoyi*) could not be morphologically separated. No new species were detected this year (pending the identifications from Zadock Thompson Natural History Collection (ZTNHC) of the University of Vermont), but rare and uncommon captures included one *Synaptomys cooperi* individual. *Peromyscus spp*. and *Myodes gapperi* were the most abundant small mammals making up 83% of the all the captures.

Introduction

2024 represents the 16th year of small mammal sampling at Colby Hill since 2000. There was a 5 year gap in sampling since the last time in 2019. Ecosystems (ES) 14 and 20 have been monitored for 16 years while ES 1 and 6 have been monitored for 15 years. Long-term studies of ecological systems are paramount in providing insights into processes that show annual variability, processes that are slow to manifest, proper natural resource management, and the conservation of biodiversity (Lindmayer et. al, 2012; Franklin, 1989). Cycles within a population of small mammals can only be observed through monitoring a site for multiple years (Krebs and Myers, 1974; Korpimäki and Krebs,1996; Hörnfeldt, 2004). Vermont Family Forest's minimal-management policy of its Colby Hill lands offers unique insight into small mammal population trends within wild areas subject to natural succession. Over the last 25 years, the small mammal surveys for the Colby Hill Ecological Project have yielded valuable data that will contribute to the state-wide small mammal project (Kilpatrick and Benoit 2011).

Materials and Methods

Small Mammal Trapping

79 traps (70 Sherman Live traps and 9 pitfall traps) were set in each sampled ecosystem (ES1, ES6, ES14, and ES20; Fig. 1). The 70 Sherman live traps were set in two trap lines. Trap line A was 18 stations 10m apart with 2 traps at each station (36 traps total). Trap line B was 17 stations 10 m apart with 2 traps at

each station (34 traps total). ES1 and ES6 were trapped concurrently from July 19-21, 2024. ES14 and ES20 were trapped concurrently from August 11-13, 2024.

The traps were set for three consecutive nights resulting in 237 total trap nights at each ES. Traps were closed after trap check in the morning and reopened in the late afternoon. The tradeoff of the traps being closed during the day will reduce the sciurid captures, but reduce mortality from small mammals being in the traps for extended periods of time. The traps were baited with "old fashioned" oatmeal and peanut butter.

Field work was carried out under the guidelines from the American Society of Mammalogists (Sikes et al. 2011, Wilson et al. 1996). Each captured individual was sexed, weighed, aged (placed in categories: juvenile, subadult, or adult), assessed for reproductive status (placed in categories: Vimp=vagina imperforated, Vperf=vagina perforated, Lac=Lactating, Preg=Pregnant, Tnd=testes not descended, and Tdc=testes descended) and inspected for presence of ectoparasites. All individuals (excluding shrews) were marked with a rodent ear punch (National Band & Tag Company, Newport, KY) to identify recaptures.

During the trapping of ES14 and ES20 (11-13 August 2024), Carlos Amissah, a graduate student from the University of Vermont, accompanied Chris Gray to learn proper techniques for small mammal trapping. In addition, Carlos is planning on studying tick borne diseases for his graduate work so the ear punches to mark small mammal captures were collected and preserved in a 70% ethanol solution. In addition, any tick parasites observed while small mammals were being processed were collected opportunistically and preserved in 70 ethanol. These ear punch and tick specimens will serve as a sort of pilot study for Carlos's graduate studies.

Several individuals (including the ones that perished in the traps overnight) of *Peromyscus* sp. (n=3), *Myodes gapperi* (n=13), *Blarina brevicauda* (n=8), and *Sorex* sp. (n=3) were kept as voucher specimens. These specimens are permanently preserved in the Zadock Thompson Natural History Collection (ZTNHC) of the University of Vermont.

Results and Discussion

Population Trends

A total of 101 individuals from were captured for the four ES (see Table 1). This year's overall trap success was 10.7%, which is a significantly lower trap success than the average year. Per usual, the highest species diversity was found in ES20 with six species, while the all of the remaining ES had a diversity of four species each. The solo rare species capture included one Southern Bog Lemming (*S. cooperi*). This capture was the first time that a Southern Bog Lemming has been captured in ES6, which is a seepy terrain rich northern hardwood forest. This year represented low captures of all species except *Peromyscus spp.* (n=63) and *M. gapperi* (n=21). These two species accounted for 83% of all captures. Acorn mast crops were poor throughout Vermont and beechnut mast crops were variable in Central Vermont in 2023 could explain the lower small mammal adundance during 2024 sampling (VTFWD, 2023). Small mammal populations often experience boom-bust cycling that is typically observed every 5-7 years, which would correspond with low observed capture rates at Guthrie-Bancroft in 2013, 2019, and this year in 2024.

Two rodent botflies (*Cuterebra sp.*) were observed on *Peromyscus* spp. and two ticks were collected off of *Peromyscus* spp.

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Small Mammals of the Guthrie-Bancroft Farm - Year 12

Colby Hill Ecological Project, Lincoln and Bristol, Vermont

2016 Final Report

Summary

Small mammals were sampled from ecosystems 1, 6, 14 and 20 on the Guthrie-Bancroft parcel on Colby Hill, Lincoln between July 15 – August 7, 2016. A total of 266 captures from 948 trap nights were recorded with overall trap success at 28.1%. At least 9 different species of small mammals were captured considering the two *Peromyscus* species could not be morphologically identified. Two *Peromyscus sp.* were sequenced and identified as *P. leucopus* based on Cytochrome *b*. No new species were detected this year. *Peromyscus sp.* and *Myodes gapperi* were the most abundant small mammals making up 91% of the all the captures.

Introduction

2016 is the 12th year of small mammal sampling in Colby Hill since 2000 with regular annual sampling since 2011. Ecosystems (ES) 14 and 20 have been monitored for 12 years while ES 1 and 6 have been monitored for 11 years. Long-term studies can yield valuable information on ecological processes that are slow to manifest, rare phenomena, processes that show annual variability and other complex processes that require large amounts of observational data (Franklin 1989). Population cycles that may occur in small mammals can only be observed by monitoring a site for multiple years (Krebs and Myers 1974; Korpimäki and Krebs 1996; Hörnfeldt 2004). Over the last 16 years, the small mammal surveys for the Colby Hill Ecological project has yielded valuable data that will contribute to the state-wide small mammal project (Kilpatrick and Benoit 2011).

Materials and Methods

79 traps (70 Sherman and 9 pitfall) were set in each sampled ecosystem (ES1, ES6, ES14, and ES20; Fig. 1). The 70 Sherman live traps were set in two trap lines (A and B) of 35 traps each. The traps were set for three consecutive nights resulting in 237 total trap nights at each ES. The traps were baited with “old fashioned” oatmeal.

Field work was carried out under the guidelines from the American Society of Mammalogists (Sikes et al. 2011, Wilson et al. 1996). Each captured individual was sexed, weighed, aged (placed in categories: juvenile, subadult, or adult), assessed for reproductive status and inspected for presence of ectoparasites. *Peromyscus* Individuals were marked with a rodent ear punch (National Band & Tag Company, Newport, KY) to identify recaptures.

Several individuals (including the ones that perished in the traps overnight) of *Peromyscus* sp. (n=8), *Myodes gapperi* (n=4), *Microtus pennsylvanicus* (n=1), *Napaeozapus insignis*, *Tamias striatus* (n=3), *Tamiasciurus hudsonicus* (n=1), *Blarina brevicauda* (n=3), *Sorex cinereus* (n=1), and *Mustela erminea* (n=1) were kept as voucher specimens. These specimens are permanently preserved in the Zadock Thompson Natural History Collection (ZTNHC) of the University of Vermont.

DNA was extracted from three specimens of *Peromyscus* collected in the summer of 2016 from the following localities at the Colby Hill, Guthrie-Bancroft ParcelES6 (n=3). The first third segment of the mitochondrial Cytochrome *b* gene was amplified and sequenced to differentiate between the *Peromyscus* spp. Readable sequences were obtained for 2 extractions and the resulting sequences were aligned against reference sequences of *Peromyscus leucopus* (DQ000483) and *Peromyscus maniculatus* (JF489123) taken from GenBank.

Results and Discussion

In 2016, we made 266 captures in total out of 948 trapnights, which translates into 28.1% trap success rate (Table 1). This year's trap success rate was almost double of last years (13.3%) and slightly higher than the overall trap success (23.1%) (Table 2). We had the most success trapping in hardwood forests of ecosystems 1 and 6 with trap success at 38.0% and 40.5% respectively (Table 1). No new species were detected in 2016 (Fig. 2). We detected 9 species in the four ESs with the highest diversity (number of species detected) observed in Ecosystem (ES) 1 and 20 with 6 species (Table 1). *Blarina brevicauda*, *Myodes gapperi*, and *Peromyscus* sp. were captured in all ESs, whereas *Microtus pennsylvanicus, Mustela erminea*, *Sorex cinereus*, and *Tamiasciurus hudsonicus* were only captured in a single ES (Table 1). The two *Peromyscus* spp., that we were able to sequence, were identified as *P. leucopus* (Table 3).

The most common small mammal species (*B. brevicauda*, *M. gapperi*, *Napaeozapus insignis*, and *Peromyscus* sp.) show marked annual variation in abundance (Fig. 3). The year 2016 is the record for the number of *Peromyscus* sp. caught (187). *Peromyscus* sp. were especially abundant in ES 1 and 6 (Table 1). However, the number of captures of *B. brevicauda*, and *N. insignis* has been comparatively low over the past 4 years. The relatively dry summer may have contributed to the lower abundance of shrews. Small mammal populations tend to fluctuate on a year to year basis. Long-term studies in northern Europe and Arctic tundra of voles and lemmings have shown 3 to 5 year cycles in population rise and fall while most famously the snowshoe hares in North America display 9 to 10 year population cycles (Hansson and Henttonen 1988; Keith 1990; Stenseth and Ims 1993; Norrdahl 1995; Korpimäki and Krebs 1996; Stenseth 1999; Krebs et al. 2001; Korpimäki et al. 2005). Environmental factors along with population density, resource availability, and predation pressure can drive population fluctuations on a year to year basis.

In terms of microhabitat variables, most small mammals were caught less than 1m from a log, less than 2m from a tree, and preferred areas with high canopy cover (>75%) (Fig. 5). The meadow vole (*Microtus pennsylvanicus*) was the only small mammal that was regularly captured in areas with canopy cover less than 50%. Most rodents were captured in areas with some amount of woody debris (>10%) and herbaceous cover (>10%). Shrews (especially *Blarina brevicauda*) preferred habitats with high leaf cover (>50%) (Fig. 5). ES 20, with the beaver pond meadow and a nearby rock wall, was very different in terms for high rock and grass cover along with low canopy and leaf cover.

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