Abundances of Small Mammals in Algonquin Park 2015 Report

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Executive Summary

The abundances of small mammals have been monitored in Algonquin Provincial Park since 1952, which represents the longest study of forest small mammals in North America. This report provides information on the activities and findings from the sixth season of research under the direction of Andrew McAdam and covers data collection between May 4, 2015 through August 26, 2015. All 17 long-term traplines were live-trapped for eight biweekly trapping sessions for a total of 8116 trap-nights. The overall number of captures on all 17 lines decreased from 2014 and 2015 represented a low to moderate year for overall small mammal abundances in Algonquin Park. Red-backed voles were captured more frequently than deer mice and all other species of small mammals and comprised 33% of all captures. Deer mice were the next most abundant (29% of all captures) followed by chipmunks (17%) and jumping mice (10%). 2015 represented the 63rd year of data collection on small mammal abundances in Algonquin Park. This unique monitoring program allows for the identification of long-term trends in small mammal abundances as well as providing information on the abundances of important mammalian consumers in the Algonquin forest ecosystem.

Background

Small mammals represent an important component of forest ecosystems and changes in the abundances of small mammal species can provide biological indicators of ecosystem integrity and can be used to monitor responses to large-scale environmental changes, such as climate change. Studies in unmanipulated and relatively intact tracts of forest can also be used as a baseline for quantifying the impacts of various land use practices.

The abundances of several small mammal species have been monitored in Algonquin Provincial Park since 1952, representing one of the longest small mammal studies in North America. This work was initiated by J. Bruce Falls from the University of Toronto and was continued by Ronald J. Brooks from the University of Guelph between 1989 and 2008. Live-trapping of small mammals has taken place in a relatively consistent fashion at 17 fixed locations surrounding the Wildlife Research Station near Sasajewun Lake, Algonquin Provincial Park, Ontario. Ten of these traplines (Falls Lines) have been monitored since 1952 with the exception of 1988 when no trapping took place. These original ten Falls Lines were placed in only hardwood forest, cut-over mixed deciduous forest, dense mixed deciduous forest or mixed coniferous forest. As a result, 12 new lines were added in a variety of coniferous habitats in 1991. Six of these lines and one original Falls Line were removed in 1992. In 1994 trapping on all of the original Falls lines resumed and one line in a pine plantation was added. As a result, the 17 traplines that have been monitored consistently since 1994 represent 10 Falls lines that were initiated in 1952, six coniferous lines started in 1991 and one line in pine plantation that was started in 1994.

In 2009, responsibility for this long-term project was transferred to Andrew McAdam at the University of Guelph. This report provides information on the activities and findings from the seventh season of research under the direction of

Andrew McAdam and covers the period from May 4, 2015 through August 26, 2015.

Activities

General Methodology -- A total of 17 small mammal traplines were monitored biweekly between May 4, 2015 and August 26, 2015. Traplines consisted of 10 pairs of traps placed at 10m intervals along each transect (20 traps per transect in total). Each trapline was trapped for three consecutive nights in each trapping session. The traps were baited with water-soaked sunflower seeds and a small amount of polyester bedding was provided for warmth. Traps were set just prior to sunset and were checked the following morning soon after sunrise. Traps were disassembled after being checked so that no animals were captured during the day.

In 2015, we continued an experiment that was initiated in 2013. In this experiment we are testing the effects of mealworms (*Tenebrio molitor*) as a bait supplement and the effects of two different types of traps on shrew mortality and overall capture success. Including mealworms as a bait supplement has previously been found to reduce accidental shrew mortality during livetrapping (Do et al. 2013), but the effects of this supplement on capture success has not yet been fully tested. In addition, there is some evidence to suggest that Sherman live traps might have higher rates of accidental shrew mortality than Longworth live traps (Shonfield et al. 2013). We sought to test the effects of a mealworm bait supplement and the two trap types on both accidental shrew mortality and capture success. This experiment was implemented by placing one galvanized steel Sherman live trap (7.5cm x 7.5cm x 30.5cm) and one Longworth live trap at each trapping station. Half of the Sherman traps were also fitted with elastic bands to assess the effects of trap noise on shrew mortality. In addition, half of all traps on each trapline were baited as described above, which

represented a control and half of the traps were also provided with approximately 4g of freeze-killed mealworms.

Mammals captured during each live-trapping session were weighed, marked with small metal ear tags (Monel #1, National Band and Tag Company) and their age juvenile or adult), sex and reproductive condition were assessed by visual inspection. Species captured included deer mice (*Peromyscus maniculatus*), eastern chipmunks (*Tamias striatus*), red squirrels (*Tamiasciurus hudsonicus*), woodland jumping mice (*Napaeozapus insignis*), meadow jumping mice (*Zapus hunsonius*), red-backed voles (*Myodes gapperi*), and northern flying squirrels (*Glaucomys sabrinus*). No southern flying squirrels (*Glaucomys volans*), meadow voles (*Microtus pennsylvanicus*), or rock voles (*Microtus chrotorrhinus*) were captured in 2015. Sorex shrews (*Sorex spp.*) and short-tailed shrews (*Blarina brevicauda*) were released immediately upon identification and were not tagged to minimize the risk of mortality. All animals were released at the point of capture after handling.

Trapping Effort -- Each trapline was trapped for seven or eight sessions (see Table 1). In some instances hazardous weather and bear activity on the lines prevented the setting of some lines on some nights. Overall, this trapping effort corresponded to between 478 and 1305 trap-nights per habitat type and a total of 7520 trap-nights. In each case the number of trap-nights was the total number of traps set minus the number of traps that were falsely sprung or disturbed (Table 1).

Table 1. Summary small mammal abundances on each of the 17 long-term transects in Algonquin Provincial Park during 2015. Each trapping session consisted of three consecutive nights of trapping. Note that some traplines were not set on some nights because of hazardous weather or bear activity.

Trapping Line	Habitat	Trapping sessions	Trap-nights[1]	Total Captures	Captures per 100 trap-nights
111, 112, 113	Sugar maple hardwood	8	1237	282	22.8
201, 202, 203	Cut-over mixed-wood	8	1305	256	19.6
303, 304	Dense mixed-wood	8	859	185	21.5
401, 402	Conifer	8	839	123	14.7
501, 503	White pine, white spruce	8	926	312	33.7
701, 703	Black spruce, aspen	8	935	273	29.2
801, 803	White pine, red pine	8	941	173	18.4
901	Pine plantation	8	478	14	2.9
Total			7520	1618	21.5

[1]The number of traps set has been reduced by the number of falsely sprung, and disturbed traps.

Findings

Overall Small Mammal Abundances – A total of 1618 small mammals were captured between May 4 and August 26, 2015 on all 17 traplines. Captures were converted to captures per 100 trap-nights to account for differences in trapping effort between years and between trapping areas (see 2009 report for a detailed examination of this approach). The total number of trap-nights was also corrected for falsely sprung and disturbed traps by subtracting the total number of these traps from the number set in the calculation of the number of trap-nights. The total trapping effort in 2015 was, therefore, 7520 trap-nights. Overall capture success was 21.5 captures per 100 trap nights in 2015. This was lower than the capture success of 2014, but was similar to 2008 and 2010, in which small mammal abundances were also low to moderate (Figure 1).

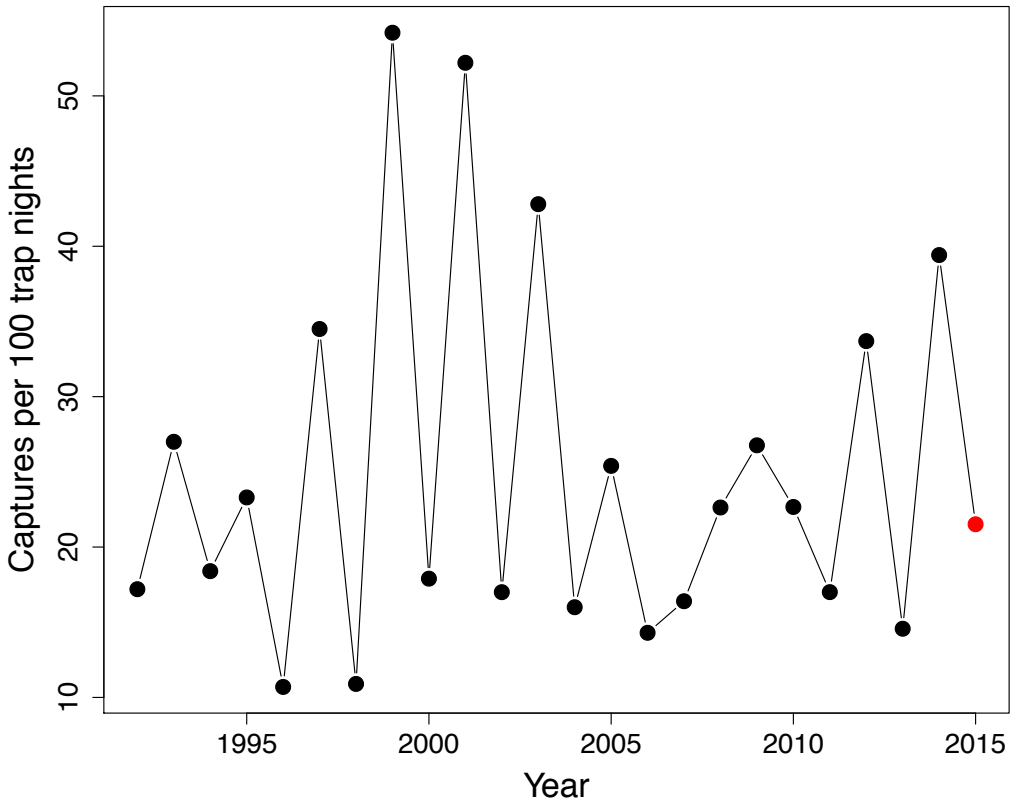

Figure 1. Abundance of small mammals in Algonquin Provincial Park captured on all 17 traplines between 1992 and 2015. Abundance was measured as the total number of small mammal captures per 100 trap nights. Data for 2015 are shown in red.

Relative Species Abundances on All Lines – Red-backed voles (33% of all captures) and deer mice (29%) were the most abundant small mammal species, followed by chipmunks (17%) and jumping mice (10%). Short-tailed shrews, *Sorex* shrews, red squirrels, and northern flying squirrels were also captured in 2015. No meadow voles or rock voles were captured in 2015.(Figure 2).

Small Mammal Abundances by Habitat Type -- Small mammals were most abundant on the white pine white spruce lines, because of many captures of red-backed voles. Small mammals were also abundant on the black spruce and aspen lines. Abundances are typically high on the sugar maple hardwood, dense mixed-wood, and cut-over mixed-wood traplines, but abundances were lower on

these lines in 2015. The pine plantation had the lowest number of captures of all traplines by far, but these numbers were higher than in many previous years (see Tables 1-2).

Table 2. Total captures of 10 small mammal species in each of 8 habitat types during 2015.

Habitat	DM	CM	RBV	WJM	MJM	STS	SHREW	RS	MV	RV	NF	Total Captures	Trap-nights
Sugar maple hardwood	92	122	2	53	0	12	1	0	0	0	0	282	1237
Cut-over mixed-wood	125	16	71	15	2	2	22	3	0	0	0	256	1305
Dense mixed-wood	69	19	76	3	0	0	14	4	0	0	0	185	859
Conifer	13	13	44	27	1	0	18	7	0	0	0	123	839
White pine, white spruce	74	41	156	14	0	2	18	7	0	0	0	312	926
Black spruce, aspen	41	19	177	4	0	0	27	3	0	0	2	273	935
White pine, red pine	48	49	2	49	0	2	23	0	0	0	0	173	941
Pine plantation	6	2	3	0	0	0	0	1	0	0	2	14	478
Total	468	281	531	165	3	18	123	25	0	0	4	1618	7520

Abbreviations: DM deer mice; CM eastern chipmunks; RBV red-backed voles; WJM woodland jumping mice; MJM meadow jumping mouse; STS short-tailed shrews; SHREW Sorex shrews; RS red squirrels; MV meadow vole; RV rock voles; NF northern flying squirrel.

Deer mice were most common on the cut-over mixed-wood lines but were also commonly caught on the white pine white spruce, dense mixed-wood and sugar maple hardwood lines. Chipmunks were most commonly captured on the sugar maple hardwood lines. Red-backed voles were most common on the white pine white spruce, and black spruce aspen traplines.

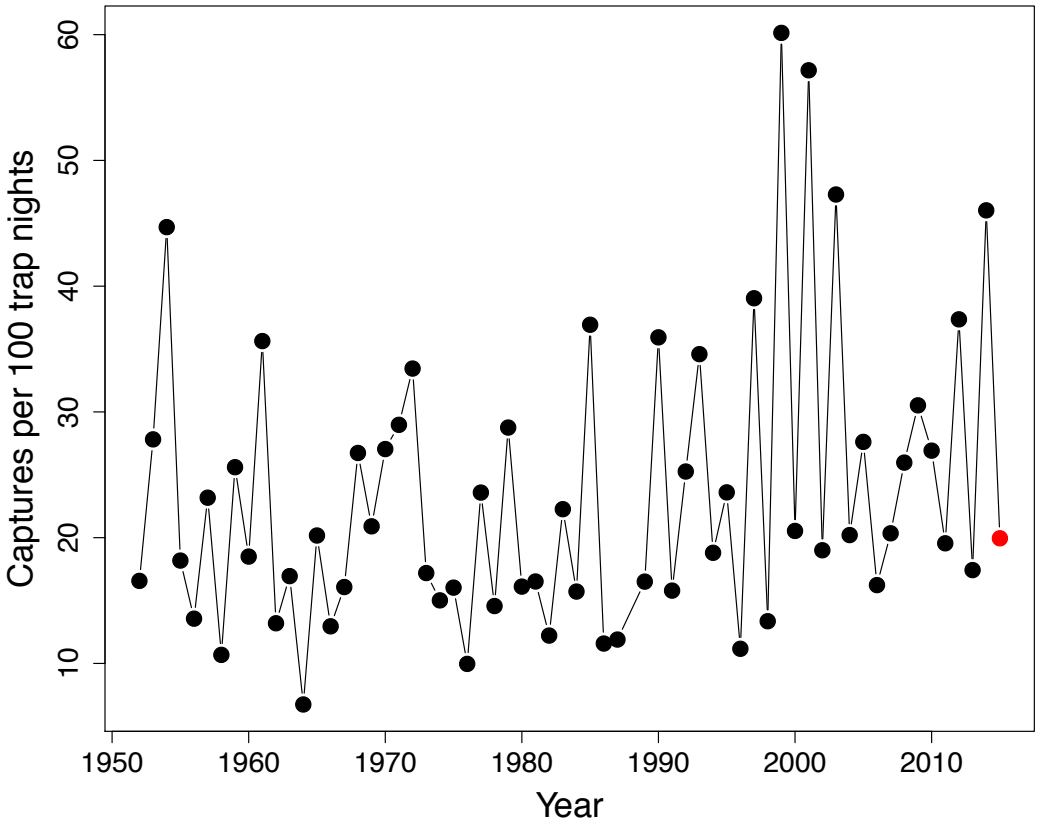

Figure 3. Abundance of small mammals on 10 long-term traplines in Algonquin Provincial Park between 1952 and 2015. Abundance was measured as the total number of small mammal captures per 100 trap nights. Data for 2015 are shown in red.

Long-term trends in small mammal abundances - In the context of the past 63 years, 2015 represented a moderate year for small mammal captures on the 10 long-term Falls Lines (49th percentile; Figure 3). The number of captures of all small mammals on the 10 Falls Lines (20 captures per 100 trap-nights) was slightly less than average number of captures on these lines between 1952 and 2014 (23.4 captures per 100 trap-nights).

Small Mammal Abundances by Species – Nearly all small mammal species were less abundant in 2015 than 2014. Red-backed voles increased slightly compared to 2014. Only woodland jumping mice increased substantially. Woodland jumping

mice were very low in abundance for the past 3 years, but are now moderate in abundance.

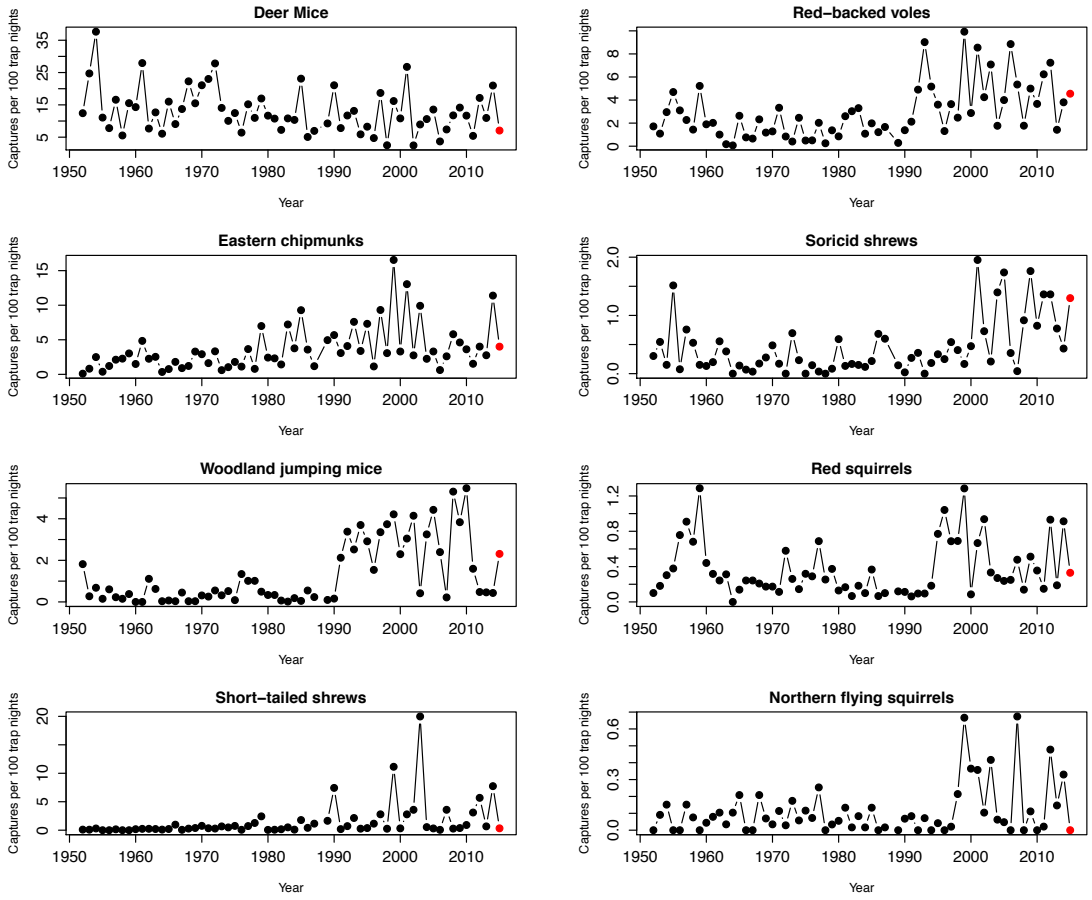

Figure 4. Abundance of eight small mammal species in Algonquin Provincial Park between 1952 and 2015. Abundance was measured as the total number of small mammal captures per 100 trap nights. Data for 2015 are shown in red. Note that the scales of the vertical axes differ in each plot.

Discussion and Synthesis

The continued monitoring of small mammals in Algonquin Park on the long-term transects established by Bruce Falls in the 1950's represents one of the longest small mammal studies in the world. Consistent long-term data collection, such as this, provides important baseline information that can be used to detect the

effects of long-term environmental changes, such as climate change, or the immediate impacts of a short-term disturbance. The 2015 season represented the seventh year of data collection on this long-term project by Andrew McAdam and his crew from the University of Guelph.

Following 2014, which was a year of high small mammal abundance, small mammal abundances returned to moderate levels. Almost all species exhibited substantial declines in abundance compared to 2014, except for red-backed voles which increased slightly (and were the most abundant small mammal) and woodland jumping mice, which returned to moderate abudnances after three years of very low abundances.

During 2015, our team also continued our experimental trapping protocols in which we interspersed Sherman and Longworth traps and baited half of all traps with sunflower seeds and the other half with sunflower seeds and mealworms. The mealworm bait supplement was previous found to substantially reduce shrew mortality during live-trapping (Do et al. 2013). Sherman traps also appear to have higher rates of shrew mortality than Longworth traps (Shonfield et al. 2013; see McAdam report from 2013). For the past two years we have experimented with some simple modifications that could be made to Sherman traps to make them quieter to close - we suspect that the noise of the door closing contributes to shrew mortality in Sherman traps. Data from these experiments are currently being analyzed.

The 62 preceding years of data from these traplines provides an extremely valuable context within which the results from 2015 can be interpreted. It is clear that small mammals fluctuate greatly in abundance over short time scales and that patterns in the dynamics of several species can appear to be relatively consistent for several years or decades, but not persist over longer time scales. As a result, less extensive studies focused on a restricted time period might have led to findings that would not have applied well to more recent time periods. The maintenance of this long-term study will, therefore, continue to provide a unique

and important perspective on the abundances of small mammals in Algonquin Park that will serve as an important baseline against which the effects of short-term and long-term environmental changes can be judged.

References

Do, R., J. Shonfield, and A.G. McAdam. 2013. Reducing accidental shrew mortality associated with small-mammal livetrapping II: a field experiment with bait supplementation. *Journal of Mammalogy*, **94**: 754-760.

Shonfield, J., R. Do, and A.G. McAdam. 2013. Reducing accidental shrew mortality associated with small-mammal livetrapping I: an inter- and intrastudy analysis. *Journal of Mammalogy*, **94**: 745-753.

Appendix 1 - Location of traplines.

UTM/UPS: NAD27 Canada, 17T, True North

Line	Station 1	Station 10	Description
111	688176 5047289	688238 5047327	Hwy 60 (north side) 6.8km west from the end of the Station road, two hydro poles west of westbound Cache Lake sign, near km 24 sign. Park near beginning of cliff.
112	688857 5047793	688888 5047872	Hwy 60 (north side) 5.8km west from the end of Station road, two hydro poles west from km 25, just west of highway guard rail, four hydro poles west of Track and Tower parking lot.
113	692292 5048834	692276 5048915	Hwy 60 (north side) 2.0km west from the end of Station road, east of hill crest between Highland Hiking trail and dump road, just west of highway guard rail.
402	693016 5049291	693035 5049201	Peewee lake (west side), path that starts on the west side of the beaver dam at the north-west end of the Highland Hiking trail parking lot.
303	693851 5050769	693819 5050843	WRS road (east side) 0.3km from the junction of the pavement and gravel road, on path that starts approximately 10m in front of white sign across from turn-around area.
401	693590 5050721	693581 5050790	Off Station road to Bat lake, take trail from the parking area down to the lake, trap line crosses trail approximately 30m east of lake.
304	693463 5051573	693438 5051632	Chit lake trail (west side), on path that branches off the main trail approximately 30m from Wolf cabin.
202	693568 5052221	693594 5052156	Chit lake trail (east side), on path that branches off the main trail approximately 600m from Wolf cabin, cross stream.

Line	Station 1	Station 10	Description
201	693745 5052585	693783 5052498	Chit lake trail (east side), on path (approximately 350m east of ridge line) that branches off of main trail approximately 1km from Wolf cabin (opposite path to line 203).
203	693496 5052407	693458 5052464	Chit lake trail (west side), on path that branches off the main trail approximately 1km from Wolf cabin (opposite path to line 201).
503	693943 5050164	693891 5050150	Hwy 60 (north side), west end of Two Rivers trail parking lot, take trail approximately 50m and follow trail leading west approximately 5m to station 1.
501	694211 5050198	694282 5050225	Hwy 60 (north side), 0.4km east of the end of Station road, three hydro poles east of Two Rivers trail parking lot, two hydro poles east of 31km sign.
901	698554 5050152	698519 5050070	Hwy 60 (south side), 5.2km east from the end of Station road, across from the Sanitary Station road, located in a pine plantation in the bottom of an old aggregate pit.
803	699361 5049618	699334 5049699	Hwy 60 (north side), 6.1km east from the end of Station road, rest stop parking lot (east of centre of the lot) located 1 hydro pole east of km 26.
801	699945 5049699	699961 5048990	Hwy 60 (south side), 7.0km east from the end of Station road, 30m east of km 37, across from Pog/ Whitefish Lake west bound sign.
701	704596 5051135	704654 5051097	Hwy 60 (south side) 12.2km east from the end of Station road, two hydro poles west from east bound Spruce Bog trail sign.
703	704710 5051147	704734 5051076	Hwy 60 (south side), 12.3km east from the end of Station road, beside east bound Spruce Bog sign.

Note: All trails are marked with pink flagging tape and/or red paint on trees (old markings).