Radio Telemetry of Southern Flying Squirrels at Brookhaven National Laboratory

BRADLEY BUCKALLEW[1] and JENNIFER HIGBIE[2]

Presbyterian College, Clinton, SC 29325

Brookhaven National Laboratory, Upton, NY 11973

Introduction

Southern flying squirrels are a common nocturnal small mammal found throughout the state of New York. Their range extends north to south from Maine to Florida and east to west from the coast to the Mississippi River. Using a skin membrane called a patagium, the southern flying squirrel is able to glide from tree to tree. It uses this ability to locate food ranging from carrion to insects, but it mainly feeds on nuts and acorns. It stores nuts and acorns in cavities of trees and also uses the cavities for day hides and nest. It breeds twice a year and the average litter size is three to four pups.

The abundance of southern flying squirrels on Brookhaven National Laboratory property was established in a previous study conducted in the summer of 2009. While the squirrels were ear tagged and recaptures made, not enough data was collected to establish an average home range for the squirrels on property. The purpose of this study is to determine the average home range by following the movements of a number of individuals. This will be accomplished through the use of radio telemetry.

Radio telemetry has been used in multiple studies to determine the home ranges of flying squirrels, both northern and southern. The reported home ranges from these studies vary from 2.45 ha for males and 1.95 ha for females to 16.03 ha for males and 5.88 ha for females. This great disparity could be due to a number of variables including geographic location, habitat, or season.

Materials and Methods

Trapping during the 2009 summer had shown the presence of southern flying squirrels and the two most successful areas in 2009 were chosen as the trapping locations in 2010. Twenty Sherman traps were split into two groups of ten and placed throughout the chosen locations. The traps were bait during the evening with a mixture of peanut butter and oats and checked early the following morning. Trapping was performed the second and third weeks of June with four trap nights per week.

If a squirrel was captured, it was anesthetized using isoflurane. One person handled the squirrel while another person ear tagged the squirrel and took measurements of the squirrel's tail length, hindfoot length, and total length while noting any markings or evidence of breeding. It was equipped with an ATS model M1420 radio collar. The squirrel was released back into the habitat where it was captured only after all the visible effects of the anesthesia had worn off.

Pinpoint tracking was used during the daytime hours because of its accuracy. A Yagi antenna and R-1000 Telemetry receiver (Communication Specialist, Inc) were used to track all the squirrels to their exact location. Each radio collar had a different frequency allowing individuals to be found separately. Each squirrel was found at least once per day. Triangulation was used during nighttime hours because of safety concerns. Overall, the movement of each squirrel was tracked for most of the 24 hour period with an average of 1 point per hour.

The data was then imported into ArcGIS ArcInfo 9.2 and analyzed. The mean center of the points was calculated to estimate the center of the squirrel's home range. The directional distribution of the points was then calculated at one standard deviation and two standard deviations as estimates of home range along with a minimum convex polygon. Points were then split into roosting and foraging groups based on the time they were taken. Roosting points were taken after 0530 hours but before 2030 hours while foraging points were taken during the remaining hours. The points were then connected and measured to get an idea of total movement and average nightly movement. Vegetative data was analyzed by overlaying the squirrels' minimum convex polygons with vegetative maps to determine the percentage of each vegetative type found within the squirrels' range.

Results

Seven individuals were captured over the course of 160 trap nights yielding a success rate of 4.375%. Six squirrels were successfully collared and released. The individual squirrels will be referred to based on their radio collar frequencies which were 149.281, 149.310, 149.370, 149.400, 149.431 and 149.460. The results from the GIS analyzes of home range and movement is displayed in the graph below.

Flying Squirrel GIS Data

	281	310	370	400	431	460	Average
Total Directional Distribution 2sd (hectares)	3.71	0.97	7.49	11.63	5.02	3.69	5.76
Total Directional Distribution 1sd (hectares)	0.93	0.24	1.87	2.91	1.25	0.92	1.44
Roosting Directional Distribution 1sd (hectares)	0.93	0.01	0.38	1.07	0.26	0.15	0.37
Foraging Directional Distribution 1sd (hectares)	N/A	0.48	2.97	2.96	1.94	1.55	1.98
Total Minimum Convex Polygon (hectares)	0.71	0.83	5.28	4.25	2.41	3.94	3.34
Total Distance Moved (meters)	379.63	1403.93	3077.54	2473.11	1712.97	2208.18	2175.15
Total Days Tracked	4	37	35	36	18	35	32.2
Longest Distance Moved Within 24 Hour Period (meters)	156.13	104.00	346.16	233.99	209.34	226.10	223.92
Elapsed Time	19h 20min	21min	16h 47min	10h 23min	56min	42min	
Longest Distance Moved Within 1 Hour Period (meters)	N/A	104.00	182.03	162.14	209.34	226.10	176.72
Elapsed Time	N/A	21min	1h	50min	56min	42min	

MCP Vegetation (Percentage)

	281	310	370	400	431	460
Pitch Pine/ Mixed Oak-Heath Forest	17.2	N/A	3.3	7.4	2.7	23.5
Scarlet Oak-Heath Forest	82.8	36.0	17.4	27.1	41.5	52.1
Successional	N/A	8.2	3.8	5.7	4.1	3.6
Red Maple/Scarlet Oak-Mesic Heath Forest	N/A	55.8	58.7	58.3	46.0	20.4
Pitch Pine/ White Oak Forest	N/A	N/A	2.5	0.0	N/A	N/A
Red Maple – Blackgum Wet Forest	N/A	N/A	14.2	1.5	4.2	0.5
Road	N/A	N/A	N/A	N/A	1.6	N/A

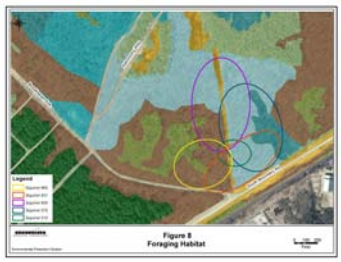
Discussion

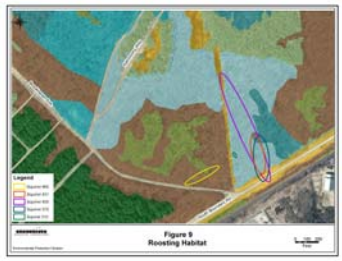
Home range sizes varied greatly between the individual squirrels, with the adult female having a far smaller home range than the juvenile males. A likely possibility is that she had a nest of young in the tree. Her home range could be smaller due to her having to care and protect her young, making her less inclined to venture farther away from the nest.

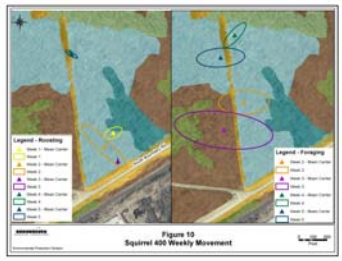
Toward the beginning of the study, squirrels 370, 431, and 460 were often found sharing the exact same day hides. Only toward the end of the study did they separate and establish their own day hides in different territories. An explanation for this is that they were siblings from the previous breeding season. They were most likely newly weaned from the nest early in the summer and as the summer progressed they spread out due to the developing food competition.

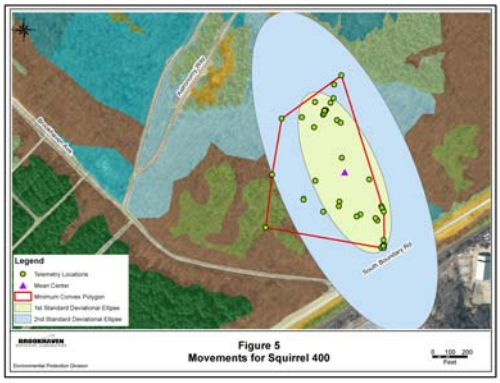
The roosting range and directional distributions for squirrel 400 in particular are very large. He moved a significant distance between weeks three and four, in terms of both roosting and foraging. This move supports the theory that the juveniles were competing for food resources because the foraging range of squirrel 400 was much lower in the weeks after his move north than it was in previous weeks.

The vegetative data shows a trend that the squirrels prefer scarlet oak-heath forest and red maple/scarlet oak-mesic heath forest to other vegetative types. The common link between these forest types is the scarlet oak, which could explain the preference since scarlet oak produces nuts that the squirrels consume. The abundance of hard mast in these forest types would provide a much larger food source for a foraging squirrel than other forest types dominated by other tree species.









Acknowledgements

I would like to thank the Department of Energy, Brookhaven National Laboratory, Science Undergraduate Laboratory Internship and the Office of Educational Programs. I would like to extend a special thanks to Jennifer Higbie for all her work teaching and helping me throughout this project. I would also like to thank Tim Green, Alex Mancuso, Brittany Hernon, Maria Brown, Rich Lagattolla and all the guys at building 528 for all their help.

References

[1] A. Godin, *Wild Mammals of New England*. Baltimore, MD: The Johns Hopkins University Press, 1977.

[2] Adams, Ian, Campbell, G. Douglas, Improved Radio-Collaring for Southern Flying Squirrels, *Wildlife Soc. B.*, 24:4-7, 1996.

[3] Bendel, Peter, Gates, J. Edward, Home Range and Microhabitat Partitioning of the Southern Flying Squirrel (Glaucomys volans), *J. Mammal.*, 68:243-255, 1987.

[4] Loeb, Susan, Chapman, Gregg, Ridley, Theodore, Sampling Small Mammals in Southeastern Forests: The Importance of Trapping in Trees, *Proc. Annu. Conf. Southeast. Assoc. Fish and Widl. Agencies*, 53:415-424, 1999.

[5] Taulman, J. F., Smith, K. G., Home Range and Habitat Selection of Southern Flying Squirrels in Fragmented Forests, *Mamm. Biol.*, 69:11-27, 2004