IDNR Wildlife Preservation Fund
Final Report

Monitoring a Flying Squirrel Population with Nest Boxes in a Fragmented Suburban Landscape

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Project Objective: The objective of the proposed study is to set up a series of nest box grids within fragmented woodlots on the SIUE campus to monitor the local flying squirrel population.

Project Description: We monitored populations of the Southern Flying Squirrel using nestboxes and live traps. We built 100 nest boxes and placed them randomly in forest patches on the SIUE campus. Nest boxes were checked periodically for the presence of flying squirrels. To date, we have observed only indirect evidence of their presence in the form of wear patterns on hard mast, shredded nesting material, and host-specific parasites. We are continuing to monitor boxes and are incorporating temperature data loggers as a way of detecting nest box activity. We are currently expanding our study to include the adjacent Bohm Woods Nature Preserve. In addition, we have tested primers on flying squirrel specimens from the Midwest to facilitate studies of relatedness.

Project Accomplishments:

Introduction

Southern flying squirrels (*Glaucomys volans*) are small, cavity-nesting rodents found throughout the eastern United States and parts of Central America (Dolan and Carter, 1977). They are a highly gregarious species that form nest groups (Layne and Raymond, 1994). These groups have been categorized into two basic types: 1) related family groups and 2) unrelated adult groups (Winterrowd and Gergits, 2005). To date, studies of relatedness in *G. volans*, have been limited to populations from mixed hardwood-pine forests in the southern United States, a forest type not representative of the habitat found over the majority of its range (*i.e.* oak-hickory forest). The goal of our study was to

determine relatedness within southern flying squirrel nest groups in a more typical oak-hickory forest in order to elucidate the social structure of this enigmatic species.

Materials and Methods

We monitored flying squirrels using 100 nest boxes constructed of untreated 1.9 x 14.0 cm cedar with a 3.8 cm opening, distributed randomly among several forest patches on the SIUE campus (Fig. 1a). Nest boxes were attached to south or east-facing sides of trunks at a height of 3-4 m and monitored regularly with ladders. In addition, we attempted to trap squirrels by placing baited Sherman live traps on elevated platforms beneath existing nest boxes (Fig. 1b).

The relatedness study required the use of microsatellite DNA taken from squirrel tissue. To prepare for this we tested primers, developed by Fokidis *et. al* (2003) for a different subspecies of southern flying squirrel (*G. volans saturatus*), on preserved specimens (*G. volans volans*) from Ohio and Missouri (n=6). DNA was extracted and polymerase chain reaction (PCR) was used to amplify the desired sequences. The PCR samples were viewed under UV light following gel electrophoresis (Fig. 2).

Figure 1a. Nest box and Sherman trap in Bluebell Woods of SIUE.

Figure 1b. Sherman live traps were placed on elevated platforms and baited with sunflower seeds.

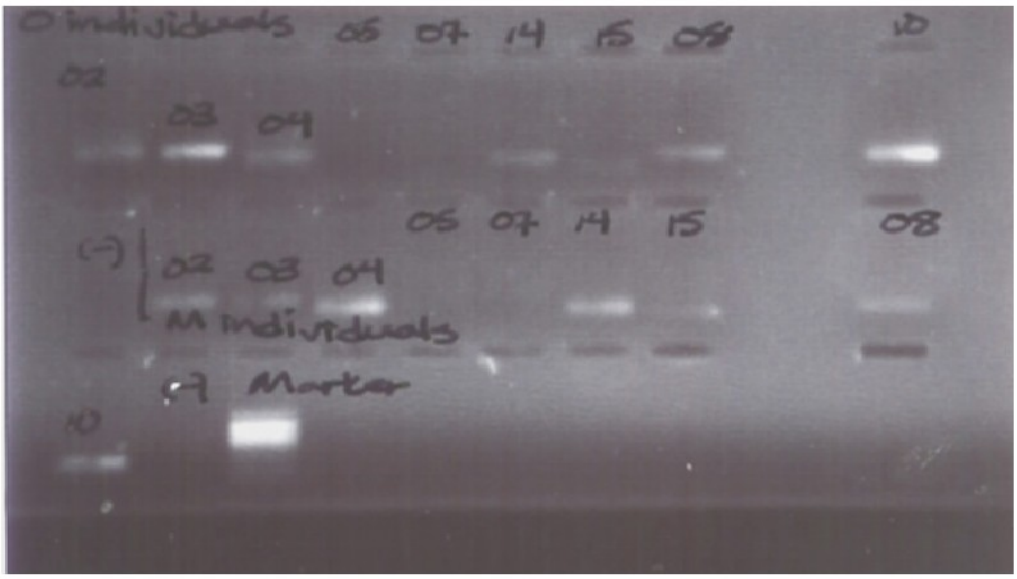

Figure 2. Image of PCR products under a UV light to view primers appropriate for relatedness studies with *G. volans*.

Results

Monitoring

There was little evidence of flying squirrel use of nest boxes (300 trap nights). Therefore, elevated Sherman traps baited with sunflower seeds (1173 trap nights) were incorporated into the study. There were no direct encounters with flying squirrels; however, several other rodent species were encountered (Table 1).

Genetic Analysis

Of the nine primer pairs tested, two of the sequences from the northern flying squirrel, *G. sabrinus,* and five of the primer pairs from *G. volans* were successful (Fig. 2, Table 2).

Table 1. Arboreal vertebrates trapped via Sherman live traps (trap nights = 1173).

Species	No. of Animals Trapped
Gaucomys volans	0
Peromyscus leucopus	1
Sciurus carolinensis	1
Tamias striatus	4

Table 2. Description of the seven primer pairs that successfully amplifed the microsatellite DNA of *Glaucomys volans volans* through PCR.

Locus	Primer Sequence (5'-3')
SFS-02U	CAGTCGGGCGTCATCAATGGAGTGTGGTGTATCT
SFS-02L	CTGGGTTCAATTCCTAATA
SFS-03U	GGAAACAGCTATGACCATGCACTTGCTTAGTTTGTATG
SFS-03L	CAAGCTAGAGCCAATAACT
SFS-04U	GGAAACAGCTATGACCATGTGAATCAAAATGCAGTCT
SFS-04L	GTAAAAATAAAACCCAACTC
SFS-14U	CCCACATGCAGATCAC
SFS-14L	GGAAACAGCTATGACCATGTAAACCGTCCTTGTATTC
SFS-15U	CAGTCGGGCGTCATCAGGGAGAAAGGAACACA
SFS-15L	CCAGAACCCAGCTAAT
GS-08U	CAGTCGGGCGTCATCATGCCATCTCCCCTCTC
GS-08L	GCTGTGCTTCCAACCTGT
GS-10U	CAGTCGGGCGTCATCACTATGCTGAGGAGGAGTGGTG
GS-10L	CGTTTATGTGAAGAGCCTTG

Discussion

We are currently unable to evaluate the status of Southern Flying Squirrel populations at these sites due to an insufficient number of encounters. However, there is evidence of viable populations in both study sites based upon: 1) diagnostic wear patterns left on mast recovered from the forest floor (Fig. 3); 2) shredded nesting material found in nest boxes (Fig. 4); and 3) presence of host-specific fleas. Possible explanations for the lack of encounters include:

1) Dense ground cover
2) Overabundance of natural cavities
3) High predation levels
4) Newness of nest boxes
5) Historical effects of forest fragmentation/isolation
6) Population cycling

As we continue to monitor these sites over the long term, we hope to determine which of these hypotheses has the greatest support. We are currently in the process of expanding the study to include nearby Bohm Woods Nature Preserve and are adding temperature data loggers to nest boxes to detect nest box activity (Fig. 5). Identification of successful primers lays a solid foundation for continued research on relatedness. Moreover, the addition of artificial cavities has the potential to benefit a wide array of other wildlife species including mammals such as the White-footed Mouse and cavity-nesting birds such as the Carolina Chickadee and Prothonotary Warbler (Table 3).

Figure 3. Black walnut, *Juglans nigra,* exhibiting circular wear pattern characteristic of *G. volans*.

Figure 4. Shredded nesting material from active SIUE nest

Figure 5. Data loggers (Thermochron iButtons) used to detect temperature changes in nest boxes as an indicator of activity

Table 3. Wildlife potentially benefiting from artificial cavities used in this project.

Species
White-footed Mouse
Carolina Chickadee
Black-capped Chickadee
White-breasted Nuthatch
Tufted Titmouse
Eastern Bluebird
Caroline Wren
House Wren
Great-crested Flycatcher
Prothonotary Warbler
Black Rat Snake

Summary

We monitored populations of the Southern Flying Squirrel using nestboxes and live traps. We built 100 nest boxes and placed them randomly in forest patches on the SIUE campus. Nest boxes were checked periodically for the presence of flying squirrels. To date, we have observed only indirect evidence of their presence in the form of wear patterns on hard mast, shredded nesting material, and host-specific parasites. We are continuing to monitor boxes and are incorporating temperature data loggers as a way of detecting nest box activity. We are currently expanding our study to include the adjacent Bohm Woods Nature Preserve. In addition, we have tested primers on flying squirrel specimens from the Midwest to facilitate studies of relatedness.

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Acknowledgments

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Total project expenditures: See attached

SIUE
IDNR

Bohm Woods
Bluebell Woods
Sweet William Woods
Edwardsville
0
km
1
N
W
E
S
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