Live Capture Methods of Sympatric Species of Flying Squirrel

Thomas C. Engel, Michael J. Lemke, and Neil F. Payne

Standard methods of capturing other tree squirrels are not as effective for flying squirrels, which spend proportionately less time foraging on the ground (Sollberger 1940; Sonenshine et al. 1979). They can be captured in natural or artificial dens (Sonenshine et al. 1973) or in Sherman live traps attached to trees (Sonenshine et al. 1979). Sumner (1927) captured flying squirrels with rat (kill) traps nailed in trees. Burt (1927, 1940), Jackson (1961), Sonenshine et al. (1979), and Mowrey and Zasada (1984) reported that traps set in trees are effective but did not present trapping details or trap sympatric species of flying squirrels. The objective of this study was to determine the trapping success for sympatric species of flying squirrel relative to tree species, trap type, and height of trap in tree.

The study area was the 83-ha Schmeeckle Reserve, University of Wisconsin–Stevens Point, an area within the vegetational tension zone (Curtis and McIntosh 1951; Curtis 1959) that includes plants and animals typical of both the prairie and boreal forest ecotone extending northwest-southeast in Wisconsin. Forest composition was 5.7 ha of mixed hardwoods including oak (*Quercus* spp.), maple (*Acer* spp.), elm (*Ulmus* spp.), white birch *(Betula papyrifera),* and quaking aspen *(Populus tremuloides);* 14.3 ha of pine *(Pinus strobus, P. banksiana, P. resinosa);* 15.6 ha of mixed woods containing mature hardwoods and scattered mature white pine; and 8.9 ha of oak savanna (Engel 1980).

Methods

To test trap type, we used wooden box traps (Mosby 1955 in Day, Schemnitz, and Taber 1980), Sherman sheet metal box traps 7.5 × 7.5 × 26 cm (Sonenshine et al. 1979) and 13 × 13 × 45 cm, and Havahart wire cage traps 13 × 13 × 45 cm; all were baited with peanut butter. In 1978 we added tree traps to three traplines consisting of wooden box traps set on the ground 30 m apart, which had produced 0.2 flying squirrels per 100 trapnights in 1977. Because the size and weight of the wooden box traps made them awkward to secure in trees, we set Sherman and Havahart traps 60 m apart in trees next to the ground traps. Trees for trap placement were selected for convenience to the trapline; height of trap placement was determined by the ease of climbing without spikes. Trap heights were grouped as 0 (ground), 1–3.1 m, and > 3.1 m. Tree species of trap placement were pooled as red maple *(Acer rubrum),* other hardwoods, jack pine *(Pinus banksiana),* red pine

Thomas Engel graduated from the University of Wisconsin–Stevens Point in 1980 with an M.S. in wildlife. Now based in Grand Rapids, he is the Forest Wildlife Coordinator for northeastern Minnesota.

Michael Lemke graduated with a B.S. degree in natural resources from the University of Wisconsin–Stevens Point in 1980 and an M.S. in zoology from the University of British Columbia–Vancouver in 1985. He currently is a doctoral candidate in the Department of Biological Sciences at Michigan Technological University studying aquatic food chains.

Neil F. Payne teaches wildlife courses at the University of Wisconsin–Stevens Point. He received a B.A. in biology from the University of Wisconsin–Madison in 1961, an M.S. in wildlife from Virginia Polytechnic Institute and State University in 1964, and a Ph.D. in wildlife from Utah State University in 1975.

(P. resinosa), and white pine *(P. strobus)*. Traps were secured in trees with a rubber band cut from an auto tire inner tube and looped around one end of the trap and passed beneath a branch, or around the tree trunk of smaller trees and looped over the opposite trap end. When large branch size precluded this method, the rubber band was cut and extended with a short length of light rope. Traplines were operated 24 September–3 October, 10–20 October, and 22 October–2 November 1978 in three locations within the study area and checked at dawn. Flying squirrels were sexed, tagged in each ear with a numbered aluminum fingerling tag No. 1 (National Band and Tag Co., Newport, KY), and released. After two flying squirrels died in traps early in the study, we added shredded wood packing materials and/or cotton to the tree traps to provide insulation and help absorb moisture from respiration. We used loglinear models (Fienberg 1980) to analyze capture data.

Results

In 1978 we captured 13 *G. volans* and 14 *G. sabrinus* in live traps 39 and 31 times, respectively. Tree sets were nearly sixteen times more effective than ground sets for capturing flying squirrels ($X^2 = 300.3$, $p < .001$, df = 2) (Table 1). No difference existed ($p > .05$) in capture rates of traps set 1–3.1 m from the ground and > 3.1 m. Small sample sizes precluded statistical comparisons of the ease of trapping the two species, although *G. sabrinus* seemed slightly more predisposed to ground traps (Table 1).

The number of flying squirrels trapped per 100 trapnights (Nelson and Clark 1973) in trees was 15.4 in wire traps, 10.8 in large Sherman traps, and 10.2 in small Sherman traps. These catch rates are not different, although wire traps might have been superior had sample sizes been larger. No squirrels died in the wire cage traps; squirrel mortality was 10% in the other traps. No difference existed in survival due to squirrel species or trap type ($G^2 = 6.89$, $p = .44$, df = 7), but sample size was small.

We caught flying squirrels in all species of trees (Table 2). The best loglinear model ($G^2 = 6.33$, $p = .90$, df = 12) indicates that the tree species in which traps were placed was more important than trap type or trap height in determining capture rates. Indications are that the most successful combination of trap and tree used was a wire trap set in a white pine (Table 2).

Discussion

The lack of differences among trap types and the importance of ground versus tree placement suggest that wooden traps set in trees would be effective and that other types of traps set on the ground would not, although study design precluded testing these combinations. The relatively high capture rates of both species in white pines in our study area (Table 2) might not reflect habitat preference or tree species as much as size of tree, especially for *G. volans*, because pines were available in all habitat types and were the biggest trees. Most white pines in the study area were taller than the forest canopy. Post-

Table 1. Trapping success for flying squirrels*

Trap height above ground	N trapnights†	N captures		Total captures/100 trapnights
		G. volans	G. sabrinus	
m				
0.0	1484.5	2	8	0.7
1.0–3.1	387.0	18	20	9.8
3.1	155.5	19	3	14.12
Total	2027.0	39	31	3.5

*University of Wisconsin–Stevens Point, September–November 1978.
†Adjusted for sprung traps (Nelson and Clark 1973).

Table 2. Trapping efficiency for flying squirrels for traps set in various tree species*

Tree species	N *trapnights*†	N *captures* G. volans	N *captures* G. sabrinus	*Total captures/100 trapnights*
Hardwoods	178.5	4	3	3.9
Red maple	66.5	5	0	7.5
Jack pine and red pine	88.5	3	6	10.2
White pine	209.0	25	14	18.7
Total	542.5	37	23	11.1

*Three types of trap were used, but there was no difference in catch rates. University of Wisconsin–Stevens Point, September–November 1978.
†Adjusted for sprung traps (Nelson and Clark 1973).

release observations of *G. volans* and *G. sabrinus* indicated that squirrels choose the most direct route to a large (> 40-cm diameter at breast height [dbh]) mature tree. Squirrels climbed only 2–3 m up smaller (12–30 cm dbh) trees before gliding to the base of another small tree in a direct route to a large white pine or oak. Squirrels climbed to canopy height and glided longer distances only from large trees. Trees > 40 cm dbh typically were selected as targets for glides initiated at canopy heights. Sonenshine and Levy (1981) and Ando and Imaizami (1982) also found strong positive associations with extreme height and gliding. Bendel and Gates (1987) suggested that trees > 40 cm dbh and open upper-understory (> 10–15 m) aid locomotion and escape, and that clearcuts > 75 m wide are barriers. Mowrey and Zasada (1984) suggested clearcuts not be > 40 m wide, with ≤ 20 m preferable.

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