



FEEDING ECOLOGY OF EASTERN GRAY SQUIRRELS (*SCIURUS CAROLINENSIS*) ON BISHOP'S UNIVERSITY CAMPUS

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INTRODUCTION

The purpose of this study was to observe the diet and diurnal activity pattern of Eastern gray squirrels (*Sciurus carolinensis*) on Bishop's University Campus during the late fall season.

Gray squirrels are the most common members of the squirrel family (Sciuridae, order Rodentia) living in North America. They are known as tree squirrels and forage extensively on trees and also on the ground. *Sciurus* is a Latin word for "squirrel" and is derived from the Greek words *skia* meaning "shadow" and *oura* meaning "tail" and is translated as "shade tail" (MacClintock, 1970). The squirrel family originated in the northern hemisphere and is well represented in North America, with over 60 species in 8 genera (Hafner, 1984). The natural range of gray squirrels is from southern Ontario to Florida in the east and from North Dakota to eastern Texas in the West and in Canada they occur from southeastern New Brunswick, southern Quebec and Ontario, to western Ontario and southern Manitoba. This species has adapted readily to the protection provided in town and cities and has become a characteristic inhabitant of the tree-shaded parks and lawns in suburban areas (Banfield, 1974).

Squirrels are diurnal granivores and the diet varies with the season, depending on what is available. Acorns, hickory nuts, walnuts, beechnuts, butternuts and pine seeds supply much of gray squirrels' diet from late summer to the following spring. Squirrels feed on wild fruits, nuts and berries as the season progresses. Bark and twigs keep squirrels alive when food stores run out in the late winter (Peterson, 1966; MacClintock, 1970). Maple buds, bark and samaras and cedar, hemlock, fir and spruce seeds are additional food sources, along with a variety of herbaceous plants. Heaney (1984) reported that the total number of plant species known to be eaten ranges from 25 and 76 and most of these are incidental foods that are eaten rarely.

Eastern gray squirrels do not hibernate, so the late fall is spent looking for food supplies and storing

food for winter. Gray squirrels exhibit hoarding behavior and cache their food for future use. Caches can provide direct benefits by increasing survivorship during periods of prolonged food scarcity, such as during winter months in temperate climates. If individuals can remember the location of their caches, they do not need to spend time foraging during periods when other activities, such as breeding or rearing offspring, become time-consuming. An animal attempting to maximize the direct benefits of caching can either actively defend its caches or conceal them in locations that are easy for it to remember but not easy for other animals to detect (Spritzer & Brazeau, 2003). Squirrels do not cache nuts where they find them, but carry them to a new spot. They then bury each nut individually in a hole dug with the forefeet and then tamped down with the forefeet and nose.

STUDY AREA AND METHODS

Bishop's University is located on 200 ha of land at the convergence of the St. Francis and Massawippi Rivers. The campus can be divided into two sections. The smaller section contains the inner campus, including academic and other buildings. The other part of the campus, aside from golf fields, is made up of large forests and is virtually untouched by development (Gordon, 2000). This second section is very important because it is probably the home range of many wild animals, although this study was carried out in the first section of the campus only.

The present study was conducted at four sites on campus and each site had different species of trees and possible food sources for squirrels, such as sugar maple (*Acer saccharum*), balsam fir (*Abies balsamea*), red oak (*Quercus rubra*), white pine (*Pinus strobilus*), apple (*Malus sylvestris*), white spruce (*Picea glauca*) and other species. All sites were visited during the day and observation periods lasted 20 mins in each site. If there were no squirrels at the site, 10 mins were spent waiting for them. Binoculars (8 x 32) were used to observe what type of food the squirrels were handling and

all observations were noted in tables for later analysis. In order to determine the activity pattern of squirrels on campus, the same path was covered during the day and the number of squirrels observed as well as the time was recorded. Only observations obtained during clear weather were used because squirrels' activity decreases during inclement weather, such as rain or snow (Peterson, 1966).

Statistical analyses were χ^2 goodness-of-fit test for squirrel food preferences and analysis of variance (ANOVA) for squirrels' activity during the day.

RESULTS AND DISCUSSION

A total of approximately 16 hours of observation during 11 days was made from 10 October to 6 November, 2005 and squirrels were observed eating or hoarding food a total of 270 times. Observations were made at different times of the day. Nine different food items were identified, but some items could not be identified, *i.e.*, were unknown. Only acorns and white pine cones were both consumed and hidden.

Acorns (red oak) were the most handled food item (53%) and sugar maple samaras were of secondary preference (32%; excluding unknown foods, $\chi^2=623.29$, $P < 0.001$, $n=250$). There was a tendency for the squirrels to hide acorns more than to eat them ($\chi^2=3.03$, $P=0.08$, $n=132$). Although it appeared more pine cones were consumed than hidden, there was no significant difference between hiding and eating ($\chi^2=0.33$, $P=0.56$, $n=12$).

There was no relationship between mean numbers of squirrels seen and time of day ($F=0.59$, $P=0.77$). This finding means there was a 77% probability that the results were due to random chance only and there was no diurnal trend in squirrel activity throughout the day.

The lack of a trend in squirrel activity could be due to not enough samples collected during the study, because all literature reported a pattern for squirrel activity. Thompson (1976) suggested in his study that activity peaks are increasingly displaced toward midday during fall. This was not seen in the present results. Peterson (1966) reported that gray squirrels have two peaks of feeding activity, the first between 07:00 and 08:00 and the second between 15:00 and 18:00. Although the results seemed to show two peaks of activity, one between 08:00 and 09:00 and the second between 15:00 and 16:00, the statistical analysis did not reveal a significant difference. There is one consideration to be clarified; Eastern Daylight Time (EDT) started

on 29 October so all observations after that date were adjusted to Eastern Summer Time (EST).

Spritzer (2002) reported that gray squirrels have a significant peak in activity during the fall when acorns were the primary food item and pine seeds were of secondary importance. The present study showed a similar food preference, even though maple samaras represented the second most handled item. Squirrels were observed eating samaras at one site only, and they never hid them.

CONCLUSION

The present study showed a similar food preference as in the literature. Acorns were the most handled food item and samaras of sugar maple were of secondary preference. There was no significant trend in squirrel activity throughout the day, probably due to insufficient sampling. Two activity peaks appeared to occur: one between 08:00 and 09:00 and the second between 15:00 and 16:00.

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