

APPROACHABILITY OF EASTERN GRAY SQUIRRELS

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ABSTRACT

The Eastern Gray squirrel (*Sciurus carolinensis*) is known to forage in the morning and evening hours. In this study we hypothesized that Eastern Gray squirrels on the campus of Juniata College should be more approachable in the evening hours because they are less alert to the presence of potential predators than they would be in the morning while they are foraging. We believe that they would be more careful while they are feeding in the morning, and more relaxed in the afternoon. This study took place on the Juniata College campus (Huntingdon, Pennsylvania) where large numbers of gray squirrels can be found. We studied the squirrels at different hours of the day, using the same two people to approach them for every data collection event. The squirrels were more approachable in the late afternoon and evening hours; in the evening, the mean distance of approachability before a squirrel fled (2.249 ± 1.519 meters) was found to be smaller than that of the morning distance (3.718 ± 1.519 meters).

Keywords: Eastern Gray Squirrel (Sciurus carolinensis), foraging, habitat, vigilance behavior

INTRODUCTION

The Eastern Gray squirrel (*Sciurus carolinensis*) is the most common species of squirrel found in Pennsylvania, followed by the fox, red, and flying squirrels. The adult gray squirrel weighs 1 to 1.5 pounds, has a length of 18 to 20 inches, and is predominantly gray in color. Their diet consists mainly of acorns, hickory nuts, and walnuts, but in early spring they focus their diet on tree buds and flowers, which are a high energy food source. They only see in shades of black and white, and they are most active early in the morning and during late afternoon.

Squirrels that live in the kind of environment provided by a college campus have a high rate of regular human interaction and hence might be more

likely to allow humans to approach them. The Eastern Gray squirrel has already been found to be a highly social species, and even wild squirrels have been sighted eating food from human hands (Steele,

2001). In this investigation, human approachability of gray squirrels was measured at different times of the day. The degree of approachability in the early morning was compared to that of the late afternoon or evening.

We hypothesized that Eastern Gray Squirrels on the Juniata College campus should be more approachable in the evening. In the morning, the squirrels are very alert and hungry after a long night of rest. When approached, they are easily frightened and skittish. Conversely, in the evening, the squirrels are more relaxed. Having just eaten a few hours prior to their long rest in the afternoon, which we found to be common among Eastern Gray squirrels, it is not imperative for them to find food at this time. In the evening, we hypothesize that the squirrels will be more approachable because they will be less focused on finding food and will be more likely to manifest their natural curiosity through human interaction.

FIELD SITE

The study was conducted on the campus of Juniata College in Huntingdon, PA. For every data collection event, the squirrels were located near both trees and college buildings, allowing them equal opportunity for safety and equal exposure to human presence.

MATERIALS AND METHODS

The squirrel and the human tester were captured on video in a single frame, and optimal zoom for the clearest viewing. The model of the digital camera used was a Canon Powershot DS850 IS. The height of the person in the video was taken as the known, to provide the constant measure of distance needed for quantification. After this point, the camera was not zoomed in or out, to ensure constancy of distance covered towards the subject squirrel. The attire of the person interacting with the squirrel was controlled, so that this could be eliminated as an experimental variable. Dull solid colors, with no loud or bright patterns that might alarm the squirrel were worn.

The human tester walked slowly and steadily in the direction of the squirrel, trying to remain unnoticed and not alarm the squirrel for as long as possible. The behavior exhibited by the squirrel as the gap between the human and itself closed was observed and the final distance between the two subjects before the squirrel darted away was also measured. The video recording was stopped after the squirrel had noticed the tester and had run away, and this was considered as one raw data point for further analysis.

In order to accurately quantify this distance, we used a computer software program called Data Point, which takes distance measurements using the pixels from the video footage and the known height as a measure to give us comparable numerical data for each different data collection event. Statistical analysis of the quantified data was conducted using Minitab.

RESULTS

The mean distance of approaches obtained for the morning data was 3.718 ± 1.519 meters and for the afternoon data the mean was calculated to be 2.249 ± 0.859 meters. A single tailed, two sample t-test was used to analyze the data that were collected using the Data Point software. Two sample t-tests are used to infer whether a difference existed between the two sets

of data. In this study, we tried to determine if we could approach squirrels more closely in the afternoon as compared to the morning or vice versa. A single tailed test was utilized because the original hypothesis infers directionality; i.e., we predicted that we would be able to approach squirrels more closely in the afternoon as opposed to the morning. The raw data and Minitab calculations are attached in the Appendix.

It was determined that the test statistic for the two groups of data was 2.32 and the critical t-value was determined to be 2.145 ($df = 14$, and $\alpha = 0.05$). In this case, the null hypothesis, which states that a difference between means does not exist, can be rejected because the critical value is less than the test statistic, which is supported by the P-value of 0.019 that was obtained. In other words, the means are different enough to statistically say that there exists a significant difference in approachability of the squirrels in the morning in comparison to in the afternoon.

In the interest of thoroughness, we thought it was important to see if a statistical difference existed between the two investigators, Tommy and Nisha. We did this to eliminate the possibility that the different testers obtained different results because of their appearance/stature. To do this, another two sample t-test was preformed to compare the mean distance calculated from Tommy's data to that calculated from Nisha's data. This was done for the morning and afternoon data sets. For the morning data, a P-value of 0.564 was calculated, and for the afternoon data a P-value of 0.434 was calculated. Due to the fact that both of these P-values are above 0.05, the null hypothesis was not rejected. This means that there was no statistical difference between the mean distances of the two testers in either the morning or the afternoon data.

DISCUSSION

Squirrel approachability was tested to determine whether there was a difference in how close one could get to a squirrel at different time periods of the day. We hypothesized that there was such a difference and that squirrels could be better approached during the afternoon period. This could be because the squirrels forage for their food in the morning (Steele, 2001), and thus are more alert to predators and anyone that passes by. In the afternoon, squirrels are foraging less, if at all, and although still alert to predators, they seem to be more relaxed and less frightened by any human interactions.

The mean distance for the afternoon was found to be 2.249 ± 1.519 meters. This finding supports the hypothesis in which the mean distance was found to be smaller than that of the morning distance (3.718 ± 1.519 meters). This meant that the testers were able to get closer to the squirrels in the afternoon when compared to in the morning. This result was further confirmed through statistical analysis of the raw data, in which a P-value of 0.019 was attained. This P-value was seen as significant because not only was it smaller than 0.05, but it established that the means were statistically different, reconfirming the hypothesis that squirrels are more approachable in the afternoon.

Squirrel approachability is surely affected by human interactions. Thus, the data collected by both testers in the morning and afternoon were also analyzed in order to eliminate any direct effects they may have had on the squirrels themselves. The two testers had some significant differences which could affect the outcome of the data. Tommy is not only male but also taller and of a lighter skin tone. On the contrary, Nisha is female, of a shorter stature and has a much darker skin tone. After analyzing and comparing their data, it was calculated that the P-values for both the morning (0.564) and afternoon (0.434) yielded a value that was much higher than 0.05, meaning the data collected by both testers is statistically not dissimilar. This means that the differences between the two testers did not affect the squirrels and thus in the end, did not alter the data.

With this elimination, we are confident that squirrels are more approachable in the afternoon rather than the morning. We believe this is so because the squirrels are not preoccupied with finding food, as they are in the morning. It is clearly visible that squirrels are exposed more to humans during the afternoon on the Juniata College campus, rather than in the morning. Unlike squirrels, the students here seem to be more active in the afternoon, and for this reason, the squirrels may have a natural adaptation to being more accustomed to human interactions at that time.

A possible next step to verify the findings would be to calculate the human population on the Juniata College campus, and recreate this study in a remote area where squirrels interact less with humans. This would help in verifying the afternoon approachability hypothesis more and would aid the conclusion that higher levels of human presence and interaction in the afternoon on the Juniata Campus results in the squirrels being more adapted to their presence and thus more approachable.

LITERATURE CITED

Steele, Michael A. 2001. North American Tree Squirrels. Smithsonian Institution Press, Washington, D.C., USA.

APPENDIX

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Raw Data:

Tester	Location	Distance (m)	Distance (ft)	Time of Day
Tommy	Museum	1.830	6.004	Morning
Tommy	Museum	5.360	17.585	Morning
Tommy	Museum	6.312	23.990	Morning
Tommy	Museum	4.570	14.993	Morning
Tommy	Sunderland front	2.057	6.747	Morning
Nisha	Sunderland front	4.582	15.029	Morning
Nisha	Museum	2.157	7.075	Morning
Nisha	Museum	3.146	10.319	Morning
Nisha	Museum	2.977	9.765	Morning
Nisha	backyard	4.192	13.750	Morning
	Average	3.718	12.526	
	Std Dev	1.519	5.667	

Tester	Location	Distance (m)	Distance (ft)	Time of Day
Nisha	Beside Von Lebig	1.323	4.340	Afternoon
Nisha	Beside Von Lebig	0.706	2.315	Afternoon
Nisha	backyard (?)	1.984	6.510	Afternoon
Nisha	backyard (?)	1.963	6.439	Afternoon
Nisha	backyard (?)	2.295	7.528	Afternoon
Nisha	backyard (?)	3.048	10.000	Afternoon
Nisha	Steps by Halbritter	2.742	8.996	Afternoon
Nisha	Steps by Halbritter	2.364	7.756	Afternoon
Tommy	Beside Von Lebig	2.285	7.495	Afternoon
Tommy	Beside Von Lebig	3.784	12.412	Afternoon
	Average	2.249	7.379	
	Std Dev	0.859	2.819	

Statistical Analysis:**Two-Sample T-Test for morning and afternoon**

	N	Mean	StDev	SE Mean
morning	10	3.72	1.52	0.48
afternoon	10	6.00	2.71	0.86

Difference = μ (morning) - μ (afternoon)
 Estimate for difference: -2.277
 95% CI for difference: (-4.382, -0.173)
 T-Test of difference = 0 (vs not =): T-Value = -2.32 P-Value = 0.036 DF = 14

Two-Sample T-Test and CI: Nisha-am, Tommy-am

Two-sample T for Nisha-am vs Tommy-am

	N	Mean	StDev	SE Mean
Nisha-am	5	3.411	0.976	0.44

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Tommy-am 5 4.03 2.00 0.89

Difference = μ (Nisha-am) - μ (Tommy-am)

Estimate for difference: -0.615

95% CI for difference: (-3.174, 1.944)

T-Test of difference = 0 (vs not =): T-Value = -0.62 P-Value = 0.564 DF = 5

Two-Sample T-Test and CI: Nisha-pm, Tommy-pm

Two-sample T for Nisha-pm vs Tommy-pm

	N	Mean	StDev	SE Mean
Nisha-pm	8	2.053	0.754	0.27
Tommy-pm	2	3.03	1.06	0.75

Difference = μ (Nisha-pm) - μ (Tommy-pm)

Estimate for difference: -0.981

95% CI for difference: (-11.089, 9.127)

T-Test of difference = 0 (vs not =): T-Value = -1.23 P-Value = 0.434 DF = 1