EFFECTS OF PREDATORY THREATS ON SONGBIRD FORAGING BEHAVIOR

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ABSTRACT

Our study focuses on the predator-prey relationships between songbirds and the red-tailed hawk (*Buteo jamaicensis*). In order to analyze the relationship, birdfeeders with sunflower seeds were set up for the songbirds. After getting a base value of feeding events, we used a hawk decoy and recorded calls to test the response of the birds to a predatory threat. We hypothesized that the presence and calls of a red-tailed hawk would result in a lower number of feeding events. However, our results show no statistical difference in the number of feeding events when the mock predator was present compared to when it was not. Because of this, we believe that the birds did not recognize the red-tailed hawk as a threat.

*Keywords: Foraging behavior, predatory threats, songbirds*

INTRODUCTION

Risk is a factor that all foraging organisms must deal with. Time must be split between eating and watching for predators. Successful foraging by birds is extremely important, especially during cold weather. The birds must obtain enough energy, in the form of food, to revitalize themselves from the previous night. Due to the risk of predation, birds will usually try to forage in areas near dense vegetation that can provide safety (Suhonen, 1993). Birds using this type of habitat can spend less time watching for threats because with dense vegetation nearby the birds are able to flee to safety if a threat appears.

Our study observed the foraging behavior of a mixed group birds, mainly overwintering species. We were interested in how the birds would behave in the presence of abundant food, and with or without the threat of a predator. The predatory threat was a red-tailed hawk (*Buteo jamaicensis*). A mounted hawk and a recording of the bird’s calls were used. We hypothesized that fewer birds would appear at the feeding site when the predator was present.

FIELD SITE

The study was carried out at the Peace Chapel, an area with nature trails close to Juniata College in Huntingdon, PA. Two feeders were set up on a deciduous tree in an edge habitat. Immediately around the tree was open area that mostly contained shrubs and bushes. There was a wooded area a few yards away.
METHODS AND MATERIALS

Two bird feeders were used; one feeder contained oily sunflower seeds and the other contained husked sunflower seeds. The feeder with the oily seeds was about three feet off the ground, while the one with husked seeds was about five feet off the ground. After the feeders were set up, we let them stand unobserved for three days in order to give the birds enough time to locate and begin using the feeders.

After three days, we arrived back at the feeding station and recorded the number of feeding events that occurred in the span of one hour. We started counting the birds at around 6:45 every morning. We did not collect data on days that it was raining or when less than three members of the research group were present. A feeding event was defined as a bird of any species landing on the feeder. As soon as the bird left the feeder, the feeding event ended. The same birds were counted more than once if they landed on the feeders repeatedly. We took three days of data without any predatory threat to get a baseline.

After three days, we set a mounted juvenile red-tail hawk on a cardboard box in front of a bush located 15 feet away from the feeding station. At 10 minute intervals we played the red-tail hawk call. The call was about half a minute long. The feeding events were recorded as before. Once the treatment days were done, we performed a two day post-experiment study to see how the birds would react to the sudden absence of the predator. We were unable to obtain data for a third day due to rainy weather. We tallied the number of feeding events at the feeding station as we did for the control and treatment days. We used Minitab to run a chi-square goodness of fit test to see if there was a statistical difference between the expected and observed number of feeding events from the control as compared to the treatment. Throughout the study we also noted the overall behavior of the birds and the types of birds that visited the feeders.

RESULTS

During our study, we observed a total of 951 feeding events from a large variety of bird species. The birds species represented were various sparrows, tufted titmice, cardinals, pine siskins, black capped chickadees, and gold finches. When the predator was present in the beginning treatment days, the songbirds did not remain on the feeder for long compared to when the hawk was not present. We also noticed that during the treatment days, the birds spent more time scanning the area when they were not eating. By the third treatment day however, this behavior was no longer observed.

The number of feeding events for the control, treatment, and post experiment days are given in Table 1. The sum of the feeding events over the control days was 325 and the average was 108.3 (Table 2). The sum of the feeding events over the treatment days was 314 and the average was 104.7 (Table 2). Our two post days had a sum of 312 and an average of 156 feeding events (Table 2).

Since we were only able to obtain two post days we could only run a chi-square goodness of fit test between our control day sum and treatment day sum. The data used to run this test can be seen in Table 3. If our null hypothesis is correct, then there should be no statistical difference between the control days and the treatment days. Therefore, the expected values for the treatment and the control should be the same and equal the total number of feeding events, \( N \), divided by two. The chi-square value was 0.189358 and the p-value was 0.663 (Table 4). A visual representation can be seen in Figure 1.

Table 1. The total number of feeding events for each day.

<table>
<thead>
<tr>
<th>Trial</th>
<th>Number of feeding events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control 1</td>
<td>135</td>
</tr>
<tr>
<td>Control 2</td>
<td>77</td>
</tr>
<tr>
<td>Control 3</td>
<td>113</td>
</tr>
<tr>
<td>Treatment 1</td>
<td>139</td>
</tr>
<tr>
<td>Treatment 2</td>
<td>112</td>
</tr>
<tr>
<td>Treatment 3</td>
<td>63</td>
</tr>
<tr>
<td>Post 1</td>
<td>177</td>
</tr>
<tr>
<td>Post 2</td>
<td>135</td>
</tr>
</tbody>
</table>
Table 2. The sum and average for the control, treatment, and post days.

<table>
<thead>
<tr>
<th>Trial</th>
<th>Sum</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>325</td>
<td>108.3</td>
</tr>
<tr>
<td>Treatment</td>
<td>314</td>
<td>104.7</td>
</tr>
<tr>
<td>Post</td>
<td>312</td>
<td>156</td>
</tr>
</tbody>
</table>

Table 3. Expected and observed values for the control and treatment days. This data was used for the chi-square goodness of fit test.

<table>
<thead>
<tr>
<th>Trial</th>
<th>Expected</th>
<th>Observed</th>
<th>Expected Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>319.5</td>
<td>325</td>
<td>50%</td>
</tr>
<tr>
<td>Treatment</td>
<td>319.5</td>
<td>314</td>
<td>50%</td>
</tr>
</tbody>
</table>

Table 4. Minitab output of the chi-square goodness of fit test.

<table>
<thead>
<tr>
<th>Category</th>
<th>Observed</th>
<th>Test proportion</th>
<th>Expected</th>
<th>Contribution to chi-sq</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>325</td>
<td>0.5</td>
<td>319.5</td>
<td>0.0946792</td>
</tr>
<tr>
<td>Treatment</td>
<td>314</td>
<td>0.5</td>
<td>319.5</td>
<td>0.0946792</td>
</tr>
</tbody>
</table>

N  
639  
Chi-sq  
0.189358  
P-value  
0.663

Figure 1. Chi-square goodness of fit test chart. Total number of expected and observed feeding events for the control and treatment.

**DISCUSSION**

Based on our results, there was no statistical difference between the number of feeding events on the control and treatment days. This is indicated by the p-value of 0.663 from the chi-square goodness of fit test. Since the p-value is greater than 0.05 we cannot reject our null hypothesis. Even though there is little difference in numbers, it is important to note that the birds’ feeding behavior did change. At first, on the days that the “predator” was present the birds were more cautious in their feeding behavior. The birds did not stay on the feeders as long and they were continuously looking around. By the third day of our treatment this cautious behavior had disappeared and the birds returned to their normal behavior. Additionally, during the post days it was clear that more feeding events did take place. However, we were not able to do statistical analysis comparing these days to others in order to find
out whether or not the difference was significant. The increase in feeding events during post days could have been
due to a number of different factors. Contiguous with our study, the increase may have been due to the lack of a
predatory threat. Alternatively, the birds may have just fed more because of warmer weather and an earlier sunrise
on these later days.

There are many possible reasons that can explain the lack of a difference between our control and treatment
and the return to normal feeding behavior by the third treatment day. These results may have been because the birds
did not perceive the red-tailed hawk decoy as a threat. Red-tailed hawks may not be in the area. If they are not, the
birds may not see these hawks as predators because they have never had any previous exposure to them. They also
may have realized that our red tailed hawk was only a decoy. Another possibility is that the birds may have
habituated to the presence of the hawk. The birds felt less threatened by the decoy hawk due to its constant presence
without attack. In summary, the birds must have perceived that the benefits of feeding outweighed the cost of
having a potential predator in the area.

In order to clarify some of these issues, more research should be done. Studies could be done with a live
hawk. This could be done through observational studies of predator-prey interactions in the wild or with a trained
hawk. In one such observational study by Suhonen (1993), it was discovered that tits changed their foraging habits
by switching the trees they feed on in the presence of their predator, the pygmy owl. Also, the study site could be
moved to an area that has a confirmed presence of a red-tailed hawk.

ACKNOWLEDGEMENTS

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LITERATURE CITED