

## ***Turdus migratorius* (American robin) are more alert when solitary than in flocks**

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This study was undertaken to determine the relationship between foraging and alert behavior and group size in *Turdus migratorius* (American robin). We expected that robins would forage more than be alert in flocks and would be more alert than forage when solitary. Field observations were recorded for 2 weeks in April 2008 at Swarthmore College, a suburban campus with pedestrian and road traffic. Our data indicate that there is an association between group size and alert and foraging behavior. There is significantly more alert behavior than foraging behavior in solitary robins, but no significant difference in these behaviors in birds in flocks. The results of this study, along with future work, could lead to greater understanding of the optimal foraging behavior of robins and other flocking birds in suburban areas.

### **Introduction**

Optimal foraging behavior is a behavior that maximizes the rate of energy intake (Brooker et al., 2008). The optimal foraging behavior of birds might be affected by its group size. Birds can forage alone or in flocks with costs and benefits associated with either. Larger groups of birds must compete more against each other for resources, and there is an increased chance of predation because predators are more likely to notice the group. Likewise, parasites and diseases are more easily propagated in larger groups. Each individual in a smaller group, however, suffers from the need to be more vigilant since there are fewer birds to detect a predator, less social learning, and less efficient use of the environment (Hagelin, lecture, March 2008).

Various research has been done on the costs and benefits associated with small and large group sizes with evidence that natural selection selects for an optimal foraging group size. Starlings (*Sturnus vulgaris*) in groups of 10 spent significantly less time in surveillance of predators and responded more quickly to a predator than a single bird did

(Powell, 1974). Accordingly, an optimal covey size of 11 Northern bobwhites (*Colinus virginianus*) was found as a balance between a small and large covey (Williams, 2003). The unequal optimal flock sizes between species might be a result of environmental factors; group size will be selected by the factors that exert the most pressure on the populations.

Robins are birds that live in flocks and appear in abundance in the spring. We were interested in studying if robins display similar optimal foraging behavior to other flocking birds like Starlings and Northern bobwhites. In the present study, we determined the effect of group size on the foraging behavior of American robins (*Turdus migratorius*) at Swarthmore College, a suburban campus. As foraging in larger groups allows for safety from predation such as hawks and cats, we hypothesized that there would be more foraging behavior and less alert behavior in birds found in flocks compared to in solitary birds.

## **Materials and Methods**

The foraging and alert behavior of American robins was observed from April 3 to April 14, 2008 on the Swarthmore College campus located in Swarthmore, Pennsylvania, USA. In order to minimize pseudo replication, observations were made in different locations and at different times of the day around campus.

We considered a bird to be foraging when it pecked at the ground, swallowed food, or crouched its body toward the ground in preparation for pecking (Figure 1). Alert behavior was defined by a bird turning its head in different directions or chirping. Birds were considered in a flock when there were 2 or more birds within 3 meters of each other.

Each bird was observed for 2 minutes and then recorded as either alert or foraging, depending on which behavior was more predominant. Date, group size, temperature, location, wind, and overcast percentage were also recorded.

A chi-squared contingency table was used to analyze the frequency data collected and determine if there was an association between group size and alert and foraging behavior. Chi-squared goodness-of-fit calculations were done for the each group size to determine if there was a significant difference in foraging and alert behavior.

## **Results**

Birds were observed foraging mostly in open areas, commonly in fields of grass. Temperatures ranged from 8 to 14°C. Solitary birds and birds in pairs of 2 were most commonly seen. Robins were most active after rainfall and in the late morning and early evening time periods.

From the contingency table, it was shown that there was an association between behavior and group size ( $\chi^2 = 6.79$ , d.f.= 1,  $p < 0.01$ ; Figure 2). A goodness-of-fit test revealed that within the solitary group, there was significantly more alert behavior than foraging behavior ( $\chi^2 = 8.17$ , d.f.= 1,  $p < 0.01$ ; Figure 3). There was no significant difference between alert and foraging behavior for robins in flocks ( $\chi^2 = 0.011$ , d.f. = 1,  $p > 0.05$ ; Figure 4).

## **Discussion**

Our goal was to understand one aspect of optimal foraging behavior for American robins, the effect of group size on alert and foraging behavior. The fact that there was an

association between behavior and group size (Figure 2) suggests that American robins might behave similarly to Northern bobwhites and Starlings as shown from previous experimentation (Powell, 1974; Williams, 2003).

The results were consistent with our hypothesis that there would be significantly more alert behavior than foraging behavior in solitary birds (Figure 3). Previous research (Powell, 1974) suggests that birds have to be more alert when solitary due to predation. When in flocks, foraging birds can rely on other birds in the flock to be vigilant.

Contrary to our hypothesis, we found that there was no significant difference in foraging and alert behavior in flocks. Our data did not explore possible differentials in behavior within a flock. Perhaps in flocks, robins on the periphery are more alert while robins located in the center of the flock forage more (Noveral, personal communication, April 2008). In order to investigate this possibility, birds could be marked in an unobtrusive way that would allow us to see if the same robins displayed predominantly alert or foraging behavior, and if this specialization changes across time or based on where they are located within a flock. Likewise, alert and foraging behavior might differ based on gender or season if the female is preparing to or has recently laid eggs.

A limitation of our experiment is that we only observed robins on the Swarthmore College campus. Although there are several robin predators such as hawks and cats on campus, Swarthmore College is a fairly safe environment for robins. With a nearly constant flow of pedestrians around campus, the college is an urban environment. Deer were shown to have an increase in their population from urbanization due to the absence of coyote and bobcat predators (Peterson et al, 2004), and perhaps robins are the same way. As a result of the urban environment of Swarthmore College, perhaps the robins

displayed less alert behavior. This study needs to be carried out in varied environments in order to determine whether the optimal foraging group size varies as a function of predation risk. The results of this study, along with future work, could lead to greater understanding of the optimal foraging behavior of robins and other flocking birds in suburban areas.

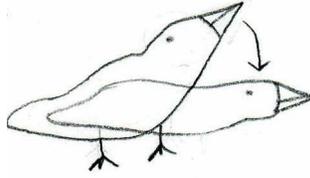


Figure 1. American robin crouching behavior.

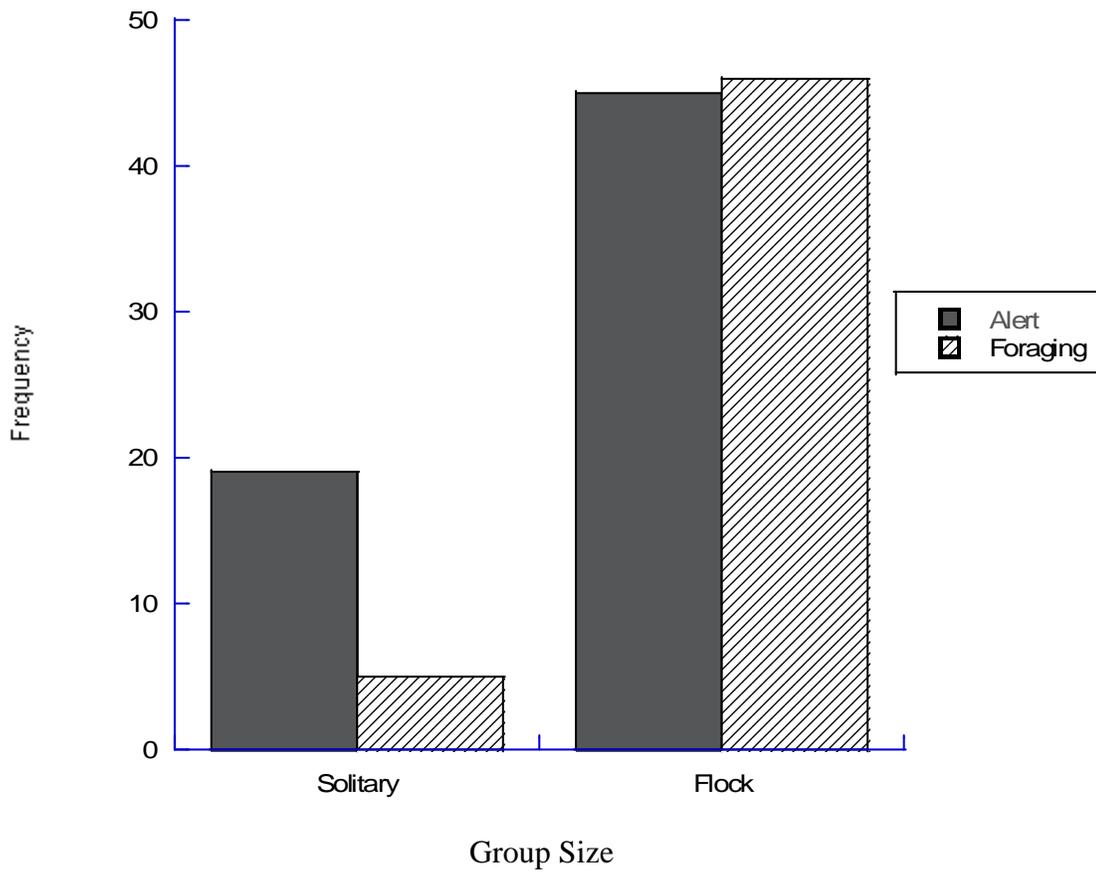


Figure 2. There was an association between group size and behavior of American robins (*Turdus migratorius*) (\* $p < 0.01$ ).

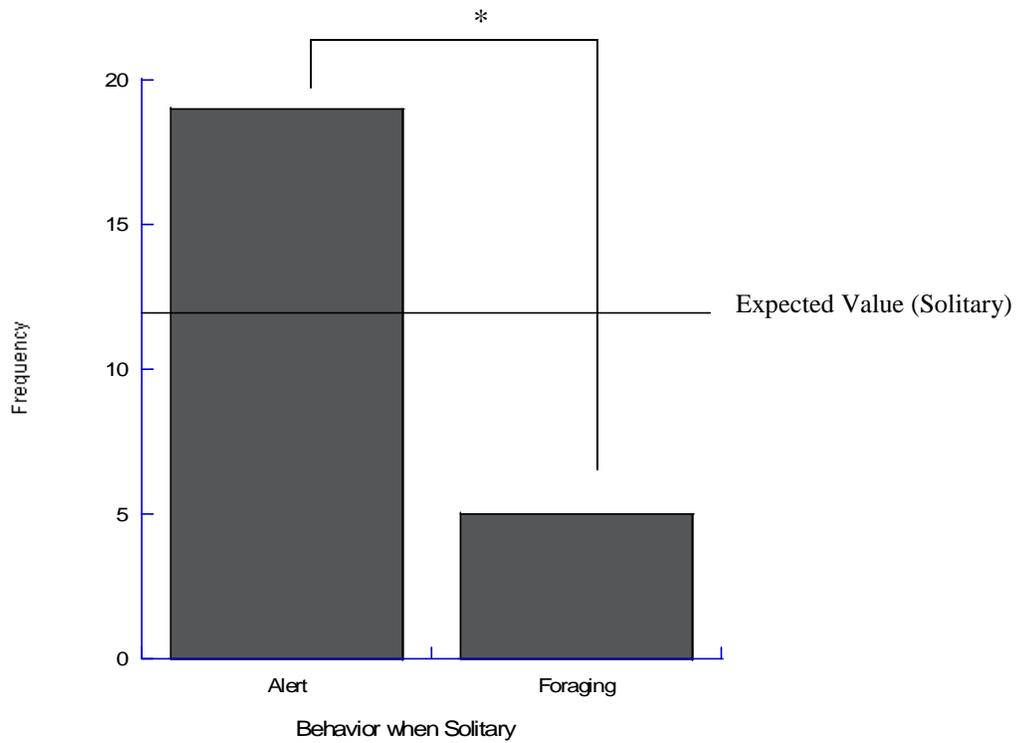


Figure 3. There was significantly more alert behavior than foraging behavior in solitary American robins (*Turdus migratorius*) (\*p < 0.01).

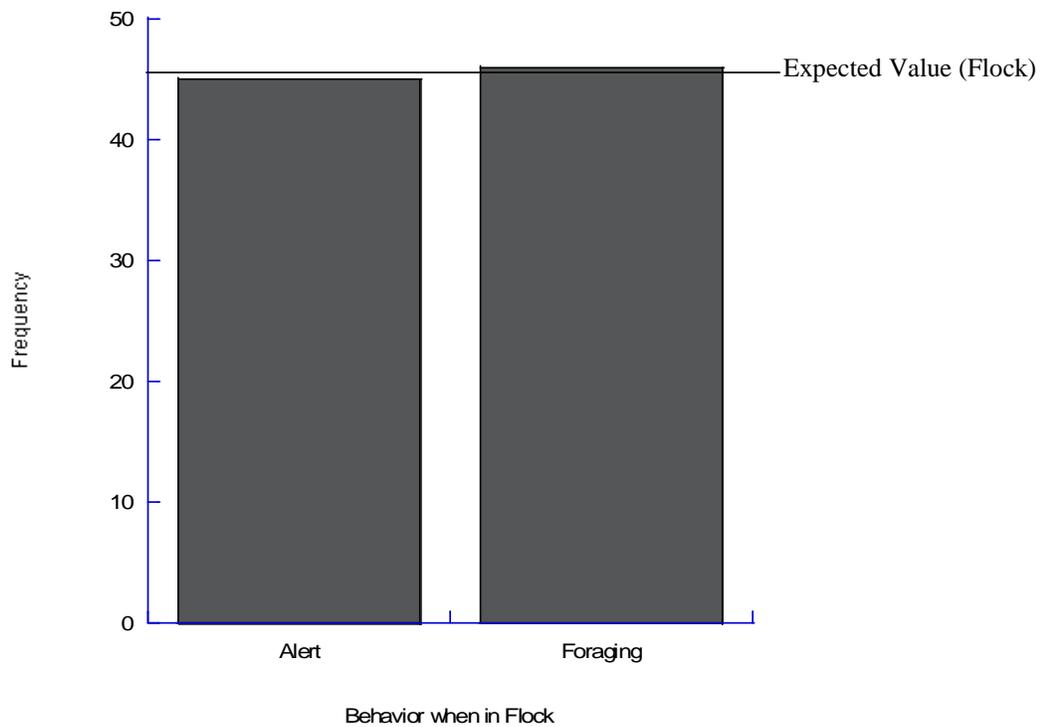


Figure 4. There was no significant difference in alert and foraging behavior in flocks of American robins (*Turdus migratorius*).

## **Acknowledgments**

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