Lab 5: Foraging Behavior and Neophobia in Birds

Please Read and Bring With You to Lab

What you should bring:

Sun protection: hat, long-sleeved shirt, and/or sunscreen
Water
This handout printed out.

What you will be provided:

Pre-baited bird feeding stations established at various locations around campus.
Bird seed
Threatening and non-threatening stimuli
Clipboard
Interval timer

Objectives:

- To collect behavioral data using interval sampling
- To analyze behavioral data using repeated measures tests
- To study the role of novel stimuli on the feeding behavior of seed-eating birds.

Preparation:

Students should read this handout and pages 165-166 & 321 in Molles.
This lab will be on campus but outdoors; there will be no shade in the observation areas. You will need to wear appropriate clothing including a hat; water is required. We will meet in the laboratory before going outside.

Introduction

Animals often face risks when foraging for food. Their attention may be diverted away from scanning from predators and they may need to move into locations where they are more exposed to predators. When faced with a particular food resource, animals must weigh the relative benefit of accessing that resource against the potential risks. Animals may choose to avoid food that requires increased risk of predation if less risky food can be located elsewhere. Many studies have demonstrated that animals will alter where and when they forage in response to predator risk. For example, elk in Yellowstone National Park spent much less time foraging in riparian willows following the reintroduction of wolves (Creel et al. 2005).

Alternatively animals may seek to mitigate the risk of predation while foraging in other ways. One common anti-predator tactic is to form groups (Alcock 2005). Groups provide anti-predator benefits through several mechanisms. More individuals means that there are more eyes looking for predators and while some are looking for food, other individuals can be scanning for predators. This increases the chance that an approaching predator will be spotted before it gets too close. As a group of individuals make their getaway, the chaotic movements may also make it more difficult for a predator to select and pursue a single target. Finally, being in a group reduces an individual's chance of being targeted by the predator. Individuals join the group in their selfish desire hide behind others and spread the risk among all members of the group, reducing the risk to themselves. This latter phenomenon is known as the "selfish herd effect."

Even without overt evidence of the presence of predators, potential prey species may show extra caution in the presence of novel features or objects in their environment. The fear of new things is termed **neophobia** and can affect where an animal forages (Greenberg 1984) and what food items it selects (Kijne & Kotrschal 2002). Novel items may represent a threat and may result in a more cautious approach until that threat can be assessed. Alternatively, new objects may trigger inquisitiveness and exploratory behavior (neophilia), perhaps because they may represent new sources of food.

Experimental Goals

We will explore how foraging granivorous (seed-eating) birds respond to the presence of novel features in their environment. Many local birds feed on commonly available commercial seeds which makes them ideal for studies of foraging behavior, as they can be reliably attracted to a study area and the value of the food resource can be controlled. Since seeds are often an unpredictable but patchily distributed resource, group foraging is common among many granivorous birds.

We will test if the foraging rate (number of birds foraging) is altered by the presence of an unfamiliar object or a threatening object in their environment. Depending on the data we collect, we may also be able to study interspecific differences in responding to novel items.

Each feeder will be exposed to three different treatments: a **control** with no changes, an **unfamiliar novel object** (such as a toy or bucket), and a **threatening item** (owl or snake replica). Since each feeder will be exposed to the three treatments sequentially, we will use repeated measures analysis rather than a simple comparison of means. This analysis uses each feeder as its own control, and is especially useful if there is a lot of among-feeder variation, which might be expected due to differences among the locations in which the feeders are placed. A repeated measures Anova can control for much of the among subject variation.

In addition to variation among feeder locations, we must also concern ourselves with variation in bird activity over time. We would expect that feeding activity is highest in the morning (when birds are hungry after their nightly fast) and evening (when they fuel up for the night) and lowest during midday (when it is hottest). If we used the same sequence of treatments for all of our feeders, we would be unable to distinguish the effects of the treatments from simple temporal effects. For this reason, each feeder will be randomly assigned a different sequence of treatments. Although there are statistical techniques that allow the time of day and treatment effects to be analyzed simultaneously, such statistics are beyond the scope of this class, so we will test time of day and treatment effects separately.

Behavioral Sampling

Animal behavior can be rapid, complex and—especially if animals are in a group—very difficult to keep track of. Rather than try to record every single instance of every behavior, ethologists (scientists that study animal behavior) have developed a wide array of behavioral sampling techniques. Although we will not be using all of these techniques today, we present a brief overview of the major techniques (Lehner 1996) as these may also be helpful for your independent project.

Ad Libitum Sampling: As much information as possible is recorded in a non-systematic way. This is the approach that you used if you described any behavior in your field notes. Ad Libitum sampling will usually be biased by the behaviors or situations that most attract the observer's attention, and is thus less useful for rigorous quantitative analysis. It can be of use when studying rare but obvious behaviors.

Focal Animal Sampling: A single individual (or group) is selected and observed for a predetermined time period. All occurrences of particular, specified behaviors are recorded. Where appropriate, the duration of behaviors, or the duration of time the animal was in view, are also noted. This approach is very versatile for studying a wide variety of behaviors as long as individuals can be kept in view for a long enough time period.

All Occurrence Sampling: Instead of focussing on a single individual, this approach records every instance of a specific behavior, regardless of the individuals performing the behavior. This approach works best if the behavior in question is obvious and easy to detect and not so frequent as to be overwhelming. It can provide data on the rate at which particular behaviors occur and their distribution in time.

Scan Sampling (also called Instantaneous Sampling): The activities of an individual or group are recorded at pre-selected intervals (e.g., every 15 seconds). Scan sampling is best suited for determing the percent of time an animal spends doing something, especially if the behaviors are protracted rather than brief events. It is also useful for sampling the behaviors of a group of animals. The time intervals between sampling should be as short as practical (to allow for a full scan and to record the data before the next scan). We will be using scan sampling in this lab.

Procedure—Prebaiting & Set up

1. A number of separate ground-level feeding stations were set up at various locations on the West Campus.
2. Each feeder was supplied with standard mixed bird seed for 3 days prior to this lab to allow for birds to discover the food source and become used to it.
3. No bird seed was added the morning of the lab, but the feeders will have been re-supplied during the first Wednesday lab.
4. Each student will be supplied with bird seed with which to re-supply the feeder.

Procedure—Feeder setup

1. Sprinkle about half of the supplied bird seed onto your feeder as soon as you arrive (even if there is still some seed left, you should add some more as the preferred seed type may have been eaten).
2. You will each have a randomly assigned *sequence of treatments that you must follow* to avoid bias.
3. If your first assigned treatment is the control, simply proceed to Step 4. If your first assigned treatment is either the unfamiliar or threatening object, set this item adjacent to one corner of the feeder. It should not block your view of the feeder.
4. Place yourself at a *discreet distance* (*at least 10-15 m*) where you can easily observe the feeders with binoculars but your presence is not threatening. Remember that birds have excellent vision and hearing. Wearing subdued earth-toned clothing will also help. Avoid excessive movement and noise.
4. **Wait 10 minutes** for birds to habituate to your presence before beginning any sampling. Even if birds are already at the feeder during this time, do not collect data, but make use of the opportunity to practice identifying them.

Procedure—Sampling

1. After you have waited the 10 minutes, begin sampling (even if there are no birds present).
2. You will use a **scan sampling** technique. Use a repeating timer to time 30 seconds intervals. At each beep, scan your feeder and count how many birds of each species are present at the feeder (or on the ground within 1 m of the feeder). Do not count any activity that occurred between the sampling times.
3. Continue scan sampling for 30 samples (15 minutes) and then stop.
4. Refill your feeder with more bird seed if necessary, and replace the first treatment item with the second.
5. Once again, **wait for 10 minutes** for things to quiet down before beginning your sampling.
6. Collect 30 more scan samples as above.
7. Repeat steps 4-6 with the third treatment.

Procedure—Cleanup

1. Leave the feeder and flag in place for the next lab.
2. Collect the equipment that you brought with you, including the clipboard, binoculars, timers, unused seed, and owl or snake models, and bring them to lab.
3. Calculate the row totals and column means on your data sheet as described below. Enter these data in the data sheets or computers provided in lab. I will post a summary of the class data online.

Analysis

We will pool data from the entire class for analysis. You will need to return to the lab to calculate the treatment averages and record these data in the class data sheet.

The data from each individual scan are not independent of each other. That is, the birds that were observed during one scan will frequently be the same birds recorded in the following scan. Thus, each 15 minute treatment period as a whole represents a single statistical data point for each feeder. You will need to average all of the data from the individual scans to determine the mean abundance during each treatment period.

Determine the average **number of foraging birds** in each of the three treatment intervals *for each species of bird* you observed. When determining average abundance, you should include *all* scans, *including those in which 0 birds were present*. Also include the total number of birds observed of all species combined in the right hand column of the data sheets. You can also perform the analyses for each species at a time, but focus only on the most common two or three species.

Data from each treatment-feeder combination will be analyzed using a **Repeated Measures ANOVA** (available in the Statistical Analysis *Excel* file; make sure you use this test and not the regular ANOVA). This test uses each feeder as its own control. Therefore, it is critical that you enter the data into the *Excel* file correctly. Each row in the data set should represent one feeder (thus, you should have the same number of rows as we had feeders set up); it is imperative that you do not mix data from different feeders on the same row.

Since each feeder had a different sequence of treatments over the three time intervals, you will need to enter the data for the time of day analysis and treatment analysis separately. For the time of day analysis, data from each time period (1st, 2nd, or 3rd) should be entered in the three columns. Do not worry about variation in start times, as long as the sequence is correct.

For analysis of the treatment effect, each column in the analysis will represent one of the three treatments (control, unfamiliar, and threatening). *You will need to be sure that each datum is entered in the correct column for its treatment*. This will be different than the columns for the time intervals since the sequence of treatments was different at each feeder. *Take extra care to ensure that the data are entered under the correct treatment columns*! To help organize the data prior to entering them into Excel, a pair of tables is available on the following page. Use these tables for the overall data and then make additional copies for organizing the species-specific data.

Your intial analyses of the effects of time and treatment should use the data from all of the species combined (total birds). *If* you obtained a significant effect when combining all species, you should then repeat that analysis for select species of birds. You do not need to analyze all species, but instead focus on those that were most common.

When reporting the statistical results, include the complete name of the test (although you can use the abbreviation ANOVA), both degrees of freedom, as well as the p-value. Since you will be comparing three means, a visual representation of the means with error bars that represent standard errors will help indicate which were actually different (do **not** use the "standard error" check box when adding error bars in *Excel*; you will need to enter the standard error values by hand or via a cell on the spreadsheet). See the handout for Lab 1 for calculating standard errors. For the time period data, a line graph is most appropriate since line graphs are used to represent a sequence or progression. For comparing means of the three treatments, a bar graph (what *Excel* calls a column graph) is most appropriate. Both graphs should include error bars.

Data Organization

Use the following tables to help *organize* the **class data** prior to analysis. It is essential that all of the data be aligned in rows by their correct feeder and be correctly aligned in columns under their correct treatments: remember that the treatments were not in the same order for each location. You can make additional copies of this page to organize data from individual species as well as the total birds data.

	Time Period			Treatment		
Feeder #	1st	2nd	3rd	control	unfamiliar	threat
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

References:

Alcock, J. 2005. *Animal Behavior*, 8th ed. Sinauer Assoc.: Sunderland, Mass.

Creel, S. et al. 2005. Elk alter habitat selection as an antipredator response to wolves. *Ecology* **86**: 3387–97.

Greenberg, R. 1984. Neophobia in the foraging-site selection of a neotropical migrant bird: An experimental study. *PNAS* **81**: 3778-3780.

Kijne, M. & Kotrschal, K. 2002. Neophobia affects choice of food-item size in group-foraging common ravens (*Corvus corax*). *Acta Ethologica* **5**: 13-18

Lehner, P.N. 1996. *Handbook of Ethological Methods*, 2nd ed. Cambridge University Press.

Data Sheet for Bird Foraging Study

Observer: ________________________________ Time: __________ – ____________

Feeder #: _______ Treatment (circle): **Control** / **Unfamiliar Object** / **Threatening Object**

	Bird Species:								
Scan #	Mourning Dove	White-wing Dove	Inca Dove	Gambel's Quail	House Sparrow	House Finch	Abert's Towhee	Other: ________	**Total Birds**
Wait 10 minutes before starting sampling									
1									
2									
3									
4									
5									
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Mean Abundance									

Data Sheet for Bird Foraging Study

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Mean Abundance									

Data Sheet for Bird Foraging Study