AN EXERCISE IN ARMCHAIR ORNITHOLOGY

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INTRODUCTION

The ornithological literature abounds with hypotheses and theories to describe avian distributions. Some such as Bergmann's Rule and Island Biogeography are introduced in ornithological texts. The process by which hypotheses are developed and tested will be demonstrated and conducted in this laboratory. In traditional scientific investigations hypotheses are developed and then tested using collected data. Here we will use data available in published field guides to test our hypotheses.

LEARNING OBJECTIVES

- learn to develop hypotheses about avian distributions
- gather data to test the hypotheses from field guides
- learn to present data in the form of graphs
- give a formal presentation

MATERIALS

an assortment of field guides, maps, atlases
graph paper
or computer program capable of graphing data

PROCEDURE

1. Select a field guide of interest and discuss with your lab partner questions concerning bird distributions. Write out your question of choice:

   State your question as a hypothesis. (For example, a question might be, "are owls that live in colder climates larger in body size?" Your hypothesis might then read: "owl species with the center of their ranges at higher latitudes will have longer wing lengths than birds at lower latitudes.")

Write your hypothesis:

Also state your hypothesis in the null hypothesis form. (For example, "there will be no difference in wing lengths between northern owls and southern owls.")

Write your null hypothesis:

2. Using the field guide, record data to test your hypothesis. (For example, make a list of owl species, latitude at the center of each species' range, and average wing length for each species).

3. Use graph paper to plot your data. (For example, plot owl species wing lengths against latitudes). Discuss your results with the laboratory instructor. Do your results support your hypothesis? Do you need to apply a statistical test?

4. During the next week, use a program in the computer lab to plot your data and to apply a statistical test to your data. Prepare an overhead of your graph and hard copies to give to members of the class.

5. During the next laboratory present your results to the class. Suggest related hypotheses that could be tested and possible explanations for your results.

SUGGESTIONS FOR INSTRUCTORS

This laboratory may be completed in one session if you have few students, computers in the laboratory, and a three-hour lab, but I have them work on their presentations before the second laboratory period, at which time they present to the class and we discuss their results. This laboratory exercise, in which students devise hypotheses as they look at field guides, is an exciting period with lots of enthusiasm generated for bird study. I provide examples and encourage student thinking processes that provide testable hypotheses. I ask them to learn how to state the hypothesis properly, sometimes to come up with several hypotheses before selecting the one to study, and to select a hypothesis that can be tested using data available in a particular guide. Success depends on lots of interaction with each student (small labs of no more than 12 students work best). I also find that students who work independently on a topic understand their project better and make it their own, rather than having them share projects. However, during the initial lab I do have them talk over their hypotheses in groups. An example of a student presentation is given in the Appendix.

This exercise is also particularly stimulating to their imaginations if lots of exotic and tropical guides are used and the lab takes place on a snowy winter day when local field trips have been impossible. (I use this lab to substitute for a postponed field trip due to inclement weather.) There is nothing better to excite a budding ornithologist than looking through A Field Guide to Birds of Costa Rica while snow whirls past the windows. World maps and atlases may be used for location, latitude and longitude information. Field guides come from my personal collection and from the Saint Mary's College library. A list of some field guides I use is given below.

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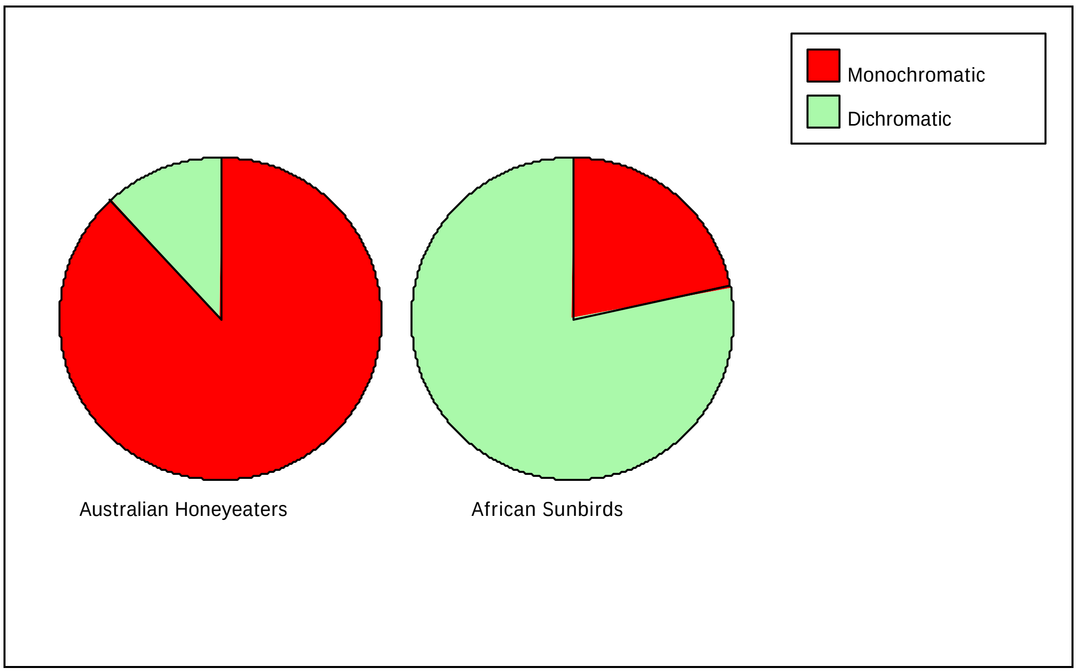
APPENDIX

EXAMPLE STUDENT PRESENTATION OF ARMCHAIR LABORATORY.

NECTIVORE COLORATION

I hypothesized that nectivores should be dichromatic.

Results:



African Sunbirds supported my hypothesis, but Australian honeyeaters did not. To explain the discrepancy, I looked at the diet and mating habits of both families. The diets of sunbirds consisted of both nectar and insects. It appeared that more of their diet was insects than was nectar. The diets of honeyeaters consisted mainly of nectar, fruit and sugary secretions of herbivorous insects with a few insects eaten for protein. The honeyeaters tended to be monogamous with both parents caring for the young. Although I could not find any information on sunbirds' mating habits, I assume that they are not monogamous due to the males' bright coloration. Differences in diet and possibly mating behavior seem to explain why one group is dichromatic and one is monochromatic.