Lecture 2 – Outline

I. Hypotheses
   A. Review
   B. Wildlife Examples
   C. Abstraction with cards

II. Predictions
   A. Abstraction with cards
   B. H’s & P’s as foundation for Introductions
   C. Deductive logic practice (make predictions)

Remember Hypotheses come in two flavors:
- A hypothesis can be a potential explanation for an observed (known) natural phenomenon.
- A hypothesis can be a biological assertion for some unknown wildlife information (e.g., a solution to a management problem).

EXAMPLE
potential explanation for natural phenomenon:
Phenomenon: Mammals’ body size increases toward the poles (Bergmann’s rule).
Hypothesis: A larger body size facilitates more efficient thermoregulation (surface area to volume ratio).

EXAMPLE
biological assertion for unknown wildlife information:
Unknown info: Mate fidelity in northern flying squirrels.
Hypothesis: Northern flying squirrels are monogamous within a breeding season.

What about a real management issue…?
…the so-what factor looms large!

EXAMPLE
potential explanation for natural phenomenon:
Phenomenon: Waterfowl abundance on ________ wildlife refuge has declined.
Hypothesis: Water pH has declined and diminished submerged vegetation (duck food).
EXAMPLE
biological assertion for unknown wildlife information:
Unknown info: The value of old-growth redwood for *Ensatina* salamanders.

**Hypothesis:** Old growth redwood forest is better habitat than mature second-growth redwood forest for *Ensatina* salamanders.

Remember Predictions are logical extensions (deductions) of hypotheses.

They are not necessarily what you think will happen.
They are what **must happen** if the hyp is true.
They are often phrased as **If…then** statements.
The best predictions are both **necessary** and **sufficient** to support their hypotheses.
Possible explanations:
(a) red & black alternate
(b) "even" values
(c) (a) and (b)

Lessons of card game:
1. Experiments are more efficient than observations.
2. Hypotheses can be tested by attempting falsification or confirmation.
3. When you have competing (alternative) hypotheses, scrutinize them until they reveal contrasting predictions.
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If a prediction is upheld, its hypothesis is supported. If a prediction is not upheld, its hypothesis is rejected (or not supported).

Our studies should be designed to effectively test predictions & hypotheses.

Introductions encapsulate study design…

The most successful introductions contain five essential elements, all with key references.


Introduction

natural phenomenon: In many species of diving ducks, females migrate further south than males, producing a disparity in the sex ratio in wintering flocks (key references).

Breeding range

winter range

winter range

Breeding range

winter range

winter range

winter range

winter range

Breeding range

The main hypotheses to explain this phenomenon are (hypotheses):

1. Sexual dimorphism in body size may render females more susceptible to harsh weather, causing them to migrate further south (key references).

2. Males may winter closer to the breeding grounds in order to return earlier in spring and acquire better breeding sites (key references).

3. Females may require different food (e.g. only insectivorous), only obtainable further south, to attain breeding condition (key references).

4. Under limited food conditions in winter, male behavioural dominance may result in a reduced food intake of females and their exclusion from the best food sites, forcing them to move to poorer foraging sites (key references, Gauthreaux 1978).

Segregation between males and females might be expected to occur both locally, with males occupying the better positions and females the peripheral areas (key reference), and over a wider geographical region with males wintering north and females wintering further south.
Research Objective/Aim: In this study we attempt to test this last behavioural dominance and dispersal hypothesis using observations from the European pochard *Aythya ferina*.

Background of study animal: Of all diving ducks in Britain, this species has the greatest disparity in sex ratio in the wintering population with only 29.5% females (key reference).

From Gauthreaux’s hypothesis the following predictions were investigated:

*If the behavioural dominance hyp is true, then…*

1. males should dominate females in aggressive encounters;
2. males should monopolise good food sites, whereas females should feed in sub-optimal areas;
3. females that remain in the better food sites should have restricted access to the food and hence poorer feeding success.

Phenomenon: Mammals' body size increases toward the poles (Bergmann’s rule).

Hypothesis: A larger body size facilitates more efficient thermoregulation (surface area to volume ratio).

Prediction?

Unknown info: Mate fidelity in northern flying squirrels.

**Hypothesis:** Northern flying squirrels are monogamous within a breeding season.

**Prediction?**

Phenomenon: Waterfowl abundance on _______ wildlife refuge has declined.

**Hypothesis:** Water pH has declined and diminished submerged vegetation (duck food).

**Prediction?**