

MARS 4910: Jan 29 / 31

Plan for Today:

- Review research plans
- Discuss experimental design:
samples & variables
- Presentation: Data Summaries

Assignments for Today:

- Go Over Literature References
- Develop Proposal Outline: Hypotheses
Field sites
Sampling methods

Characterizing your Variables

NOTE: Consider one response variable at a time

Hypothesis Number and Verbal Description	# Continuous Predictors	# Categorical Predictors	Paired OR Unpaired Data ? *	Do Data Meet Parametric Assumptions

*** Paired / Unpaired Categorical Predictors:**

Are the same objects (individuals / samples)
used in each category ? (YES / NO / sometimes)

Sampling Organisms

Question: Estimating organism distributions

- Presence / Absence vs Abundance
- Relative Abundance vs Total Abundance

Examples:

- Corals, Algae
- Fish, Urchins, Turtles
- Scavengers

Standardized Samples

Question: How to ensure sample comparability ?

- Presence / Absence vs Abundance
- Relative Abundance vs Total Abundance

Examples:

- Corals, Algae
- Fish, Urchins, Turtles
- Scavengers

Standardized Samples

Tasked with comparing nest density of ground-foraging ant species in two adjacent habitats: agricultural field / forest.



Delineate Two Study Areas

Sample Randomly (lat / long)

Standardize Survey Effort (1 m x 1 m)

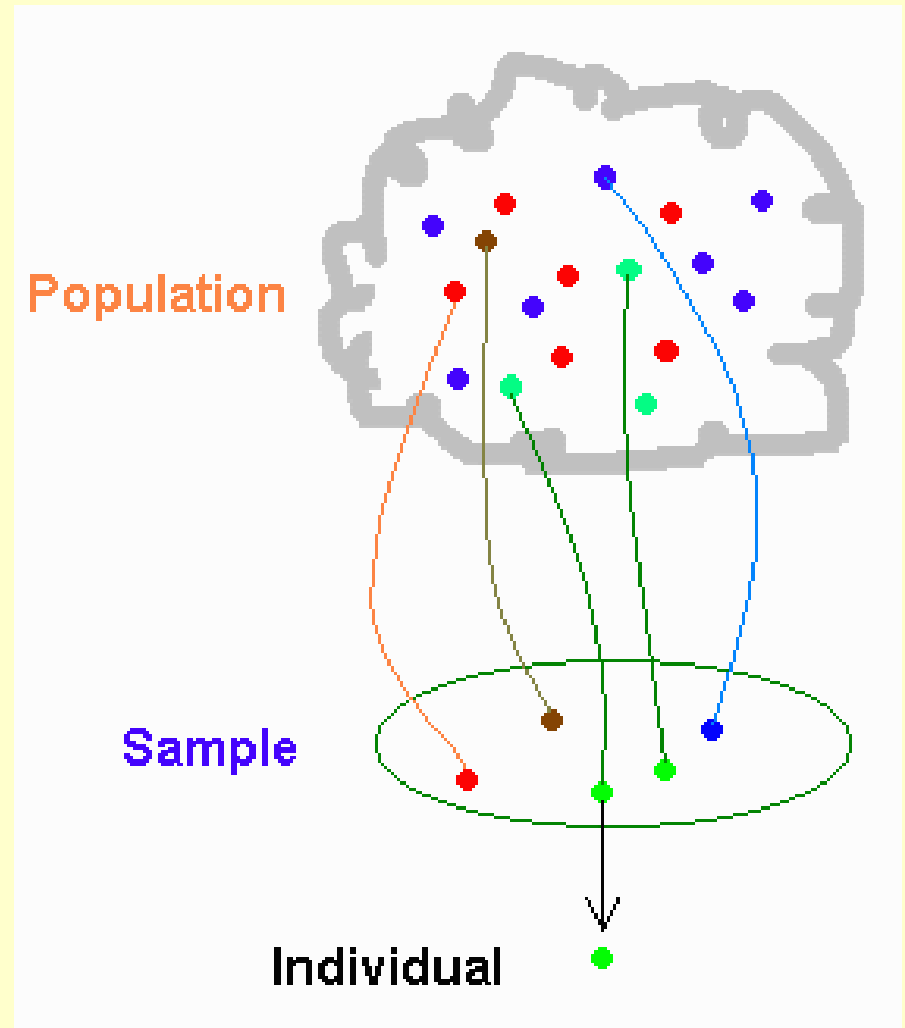


Sampling

Why do we sample ?

Why don't we just sample one individual ?

How do we ensure our sample is representative of the entire population ?



Random Sampling

A random sample is a subset of individuals (a sample) chosen from a larger set (a population) such that:

Each individual is randomly chosen (by chance):

- each individual has an equal
- and independent probability

of being chosen during the sampling process,

A random sample is an unbiased surveying technique.

Controls

Question: How do we avoid the influence of "outside" factors and variability?



Table 2.1. Sources of variability in experiments, and procedures for reducing confusion caused by such variability

Source of Variability	Reduction by Experimental Design
1. Variability among experimental units	Replication, interspersion, and simultaneous measurement
2. Random error in measurement of response variables	Replication
3. Change in conditions through time	Controls
4. Unsuspected side effects of treatment procedures	Controls
5. Bias of investigator	Randomized assignment of treatments to experimental units
6. Chance influences on experiment in progress	Replication and interspersion

Controls

- In manipulative experiments: controls are experimental units that are identical to those receiving manipulative treatments except in the critical treatment factor.
- For example, if fertilizer is applied to a plot of grassland by spraying a solution of fertilizer in water, control plots should ...

Controls

- In field research: controls can reveal whether some change is occurring in the plots over time, because of factors the experimenter cannot hold constant, such as seasonal changes in day length / rain.

RANDOMIZED BLOCK DESIGN

D	A	B	C	Block 1
B	C	D	A	Block 2
A	B	D	C	Block 3
C	B	A	D	Block 4

Figure 2.1.

Schematic representation of plot layout for experiments with a randomized block design and latin square design. The letters A, B, C, and D indicate four different treatments.

Controls

- Controls essential for field experiments, because:
 - It can rarely be assumed that conditions will remain constant for any substantial time
 - Almost any measurement or manipulation involves incidental impacts of the investigator.

Controls

Question: What "outside" factors and sources of variability may influence your measurements / samples ?

Question: What steps can be taken to remove those "outside" factors / sources ?

MARS 4910: Feb 5 / 7

Plan for Today:

Presentation of research projects by each group:

Study sites, Methods

Number of sampling days requested

Laboratory work / equipment requirements

Cruise Planning Discussion and Class Feed-back

Assignments for Next Week:

- Complete Final Research Plan
- Work on Research Proposal (Due Feb 12 / 14)