

DATA ANALYSIS

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Learning Objectives

At the end of today's laboratory, you should be able to:

- Discuss why ecologists use statistics
- Explain the purpose and calculate simple descriptive statistics (i.e. mean, variance, standard deviation)
- Describe a normal distribution
- Understand and apply the t-test
- Understand and apply the chi-square test

Why Statistics for Ecologists?


Q: who has completed a statistics course?
Q: who has completed a calculus course?

Statistical Analyses

- Descriptive Statistics to describe your sample population
 - Central Tendency – mean, median, mode
 - Variability – standard deviation, variance
- Comparative Statistics to test your null hypotheses
 - Is your sample normally distributed?
 - Shapiro-Wilk test
 - Are the means of two sample distributions different?
 - T-test for continuous data
 - Yates correction for 1 DF
 - Are two populations of counts or frequencies different?
 - χ^2 test

Measurement Theory: Scales of Measurement

- Nominal
 - Identifies categories
 - Burned vs. Unburned
- Ordinal
 - Can be rank ordered
 - Dominant > Abundant > Frequent > Occasional > Rare
 - No simple relationship like $2x A = D$
- Interval
 - Rank order, but specifies precisely how far apart the units are
 - Can be added, subtracted
 - No absolute zero. i.e. Celsius temperature scale
- Ratio
 - Has an absolute zero
 - Length, mass, Kelvin temperatures.
 - Add, subtract, multiply, divide



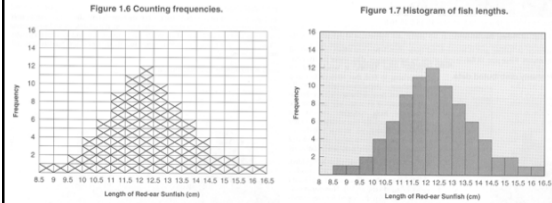
Descriptive Statistics

What does the population look like?

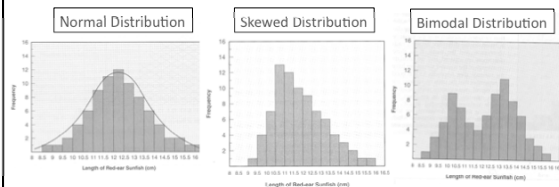
Descriptive Statistics

- Variables have a distribution
 - What does this mean?
- What statistics do we use to describe a population's distribution?
 - Central tendency: mean
 - Variability: variation, standard deviation

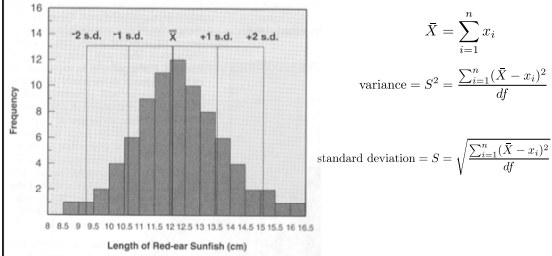
Describing Populations: Histogram



Distributions



Describing the Population



Comparative Statistics

Are two populations different?

t-test

- Assumes that the variable is
 - the is continuous
 - has a normal distribution
- Example on Board
- Use JMP to calculate
 - JMP Demonstration

Chi-Square Test

- Used to compare totals, counts or frequencies
- Are two values significantly different?
- Work example on board.
- We will calculate by hand or in Excel