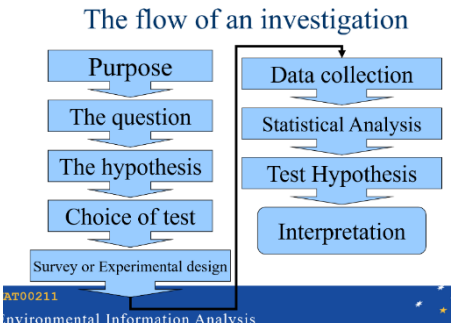
Lecture 1:

Why statistics?
"Statistics is the study of methods to describe and measure aspects of nature from samples" – Whitlock and Schluter, 2015.
To Quantify uncertainty (departure from the truth) & Infer unknown quantities in a "population"
Allows complex data to be simplified to identify trends and patterns (descriptive statistics)
Provides a commonly accepted framework for testing ideas, making assertions and communicating these ideas (inferential statistics)
Pragmatic – dealing with things sensibly and realistically in a way that is based on practical rather than theoretical considerations.
Without statistics = educated guesses

The flow of an investigation:
Purpose: Not explicit but self evident.
Do a literature review (reason for study, theoretical context, etc)
Problem definition clearly articulats what the SPECIFIC problem is, why it needs investigating and how your work will contribute.
Aim: Narrowly focused and specific.
What you hope to achieve.



The Question – objectives:
Very specifc but simple

What will you measure?
- Variable/data types
What type of questions?
Research Hypothesis: What you thinks going on.

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- Variable/data types
What type of questions?

Variables:
2 types;
1. Quantitative variables (measurements are made) such as;
- Continuous – real limits, shows level of precision, infinite number of values (length, height, % etc)
- Discrete/ discontinuous – No intermediates possible, cant split things up
2. Non measured variables (measurements are not made) based on attributes of an "individual" such as;
- Ordinal (ranked) – inherent order e.g. agree → slightly agree → neigher → slightly disagree → diagree
- Category (attribute/nominal) – No inherent order, things are split up e.g. male vs female as oppossed to 'people'.

IMPORTANT: One data/variable type can be transformed into another. Know what type of data you are dealing with at the point you present (descriptive statistics) or analyse (inferential statistics) your data!

Real limits:
When we use continuous measurements the final digit indicates the level of precision. A measurement of 171 cm implies that the true value is between 170.5 and 171.5 cm (smallest unit of measure = 1cm). Whereas a measurement of 171.3 cm implies that the true value is between 171.25 and 171.35 cm (smallest unit of measure = .1cm).
Always round to closest even number when marked half way. (Closer to the unrounded total).

Variable examples:
1. What type of variable is 42 Female and 27 Male….
Category because you allocate individuals into different groups based on an attribute!

2. What type of variable is Plot A - 16 species; Plot B - 9 species…
Discrete because you've counted the number of species in each plot!

Graphical Representation Of Continuous and Discrete Data
- Histogram (Joined bar graph)
- Frequency polygon
- scatter plot when two variables

Graphical Representation of Category and Ordinal Data
- Bar chart for category
- Pie diagram for category and ordinal

Why? Different variables are "distributed" differently

Explanatory variable – What you do to something (treatments), What you think might affect the thing you're "measuring". Can be a measurement, made at the time a "response variable" is measured (random treatments) or Can be categorical or fixed treatments (applying a specified amount of fertilizer to plots, dived vs undived sites).
Further terms; sampling unit, unit, individual, subject, replicate.

Response variable – What you're actually measuring or recording

The Null Hypothesis

Choice of Test:
e.g. *Question*: Is there a relationship between the rainfall and the growth rate of silky oak?
Null Hypothesis: There is no liner relationship between rainfall and growth of silky oak.
Test: Correlation