Biological Research and Sampling Design

Name: _____
School: _____
Date: _____/_____/_____

National Marine Science Centre

This material has been developed as part of the *Australian School Innovation in Science Technology and Mathematics Project* funded by the Australian Government Department of Education, Science and Training as part of *the Boosting Innovation in Science Technology and Mathematics Teaching (BISTMT) Programme*.

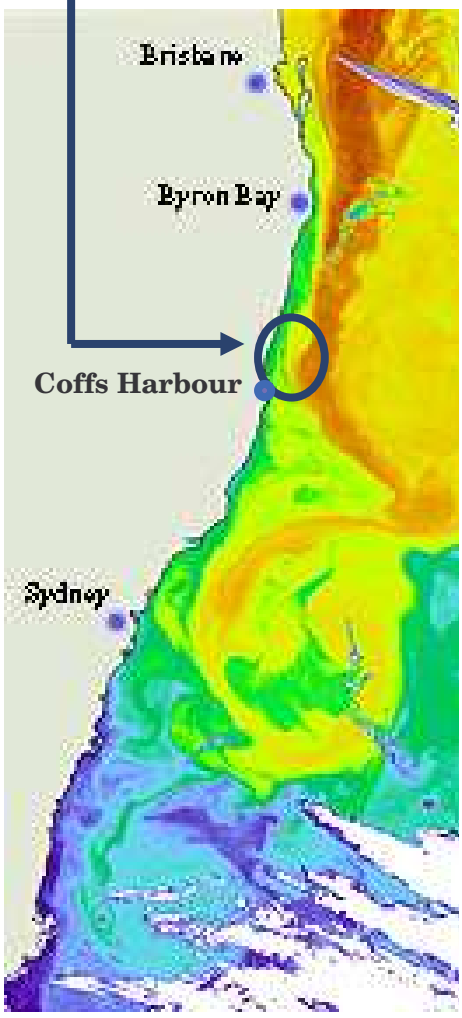
Solitary Islands Marine Park

The SIMP lies on the over-lap zone where cool temperate waters, meet warm tropical waters brought southwards via the East Australian Current.

These climatic and oceanographic influences provide a unique environment where tropical, subtropical and temperate marine species co-exist...

- Over 280 fish species
- 4 turtle species
- More than 90 coral species
- Many large marine mammals
- Sharks and rays
- + much more

The high biodiversity in this area and the protection of these marine communities, makes the SIMP a great place to carry out marine research projects...



Different Projects, Different Sampling Methods

The marine environment is incredibly diverse, and hosts a huge range of different and interesting habitats, incl. sandy beaches, rocky shores, estuaries, subtidal reefs, etc.

Many biological and physical factors work together to determine what lives in each of the different environments and how they differ from one another...

Therefore, when researching and studying the marine environment, scientists need to choose the sampling method that is most appropriately suited to the environment and/or organism they are studying...

Biological and Environmental Research

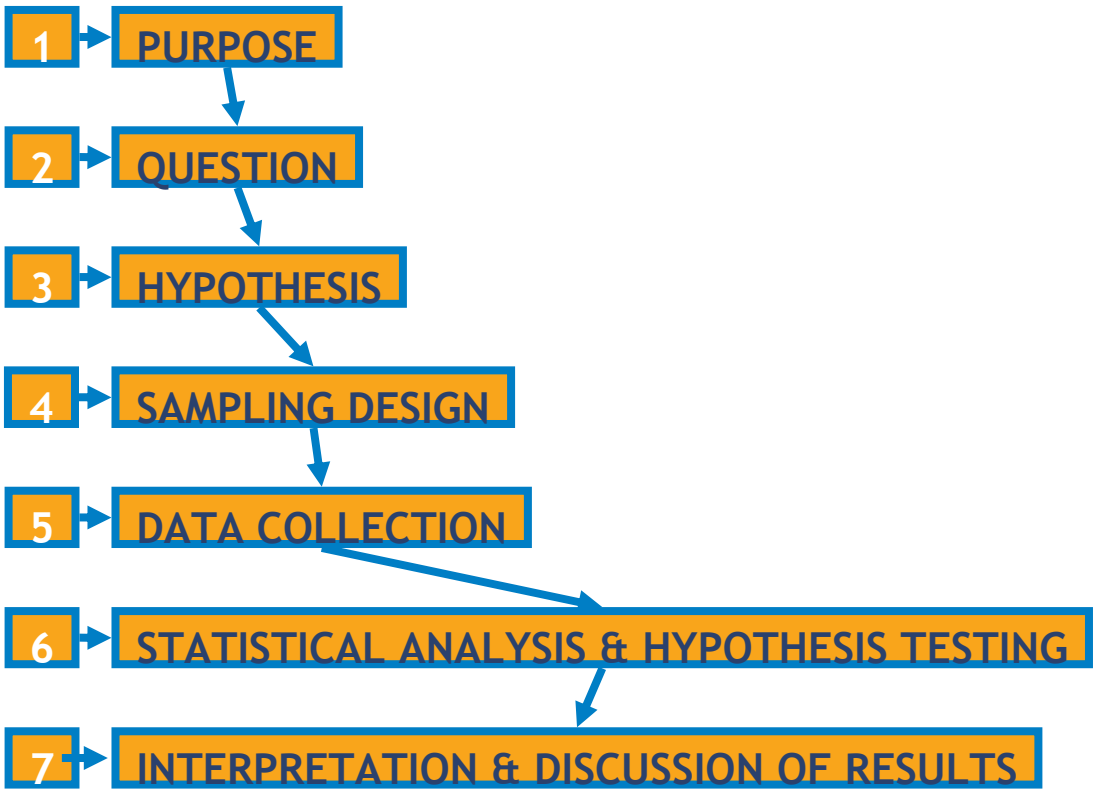
All scientific research aims to examine and explain the effects of nature in a reproducible way, hoping to use these reproductions to make useful predictions.

Research is carried out either through observation of natural phenomena, and/or manipulative experimentation.

Commonly used terms

Variables	• Specific factors that must be taken into account in any research project.
Observation	• A recording of what the scientists has noted
Data	• The information collected regarding the studied topic
Results	• A presentation and description of what was observed and recorded
Conclusion	• A summary of the results and possible explanations of the specific findings

Basic steps in any research project...



YOUR TASKS - - -

- The class will be divided into even groups, and each group will be delegated a "purpose"...
- Work together as a team to try and design a hypothetical research project.
- Complete steps 1 – 4 on the next two pages.
- Brainstorm all the biological, physical and chemical variables that might influence your study
- Answer the Extension Questions on the last page of this booklet

Designing your own research project...

1 → PURPOSE

Example: "To investigate the total number of different mollusc species living on rocky shore habitats within the Solitary Islands Marine Park"

2 → QUESTION

Example: "Does the total number of different mollusc species change at different sites on the rocky shore?"

3 → HYPOTHESIS

Example: "As a result of many biotic and abiotic factors, the number of different mollusc species is likely to change at different levels on the rocky shore..."

Designing your own research project...

4 → SAMPLING DESIGN

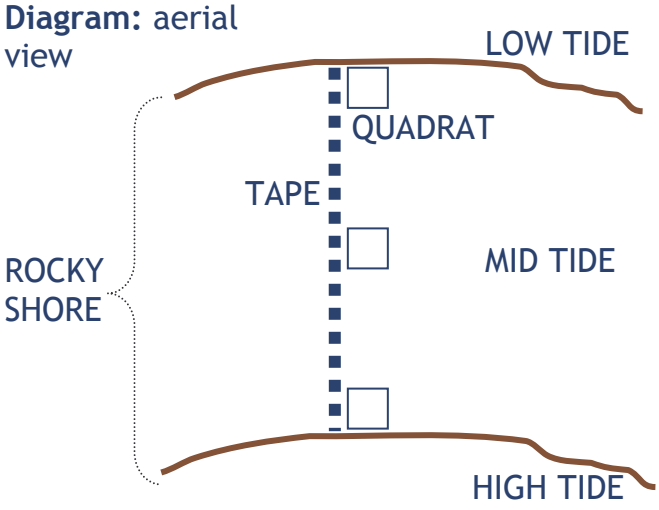
EXAMPLE:

Location:
- (1) Rocky Shore

Sites:
- (1) High Tide
- (2) Mid Tide
- (3) Low Tide

Sample Method:
- Lay out a tape from high tide level to low tide
- One 50cm x 50cm quadrat placed at each of the three sites
- All mollusc species within each quadrat will be counted and recorded

Diagram: aerial view



Location: _____

_____

Diagram:

Sites:

_____

_____

_____

_____

_____

Sample Method:

_____

_____

_____

_____

_____

_____

_____

_____

Designing your own research project...

Now pull your heads together and try to brainstorm all the different variables or factors that may influence the observations you would make.

Remember… influential factors can be –

- Physical (eg. Wave action),
- Chemical (e.g. Salinity), or
- Biological (e.g. Food availability)

Extension Questions...

1. What sampling technique could a researcher use if they wanted to discover the biodiversity of a particular group of marine invertebrates on a subtidal reef?

2. What is meant by the word Hypothesis? (give two examples)

3. What types of modifications could be made to fishing nets to try and reduce by-catch?

4. What is the main reason there are such high levels of marine biodiversity within the Solitary Islands Marine Park?

5. How could you manipulate an experiment to test the effect of higher and lower salinity levels on fish?