Lecture 1:

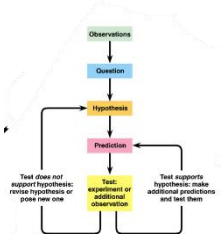
Ecology: Scientific study of organisms (microbes, plants, animals etc) in their environment.
"Ecology is the scientific study of the interactions between organisms & their environment that determines their distribution & abundance" • ecology aims to identify fundamental principles that apply to whole of natural world".
Environment = all external factors that influence an organism – abiotic (physical & non-living) – biotic (biological).
- Two-way relationship: – organisms are influenced by environmental factors – organisms in turn may modify their environment.

History: First used by Henry Thoreau – from Greek
1866 Ernst Haeckel defined ecology as "investigation of the total relations of the animal to both its organic & inorganic environment" – nowadays not just restricted to animals.
Human knowledge about living world developed & refined over 1000s years, more scientific approach from the 1800's.

Development: Early stages (late 1700s to mid-1900s) – mainly a descriptive science
- Binomial nomenclature: every species has a two-part name 1. Genus 2. Species e.g. Homo – Sapian
- Taxonomic hierarchy: Domain, Kingdom, Phylum, Class, Order, Family, Genus, Species
- 1950's ecology has become more experimental – hypothesis experimenting and t-testing (predictions made)

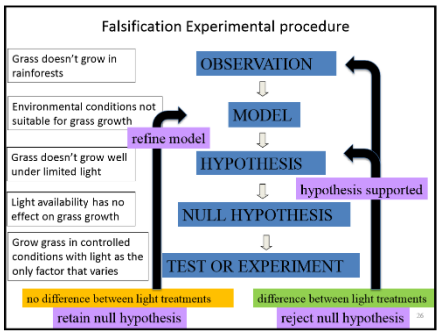
Ecological Methods: Studied on three broad but interrelated fronts: – theoretical – laboratory – field (underpinning them all is the scientific method)

Scientific Method:
- process of inquiry that includes: – repeatable observations – testable hypotheses
- hypothetico-deductive reasoning



Hypothetico-deductive Reasoning:
Model: A series of statements providig a realistic possible account for an observation
Hypothesis: New prediction deduced from a model or theory
Logical experiments: Designed to test specific questions
- experimental procedures must distinguish between potentially competing hypotheses
Falsification of incorrect models/hypotheses

Proof & disproof
Proof requires that every set of circumstances conform to the prediction in the hypothesis but one contradictory case is all that is needed to disprove a statement or hypothesis. Seeking disproof or attempting to falsify involves construction of a null hypothesis.
- Null hypothesis reverses the hypothesis to include all possibilities except the actual proposition in the hypothesis



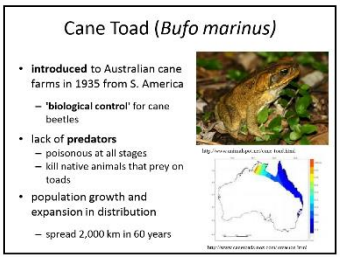
Model = set of observations

Hypothesis driven research: growth of knowledge occurs via the elimination of false models, theories & explanations. Refinement of the model can generate more precise hypotheses

Levels of scientific knowledge:
Observations – particular "truths" of the natural world – context specific
Models – verbal or mathematical statements of hypotheses
Hypotheses – predictions based on limited numbers of observations
Experiments – tests of hypotheses (observational or manipulative)
Theories – integrated sets of empirical hypotheses that together explain a significant fraction of scientific observations eg theory of evolution
Scientific laws – universal statements so well corroborated that they accepted as scientific knowledge eg. gravity (none in ecology yet)

Scope of ecology:
- Major levels of interaction & organization: individual organism – population – community – ecosystem – landscape – biome – biosphere

Individual Organism Level: single or modular organism. E.g. Cane Toad →



Hierarchy of levels:
- species = group of organisms that can interbreed
- population = all the individuals of a given species in a given area
- ecological community = assemblage of different species that co-occur in any given area
- ecosystem = combination of community + environment where it is found

Interbreed: Breed or cause to breed with another of a different race or species.

Populations: Groups of individuals of same species that occur at same place & time (can interbreed)
- evolution operates at population level.
- population ecology deals with dynamics of populations & how they interact with the environment.
Population dynamics = changes in abundance/ time
- *Populations increase* as a result of: – natality (births) – immigration
- *Populations decrease* as a result of: – mortality (deaths) – emigration
Demography is the study of these four factors.

Resource Management: Maintain populations at levels that provide sustainable yields
- Control population size
- suppress pests & increase endangered species
- indicators of environmental change