

Learning Goals

Lecture 2 (Intro methods)

1) Explain the role of observations, experiments and models in answering ecological questions

How ecologists develop and answer questions is through Observation, Experimental manipulation, and Mathematical and Statistical models

Observation - documentation for natural patterns that exist that could lead to questions of mechanisms

Experimental Manipulation - testing the hypothesized mechanism

Mathematical and Statistical models - test the expected outcome of the particular process

2) Distinguish between sampling effect model and neutral model

Sampling effect - a pattern occurs simply because a rare kind of species is unlikely to be found in a small sample size, not because of any trait or physical property of that species

Neutral model - a pattern that occurs because of random variation in dispersal, death, and birth rates between individuals, not because of its traits that determines its abundance and distribution

3) Use Stock and Flux diagrams to define a question

Input Flux - something that enters

Stock - current amount inside

Output Flux - something that leaves

Use these to make a biological explanation: explain why the input is low for example and output is high and run experimentation

4) Contrast hypotheses and predictions

Hypotheses - explanations for pattern (can be later experimented)

Prediction - guess that might happen based on observation

5) Differentiate between proximate and ultimate hypotheses

Proximate - only explains the immediate mechanism

Ultimate - explains the root cause of the effect, gives full causation

6) Design an effective manipulative experiment

Steps: First make an observation to ask your question. Ask if the pattern is real (R^2 less than 1 and p less than 0.05) and ask if you need a biological explanation (null models - sampling and neutral). First ask if it is because of a sampling effect - make a hypotheses and build your sampling effect model. If it doesn't fully explain, need a biological explanation (Use stock and flux diagrams) and see what is entering and leaving. Make a input hypotheses and output hypotheses and test each of them (experimental manipulation)

Lecture 3 (Chapter 18)

- 1) Describe the global pattern of species richness with consideration to the identity of species and the history of Earth

Species richness increases in tropical regions (low latitudes near the equator) and decreases in increasing latitude (towards poles). Species richness varies from continent to continent. A community or biome of similar type can also be different depending on its location on the earth.

- 2) Define and explain the following: diversification rate theory, diversification time theory, the area hypothesis, the productivity hypothesis, the museum hypothesis, the cradle hypothesis and the out of the tropics hypothesis

Diversification rate theory: rate of diversification is highest in the tropics because of large land mass and uniform climate so low rate of extinction

Diversification time theory: more time to develop in the tropics than temperate and polar areas

Cradle: species are born in the tropics but then disperse to the polar regions later

Museum: born in the equator area and may move to poles but most will stay

Cradle + museum: in cradle, species will disperse to the polar regions however we might find species staying in this area where they originated which lets us find species that originated long ago here and they are on display like at a museum - we can find most records of species here. Most species dispersed to poles but some were left behind making a museum.

Productivity: more productive in the tropics, more species richness, more ability to coexist and low extinction rates

Out of tropics: saying that there are more species in the tropics because they evolve faster here and go extinct less often

Lecture 4 (Chapter 9)

- 1) Suggest biological and physical factors that could limit the distribution of a species outside

Habitat suitability - no one species can live everywhere and abiotic/biotic factors can affect where it will be living. Abiotic being non living resources - such as the appropriate soil, climate, soil pH concentration etc are all factors for if it can tolerate this type of environment. Biotic being if there are certain species it cannot live without or some species that practice predation, herbivory, competition with it that drives it out.

Dispersal - limited dispersal where a species cannot go to a suitable habitat because of its less capacity for movement

Disturbance - any event that kills or damages species currently living in an area (frequent disturbances can have less species richness)

- 2) Define and apply the terms population, distribution, abundance, and individual

Population - individuals of the same species that are found living in a particular area and interact with each other

Distribution - the geographic area where individuals of a species are found

Abundance - the number of individuals of a species found in an area

Individual - the product of a single fertilization event

3) Explain what genets and ramets are and suggest potential experiments that would focus on one or the other and why

Genet - genetic individual that is formed by a single fertilization event and if produces asexually it may contain multiple more genetically identical parts (genetic individual or a group of clonal organisms)

Ramet - (physiological individual) this may be an independent member that competes for resources with other ramets

Potential experimentation - seeing competition between each Ramet will just focus on the ramets within the genets (having less or more ramets)