

Species-species interactions

- Types of interspecific interactions
- Trophic pyramids
- Optimal foraging
- Impacts of predators
 - Direct
 - Indirect
 - Behavioral modification
- Response of prey

"In any study of evolutionary ecology, food relations appear as one of the most important aspects of the system of animate nature. There is quite obviously much more to living communities than the raw dictum 'eat or be eaten', but in order to understand the higher intricacies of any ecological system, it is most easy to start from this crudely simple point of view".

G. Evelyn Hutchinson,
"Homage to Santa Rosalia,
or Why are there so many
kinds of animals?", 1959

Optimal foraging

- don't be choosy if there isn't much to eat

Species-Species Interactions

| | | Species A | | |
|-----------|-----------|--|---|---|
| | | Harmed | No Effect | Benefit |
| Species B | Harmed | Competition both species compete for limiting resource | Amensalism asymmetric competition for limiting resource | Predation Parasitism Herbivory Species A eats Species B |
| | No Effect | | Neutralism most species interactions | Commensalism plants benefit from decomposers; follicle mite |
| | Benefit | | | Mutualism zooxanthellae and coral; fungus and algae in lichen |

Optimal foraging theory

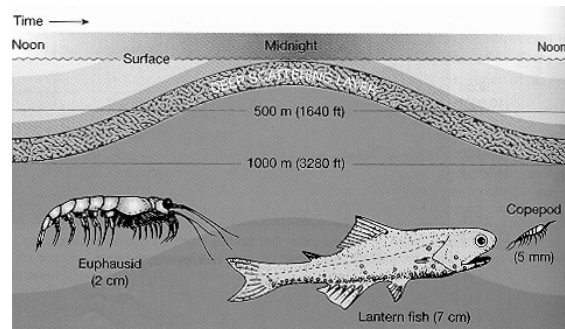
- balances benefit of food with cost of capture and handling
- should you always eat the largest prey?

Keystone Species Concept: a keystone species is any species that has a greater impact on community structure than one would predict from its abundance/biomass. Cannot be predicted.

Vertical migration of plankton - why would plankton do this?

Surface: warm; light (day); nutrient poor

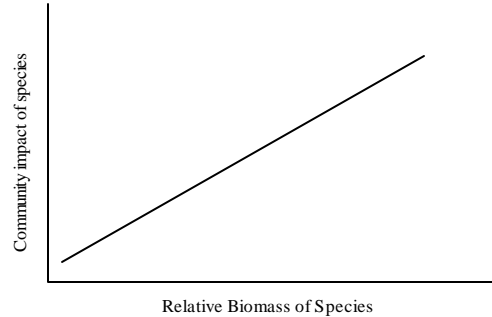
Deep: cold; dark; nutrient rich



Trophic Interactions (Feeding relationships)

- Trophic cascade - when the impact of a top trophic level cascades down to lower trophic levels.
- Direct effect - influence of one species on another through immediate interaction
- Indirect effect - influence of a species on another species in a roundabout manner, mediated by a change in population size of a 3rd intermediate species
- Higher-order interaction - influence of a species on another species in a roundabout manner, mediated by a change in behavior of a 3rd intermediate species

Keystone species: extremely important ecologically relative to their biomass



Animal-animal mutualisms

- Cleaning behavior is an association in which various species of shrimp or small fishes clean larger fishes of ectoparasites.

Hawaiian Cleaner Wrasse

Mimic Cleaner Wrasse Blenny

Prey-consumer interactions: the prey's perspective

Hide – avoiding detection spatially or temporally

Flee – escaping once detected

Tolerate - simply replace what has been eaten

Avoid - grow when and/or where herbivores are rare

Defend - possess traits that deter herbivores

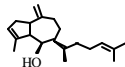
fight back
structural defenses
symbiotic relationships
chemical defenses

Defensive strategies

Symbiotic defenses


Structural defenses

Chemical defenses



Induction experiments demonstrated:

- Chemical defenses in *Dictyota menstrualis* are inducible by amphipods
- This was the 2nd seaweed in which induction was demonstrated
- The results suggest that defenses are costly to produce