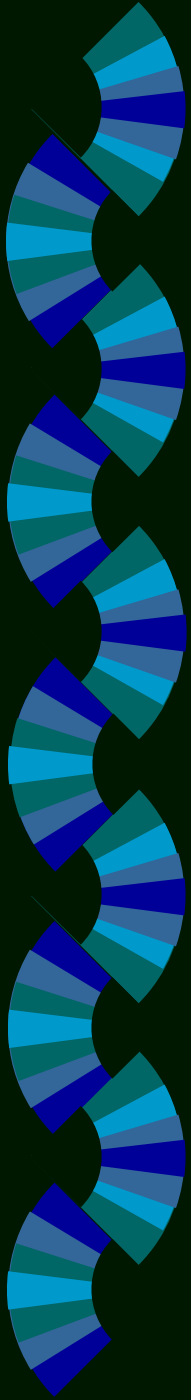


Interspecific Interactions: Symbiosis





Types of Interspecific Interactions

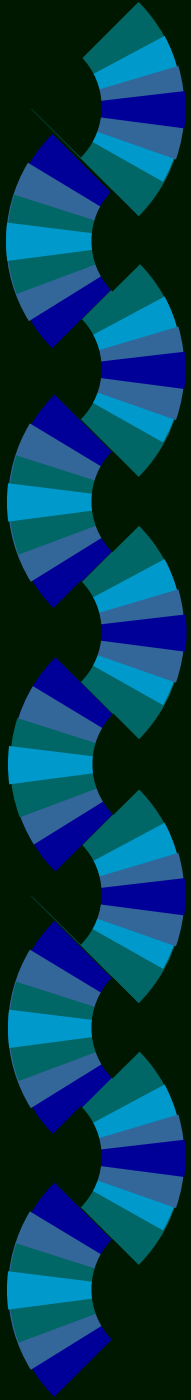
Table 45.1 Types of Interactions Between Two Species

Type of Interaction	Direct Effect of Interaction*	
	Species 1	Species 2
Neutral	0	0
Commensalism	+	0
Mutualism	+	+
Interspecific competition	-	-
Predation	+	-
Parasitism	+	-



Characteristics of symbiotic relationships

- ◆ Symbiosis is an intimate relationship between members of two or more species
- ◆ When species specific, they are developed over a long period of time; species adapt in response to each other
- ◆ Can be so specific that you have a one species to one species relationship
- ◆ A change in one species often has large effects on a second species

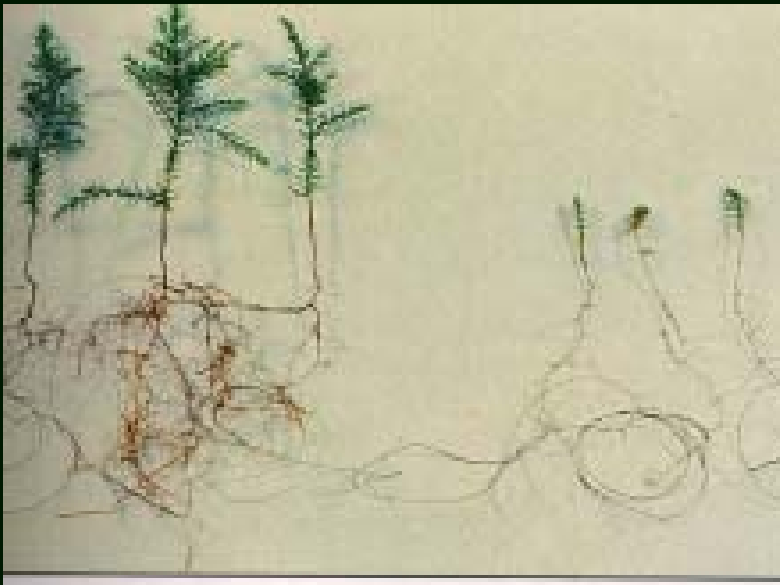
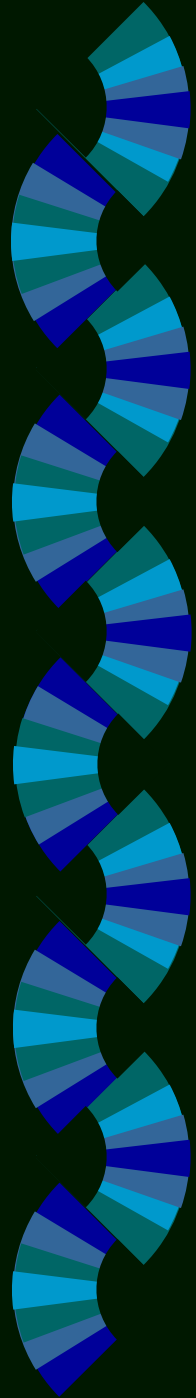


Commensalism

- ◆ Commensalism occurs when one species benefits, and the other neither benefits, or is harmed

Examples:

- ◆ clownfish and anemones
- ◆ epiphytes and trees



Mutualism

- ◆ Mutualism occurs when both species benefit
- ◆ It can be facultative ;it is helpful to both species but not required (not a one-to-one relationship)
- ◆ ex. Rhinos and oxpeckers
- ◆ trees and mycorrhizae, (*Rhizobium*)
- ◆ ants and acacia, termites
- ◆ pollination

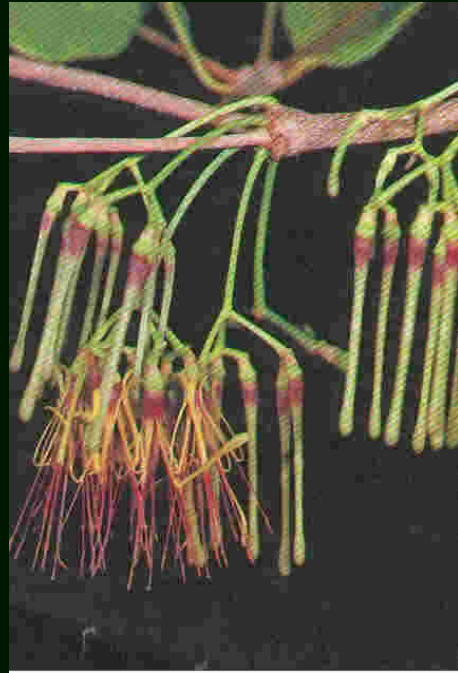
◆ OR

Mutualism

- ◆ Obligate meaning that it is required for the survival of both species
- ◆ ex. Yucca and yucca moth, lichens (algae and fungus)



Parasitism and parasitoidism



Parasitism occurs when one species is harmed and the other species benefits

- ◆ Special case of predation, except
 - parasite is smaller than host
 - parasite remains assoc. with host, weakens it over time
 - rarely kills it
- Ex. Lampreys
tapeworms
mistletoe

Parasitoidism



Parasitoidism is a special case of parasitism where the parasite (parasitoid) routinely kills the host

Usually is insect to insect

They are used to control pest populations

Ex. wasps



Predation

What is predation

- Removal of animals or plants by other animals
- involves direct contact between organisms

What patterns of predation do we see?

- When predators prey on more than one species, they often selectively remove individuals from the common species
 - search image
 - rare individuals are hard to find
- Predators remove the sick and weak individuals
 - allows remaining individuals to have greater access to resources
 - increase gene pool strength

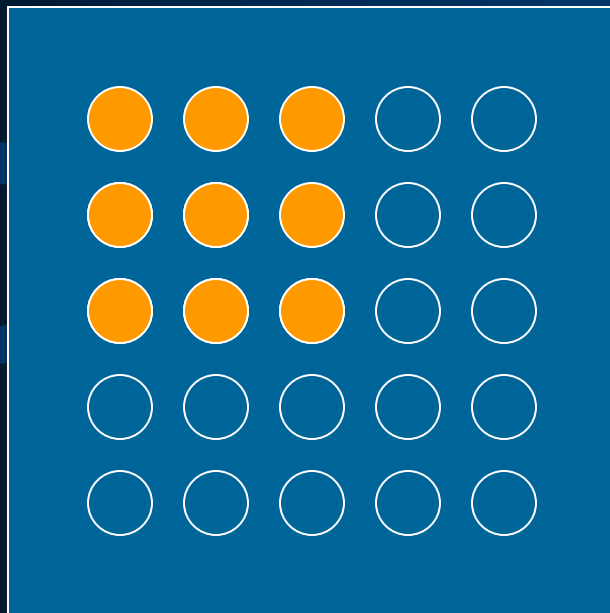
What are the outcomes of predation?

- Range between:
 - 1. Predators can be so effective at removing prey that they cause the local extinction of the prey species
 - 2. Predators and prey coexist in the same environment

What determines whether or not the prey will be eliminated, or both will coexist?

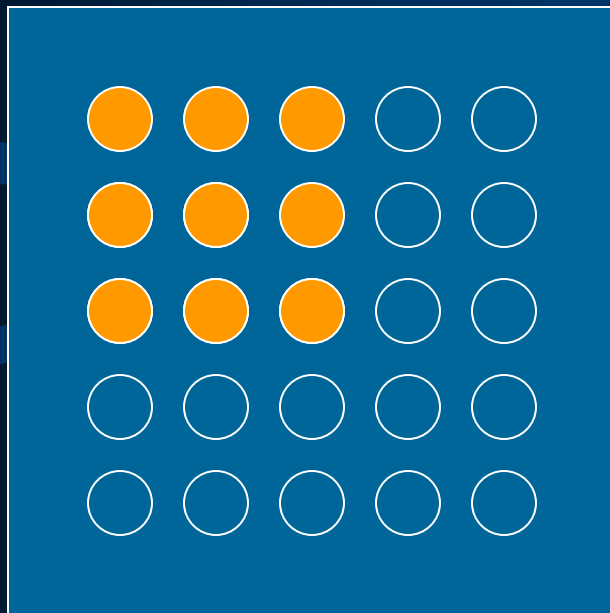
- Presence of refugia - Huffaker's mite experiment

Huffaker's Experiment



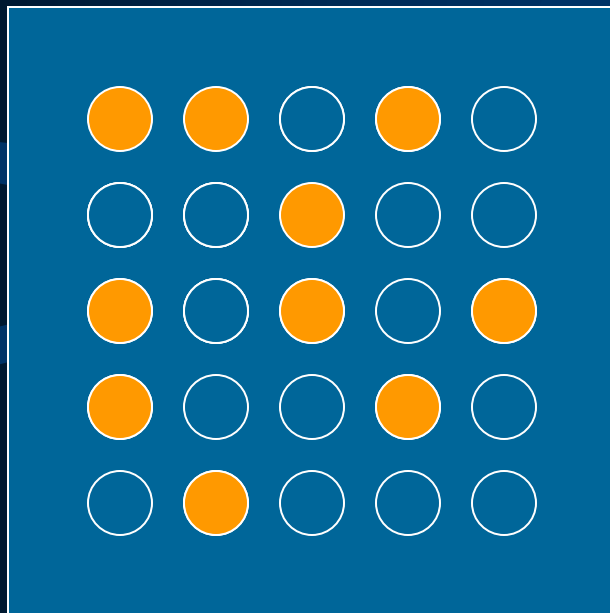
- Background
 - tray of oranges and balls
 - two mites (pred + prey)
 - the prey feeds on oranges
 - prey can travel on web strands
 - predators must walk

Huffaker's Experiment



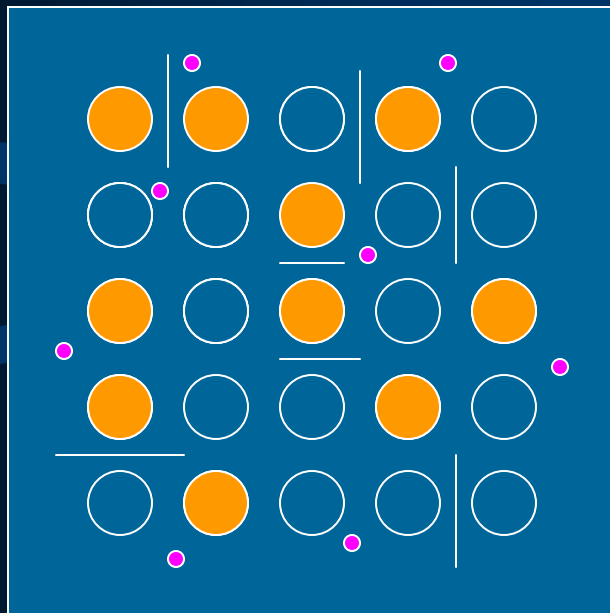
- Step 1
 - Oranges are placed together on tray
 - prey are introduced and expand
 - predators introduced
 - **RESULT:** prey eliminated

Huffaker's Experiment



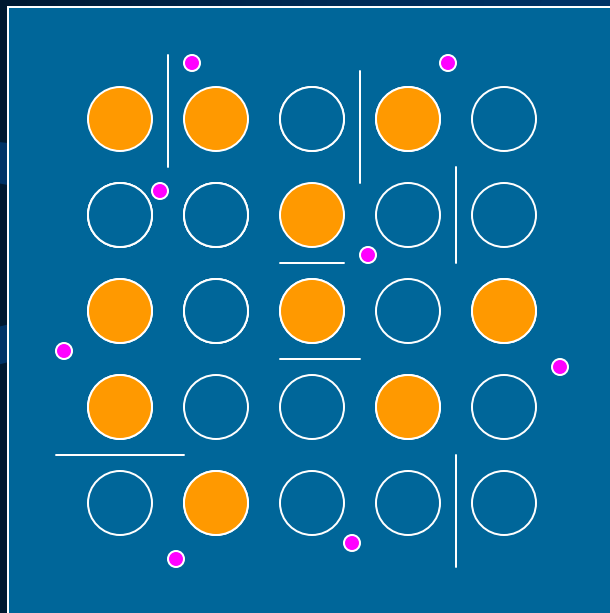
- Step 2
 - Oranges are spread out randomly in the environment
 - prey, then predators introduced
 - **RESULT:** both coexist for awhile, then prey go extinct

Huffaker's Experiment



- Step 3
 - Vaseline barriers are established which prevents predator dispersal
 - Posts are added to allow prey dispersal
 - **RESULT: coexistence!**

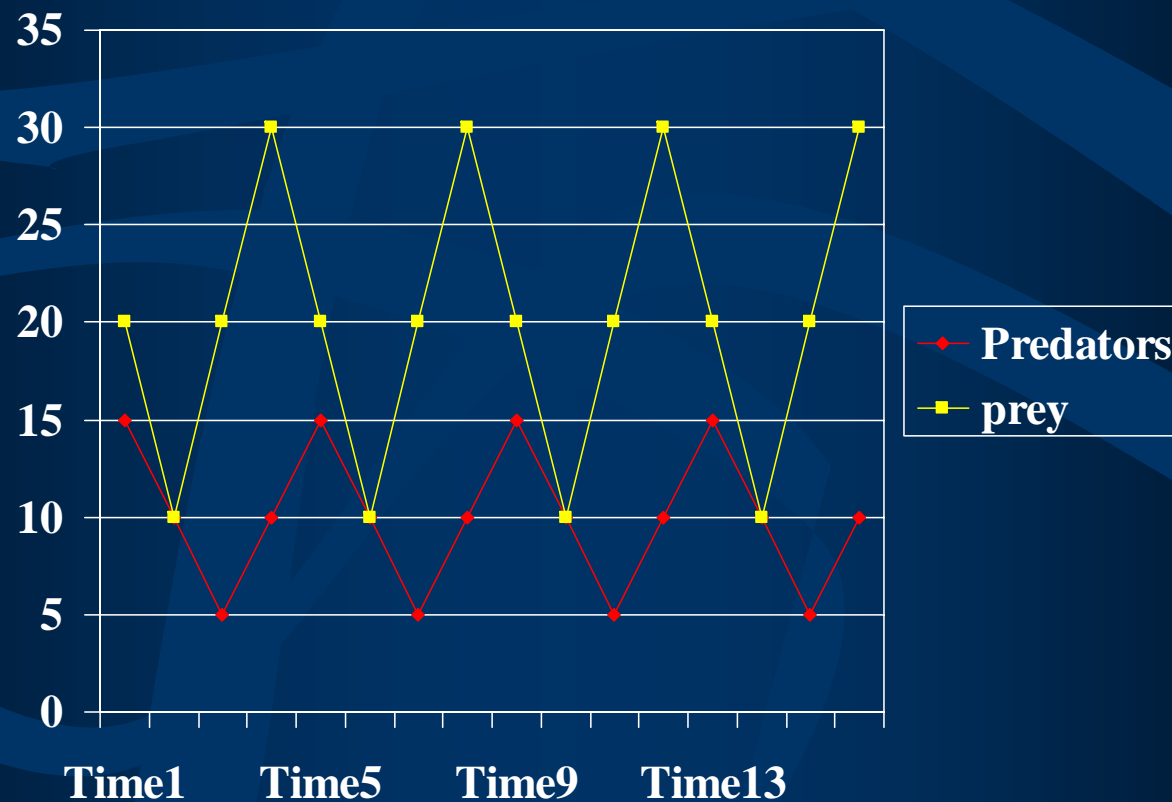
Huffaker's Experiment



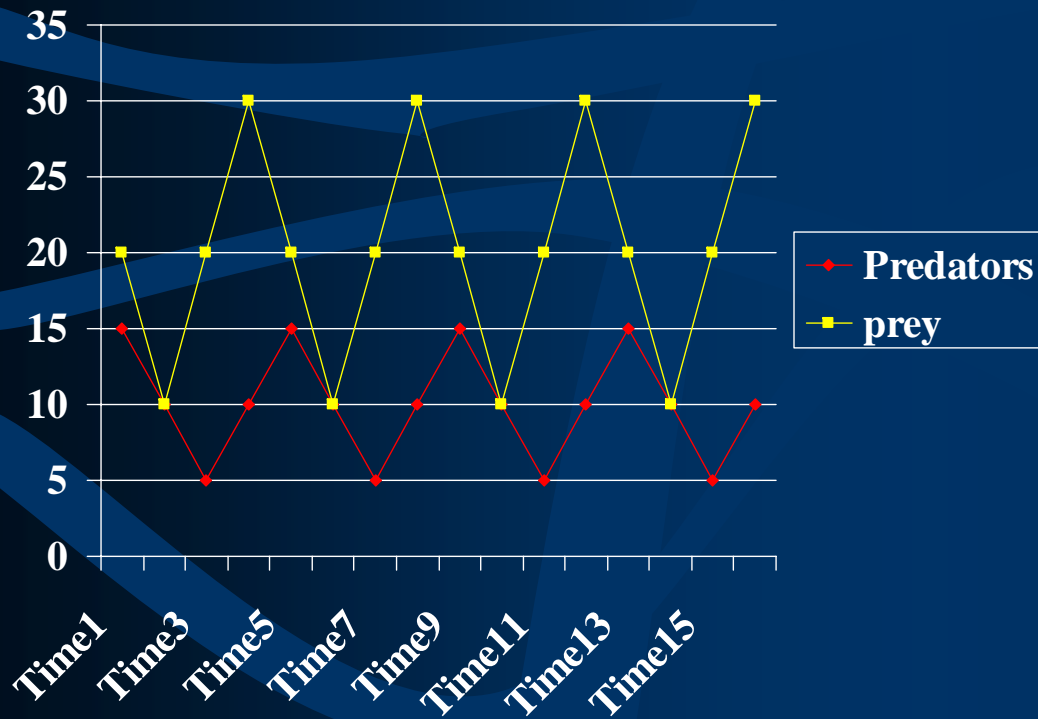
- SO WHAT?
- Predators and prey can coexist as long as prey have refugia in which to hide from predators
- Habitat heterogeneity can lead to coexistence

When predators and prey coexist, what population patterns do we see?

- Predator-prey population cycles



Characteristics of Predator-Prey cycles



- 4 stages
 - both inc
 - pred inc, prey dec
 - both dec
 - pred dec, prey inc
- time lag is due to low response time of predators

Examples of Predator-Prey cycles



- Lynx and hare
- Coyotes and rabbits

Adaptations of prey to limit predation

- Good escape ability (ex. Ostriches)
- Behavior (blowfish)
- External protection (spines on cacti and porcupines)
- Camouflage (arctic hares, walking sticks)
- Mimicry (Monarchs and Viceroy)
- Chemical warfare (skunks, insects, butterflies)
 - aposematic or warning coloration (frogs, skunks)