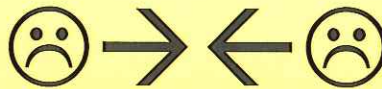


# Symbiotic Relationships

Close interactions between different  
biological species

## Competition

- Two or more species compete for the same resources (food, space, light)
- Neither species benefits



## Predation

- One species eats the other species
- Predators normally kill their whole prey instantly



## Parasitism

- One species benefits from the relationship
- One species is harmed



- Parasites are normally small and kill the prey slowly, if at all

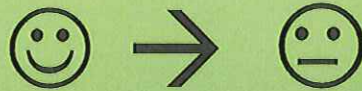
## Mutualism

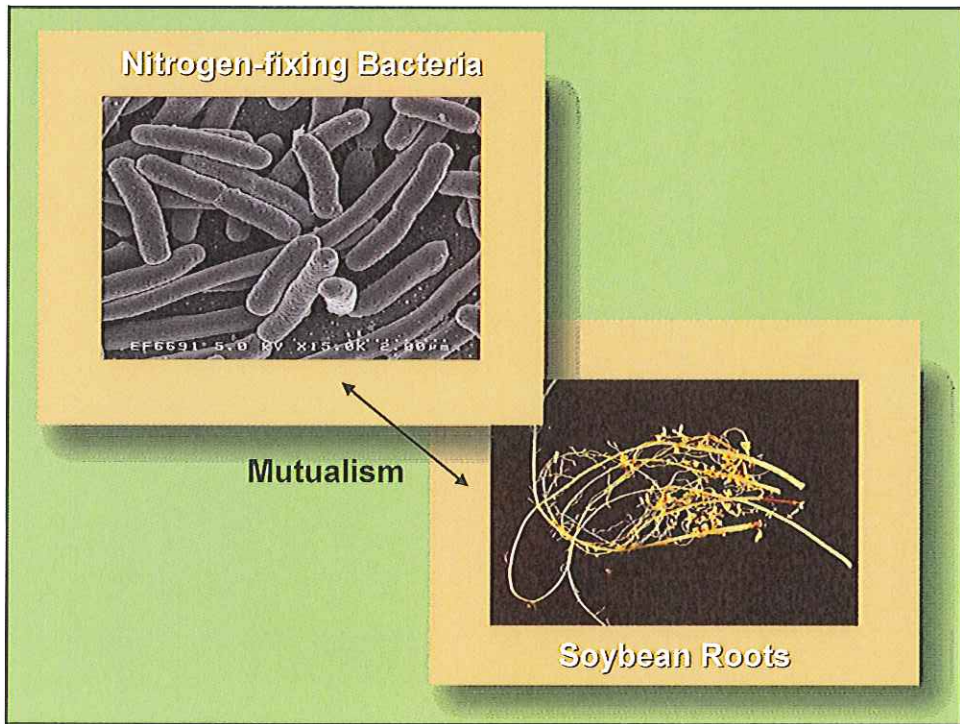
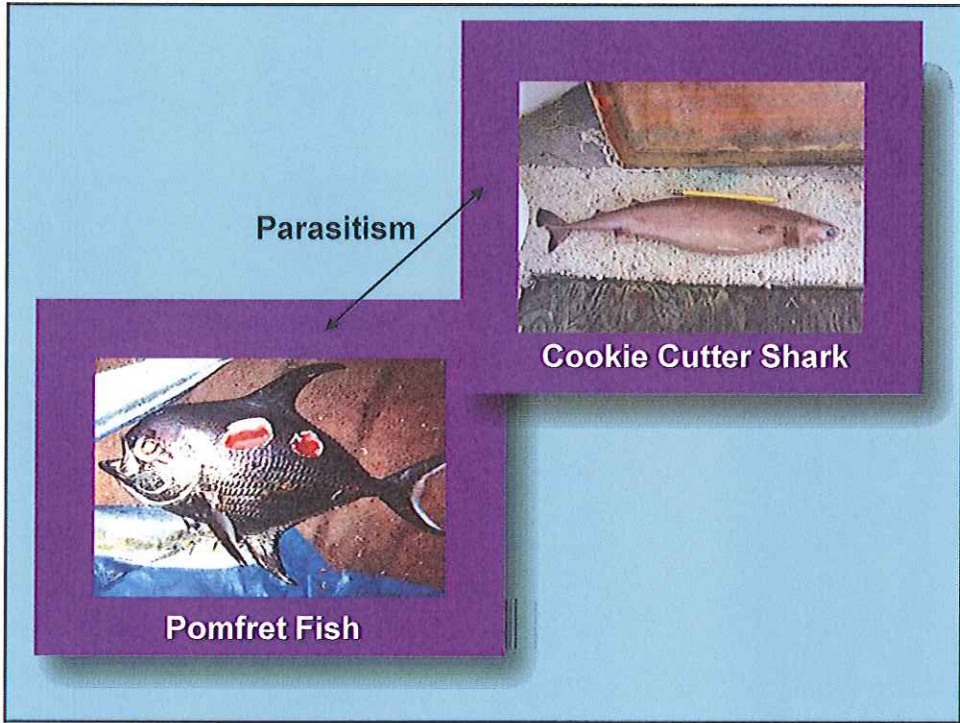
- Both species benefit from the relationship

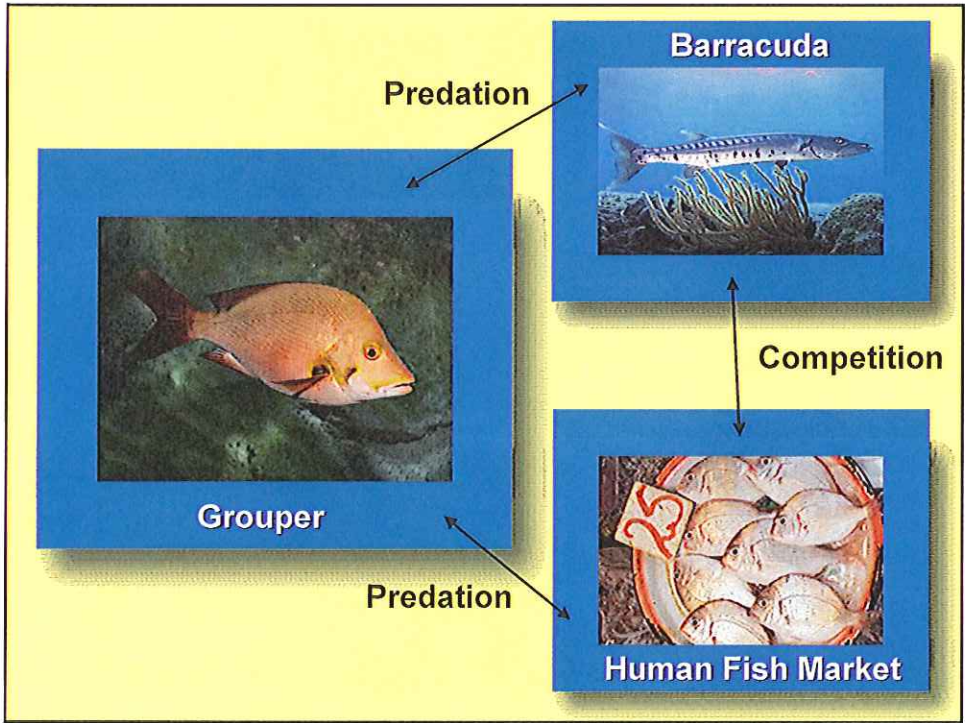


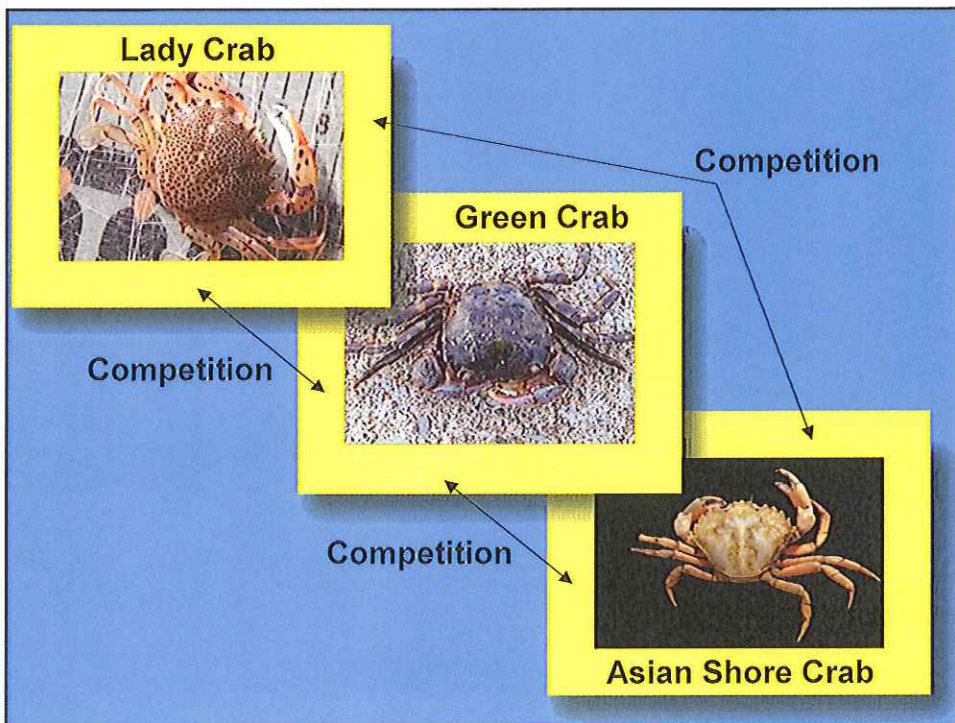
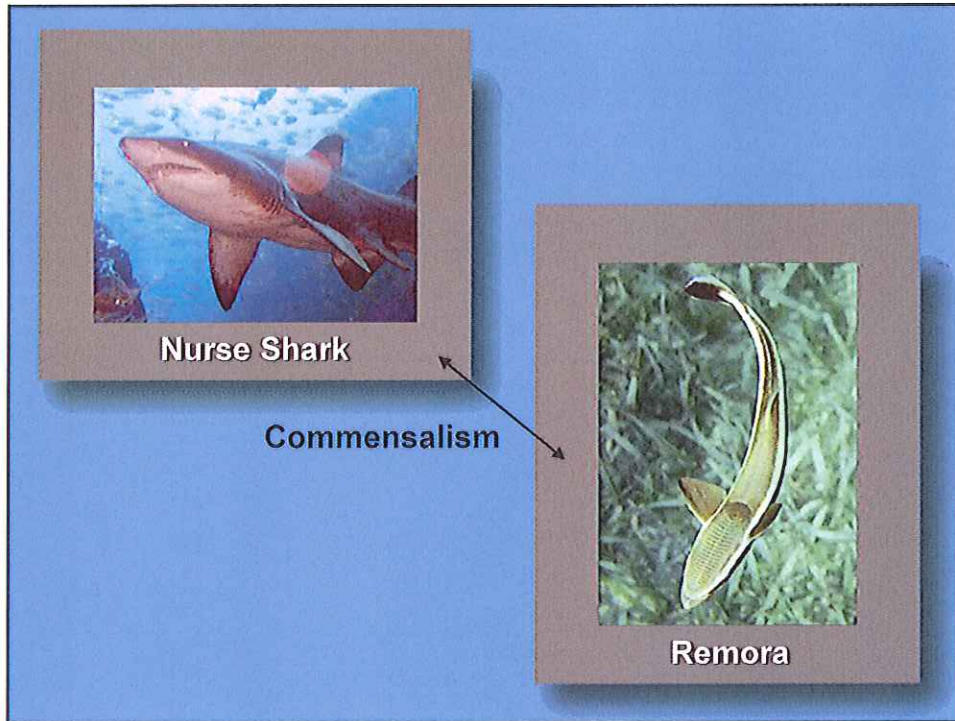
# Commensalism

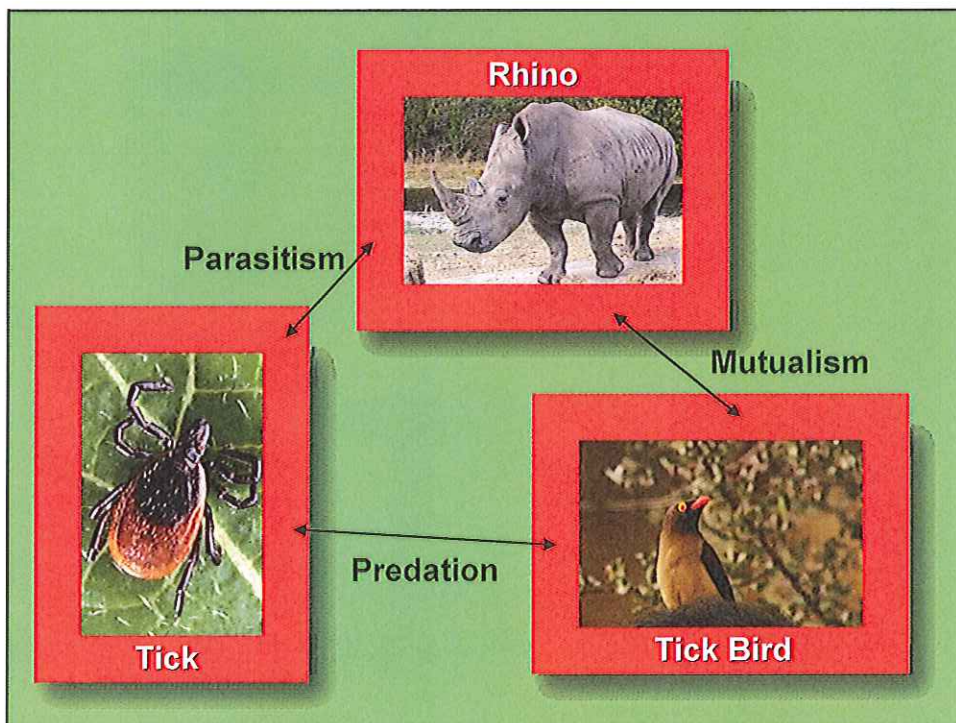
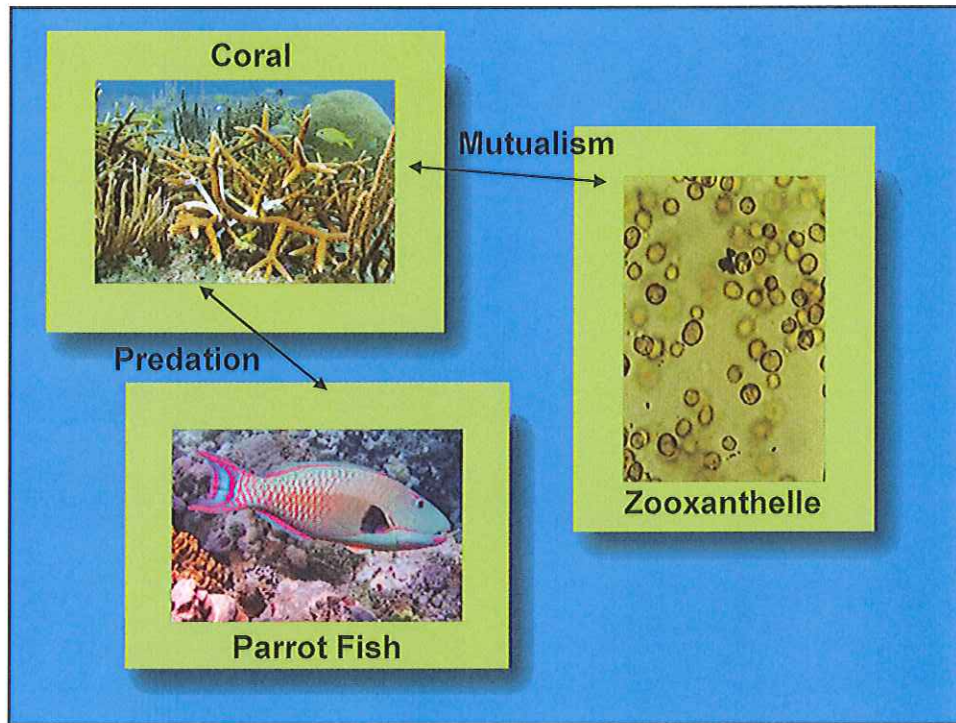
- One species benefits from the relationship
- One species is unaffected



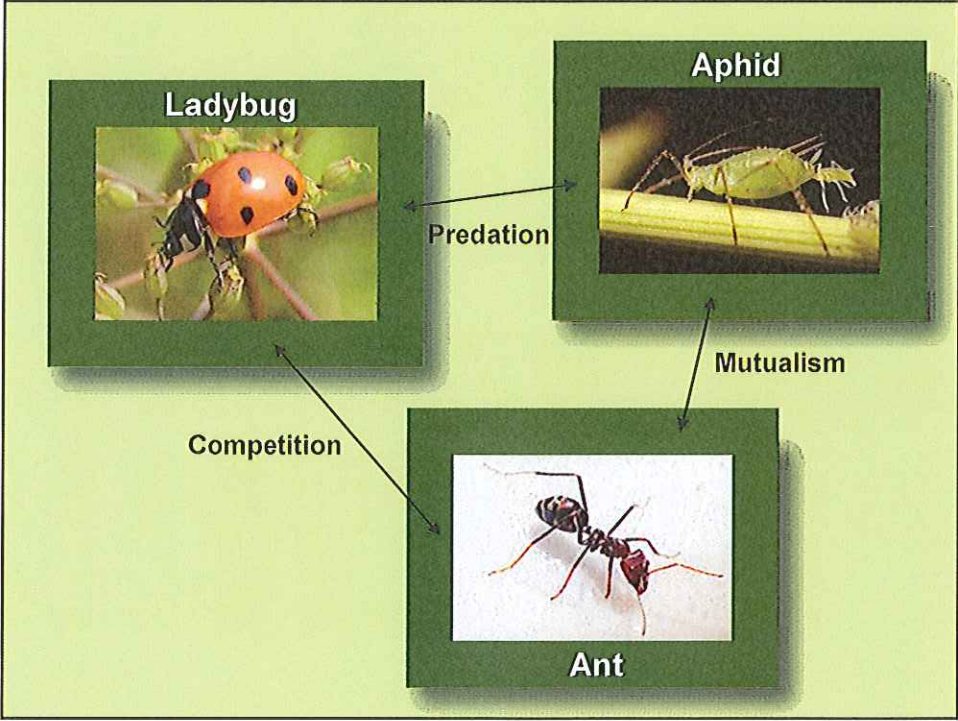












**Answers:**

clownfish & anemone = commensalism, the clownfish coats itself in the slime from the anemone and lives inside. The clownfish is protected because anemones contain nematocyst (stinging cells) that can hurt any fish trying to hunt the clownfish.

grey nurse shark & remora = commensalism, the remora eats the scraps from the shark when it is feeding. If the remora picks off parasites it can also be mutualism.

leopard coral grouper & Barracuda & grouper in fish market = predation, also bioaccumulation if the larger predatory fishes are consumed by humans and they contain toxins you can get harmful effects in humans.

tick & rhino & tick bird = parasitism (tick and rhino), mutualism (rhino & tick bird). Ticks can infest (100's) rhinos and cause bleeding areas. The tick bird live on the rhinos and eat the ticks. They get food and the rhino does not get a tick infestation.

ant & aphid & lady bug = the ant cultivates the aphid and eats the sticky substance that the aphid produces. The lady bugs want to eat the aphids and the ant defends the aphids. This is predation between the lady bug and aphid, competition between the ant and lady bug and mutualism between the ant and aphid.

fixing bacteria & soy bean plant roots = mutualism, the bacteria convert nitrogen gas from the atmosphere into nitrates and other forms that can be used by the plant for growth.

cookie cutter shark & pomfret fish = parasitism, the cookie cutter shark attacks the sides of fish and bites off a small round "cookie" like portion of flesh.

zooxanthellae & corals & parrot fish = mutualism (zooxanthellae & coral) the zooxanthellae is a photosynthesizer that lives in the coral polyp (animal) and provides food and energy for the coral. When corals bleach they expel their zooxanthellae. The parrot fish crunch and eat the coral: predation (parrot fish & coral)

Asian shore crab & green crab & lady crab = competition and invasive species. The lady crab is a native species. In the 1890's the green crab were an invasive species that came in and took over the mud and lady crab populations. Recently (past 20 years) the asian shore crabs have come into the east coast of the U.S. and are competing with the green crabs. The asian shore crabs are better competitors when both crabs are small but larger green crabs out-compete asian shore crabs.

sea squirt or tunicate & mussel bed = competition, this new invasive species (*Didemnum* sp.) is a tunicate that grows in a carpet like fashion and takes over large areas of the ocean floor. Any benthic organisms that can not move out of the way will be smothered and die under the tunicate.

## Field Trip: Ecological Relationships

### Activity: Arctic Ecosystem, Ecological Relationships – part 3

Approximate time: 5 Minutes

#### Materials per group:

- 1 set of ecosystem cards
- 1 arctic food web board
- Ecological relationship signs

#### Objective:

Students will select several organisms from the arctic food web to be classified into one of the 5 ecological relationship categories. Cards will be pulled from the food web board and placed on relationship signs.

#### Procedure:

1. Discuss each of the 5 ecological relationships with group.

Competition examples: human hunter and polar bear

Predation examples: anything that eats something else – polar bear and seal

Mutualism: Lichen – algae and fungus

Commensalism – polar bear and arctic fox

Parasitism – basking shark and parasitic copepod

#### Discussion Topics:

##### Competition:

Human hunter and polar bear compete for the ringed seals, the caribou and arctic hare compete for moss and lichens, the phytoplankton and diatoms compete for sunlight and nutrients.

##### Mutualism:

Lichen – algae and fungus, archaeobacteria in gut of arctic hare (helps digest cellulose).

##### Commensalism:

Polar bear gets adult ringed seal and arctic fox goes afterwards and eats the small seal pups. This is commensalism because polar bear doesn't get any benefit but the fox does.

Arctic fox eats the scat from the polar bear as it contains oily seal.

##### Parasitism:

Copepod hooks into the eyes of the basking shark and spend life there. This blinds the shark. The copepod gets a benefit and the shark gets hurt/harmed.

## Field Trip: Ecological Relationships

### Activity: Ecological Relationship Cards

Approximate time: 15 Minutes

#### Materials per group:

- 1 set of ecosystem cards
- Ecological relationship signs

#### Objective:

Students will determine the ecological relationship between organisms. This activity follows the Arctic Eco Relationship Activity (part 3).

#### Procedure:

1. Discuss each of the 5 ecological relationships with group.

Competition examples

Predation examples

Mutualism

Commensalism

Parasitism

2. Match cards by color borders.
3. Determine ecological relationship between cards.

#### Answers:

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### **Discussion Topics:**

**Make sure that they are comfortable explaining the difference between the 3 symbiotic relationships and can provide examples.**

**For predation, you can discuss what happens to populations when one gets eaten (their #'s crash) but then the predator will run out of food and the prey species will rebound. Predator and Prey relationships are cyclical with the predator curves lagging slightly behind the prey curve. As one goes up the other will eventually also go up.**

**For competition: discuss carrying capacity (maximum number of individuals an environment can hold) and explain that organisms can not occupy the same niche (role or job in the environment). If 2 species want to occupy the same niche they will compete and there are 2 possible results. 1<sup>st</sup> Resource Partitioning: the organisms share (multiple bird species in a tree but at different heights/levels in the tree) or 2<sup>nd</sup> Competitive Exclusion: one organism out competes and excludes the other.**