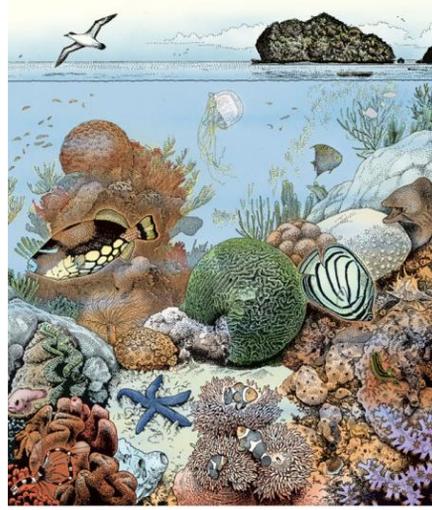
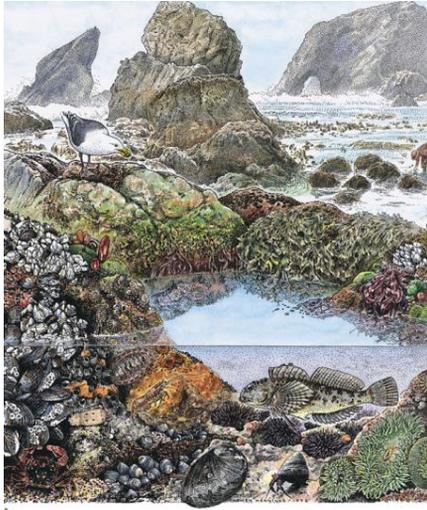
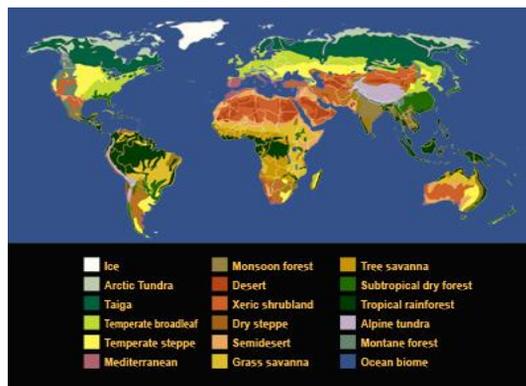


Chapter 16: Marine Communities

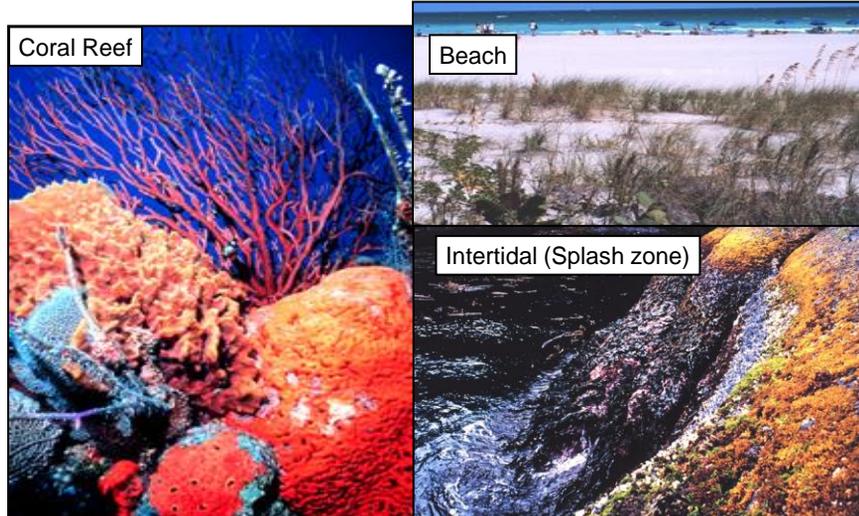


Biomes and Ecosystems

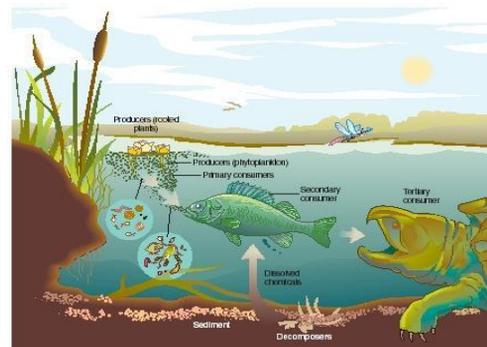
Biomes are defined as "the world's _____, classified according to the predominant _____ and characterized by _____ of _____ to that particular environment" (Campbell, 1996). Examples are _____, _____, _____.



What is an ecosystem?

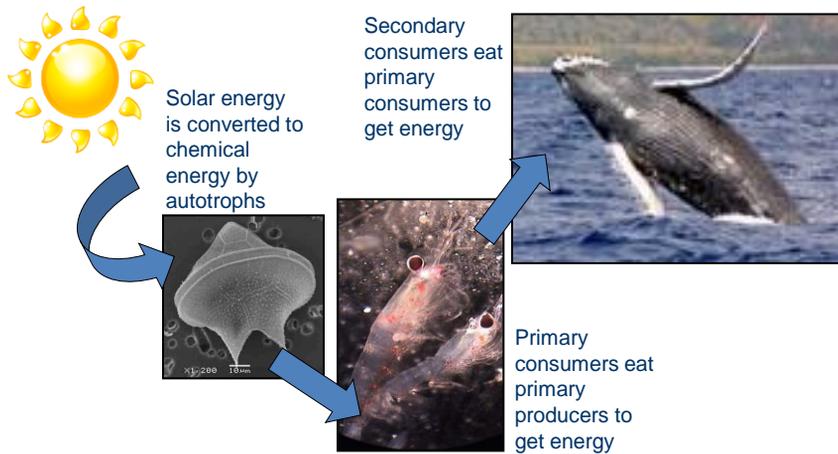


An Ecosystem is a _____ entity
 (_____ than a biome) with defined _____
 boundaries, distinct _____,
 an _____ source, and a **community of**
 _____ through which energy
 is _____ (ex: _____, _____;
 _____)



<http://www.scienceclarified.com/Di-EI/Ecosystem.html>

Energy is transferred through ecosystems



Marine Communities

- Marine Organisms _____ in _____
- Communities Consist of _____
_____, _____, and

- Marine Communities _____ as Time Passes
- Organisms in Communities Can Live in

Introduction

- What is a Community?
- It is an assemblage of _____ living close enough together for potential _____.
- Communities _____ in their _____, the _____ of species they contain, and the **relative** _____ of different species.



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Marine Communities

Key terms (1)

- A **community** is comprised of the many _____ of organisms that _____ at a particular location.
- A **population** is a group of organisms of the _____ occupying a _____ area.
- A **habitat** is an organism's " _____ " within its community, its _____. Each habitat has a degree of environmental uniformity.

Marine Communities

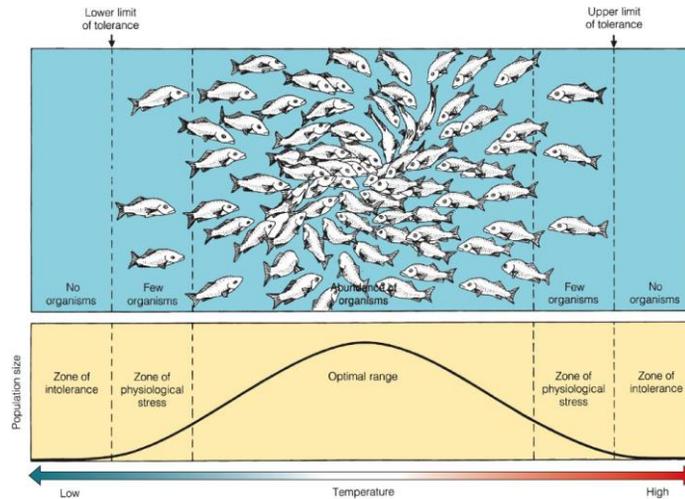
Key terms (2)

- An organism's **niche** is its “_____” or _____ within that habitat, its relationship to food and enemies, an expression of what the organism is doing.
- Physical (_____) and biological (_____) factors in the environment determine the location and composition of a community.

Physical and Biological Environmental Factors

- A proper balance of **physical and biological** _____ is important for the success of each organism and the community.
- Different organisms have different _____ for specific factors.
- *Steno-* is a prefix meaning “_____”. It can be used to describe organisms that have narrow _____ for specific factors
- *Eury-* is a prefix meaning “_____”. It can be used to describe organisms that have wide _____ for specific factors

Range of Tolerance

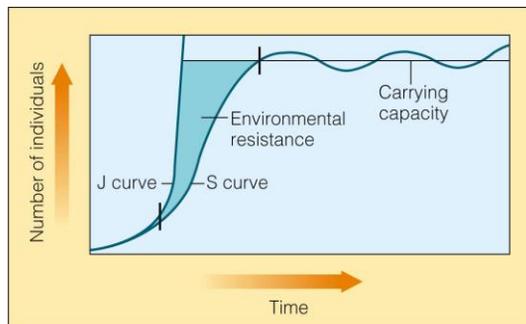


Range of tolerance to a physical factor – in this case, temperature – for a population of organisms.

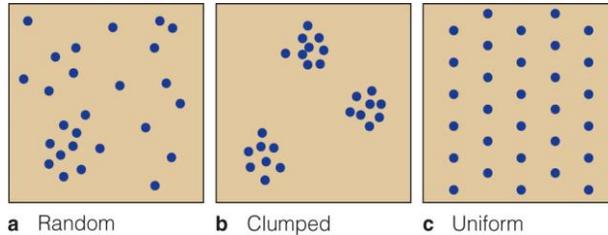
Growth Rate and Carrying Capacity Are Limited by Environmental Resistance

The J-shaped curve of population growth of a species is converted to an S-shaped curve when the population encounters environmental resistance.

The physical or biological conditions responsible for the cessation of growth are called



Population Density and Distribution Depend on Community Conditions

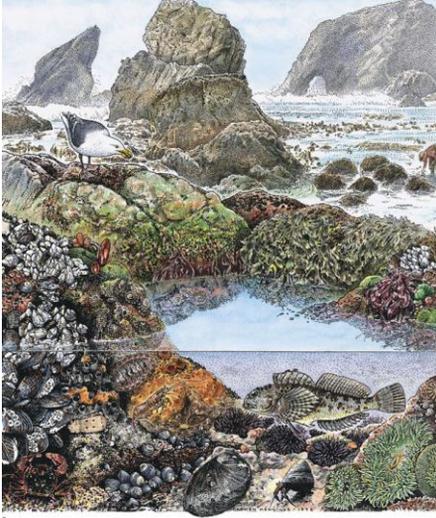


_____ , _____ , and _____ population distribution patterns. The _____ pattern is most _____ in nature; uniform is the rarest.

The Ocean Supports Many Communities

- Rocky intertidal communities
- Seaweed communities
- Sand beach and cobble beach communities
- Salt marsh and estuary communities
- Coral reef communities
- Open ocean communities
- Deep sea floor communities
- Hydrothermal vent communities

Intertidal Communities Are _____ Populated despite Environmental Rigors



The intertidal zone - the band between the _____ and _____

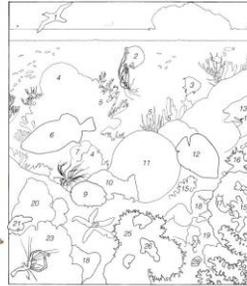
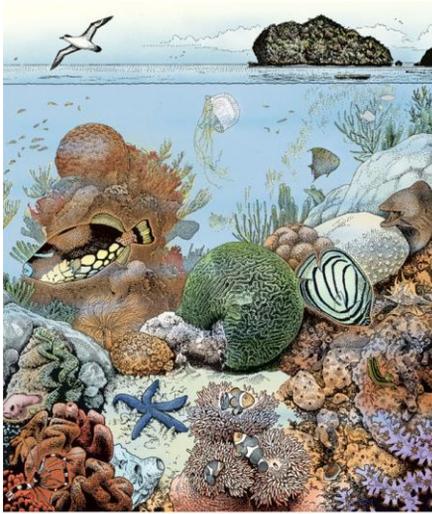
_____ marks on a rocky shore - is one of Earth's most densely populated areas.

A Pacific coast tide pool and intertidal shore.

Tropical Tide Pool, Hawaii



Coral Reefs Are the Most _____ Populated and _____ Communities



Key for coral reef habitat	
1 black-capped petrel	16 muricid snail
2 sea nettle	17 nudibranch
3 angelfish	18 sponges
4 lobed corals	19 colonial tunicate
5 sea whips and soft corals	20 giant clam
6 triggerfish	21 purple pseudochromid fish
7 sea fans	22 cobalt sea slug
8 tube anemone	23 soft corals
9 orange stone coral	24 barbed pole shrimp
10 bryozoans	25 sea anemones
11 brain coral	26 clown fish
12 butterfly fish	27 worm tubes
13 money eel	28 cowrie
14 cleaner fish	29 sea fan
15 tube corals	

The coral reef habitat.

Coral Reefs

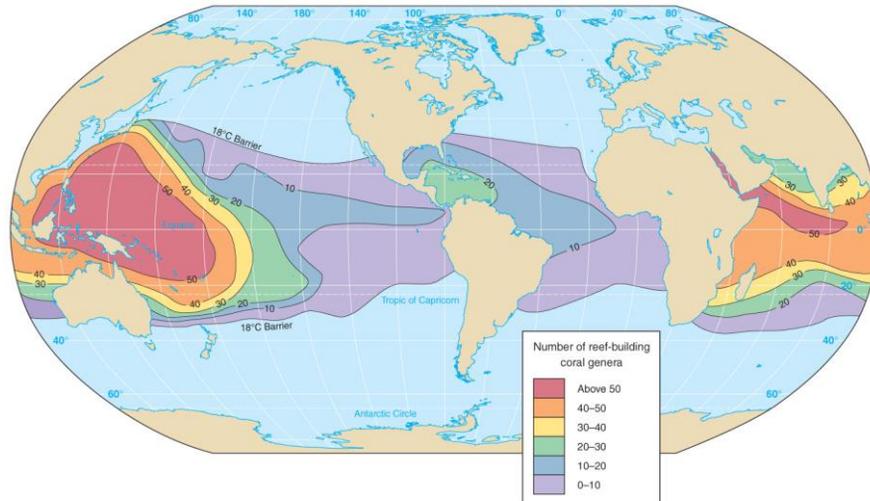
- Reefs – _____
water communities
restricted to _____
and _____
- _____ – individual
corals



(a)

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Coral Reef Distribution



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Conditions for Coral Reef Development

- _____ (but not hot) seawater
- _____ (for symbiotic algae)
- Strong _____ or _____
- _____ seawater
- Normal _____
- _____ substrate

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Importance of Coral Reefs

- _____ structures created by _____ organisms
 - _____, Australia, more than 2000 km (1250 miles) long
- Great _____ of species
- Important tourist locales
- Fisheries
- Reefs _____ shorelines



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Coral Reefs in Decline

- 30% healthy today, 41% healthy in 2000
- _____ of corals – high risk of _____
- Humans – _____
 - Global _____
 - Ocean _____
 - Coral _____
- Other threats
 - Hurricanes
 - Floods
 - Tsunami

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- Competition.
 - _____ **specific competition**: can occur when _____ are _____.
 - Ex. Habitat space or Food.



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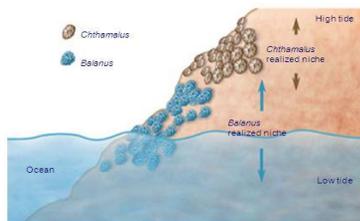
Competitive Exclusion Principle

No _____ similar _____ occupy the same _____ at the same time.

Competition Between Two Species of Barnacles

EXPERIMENT

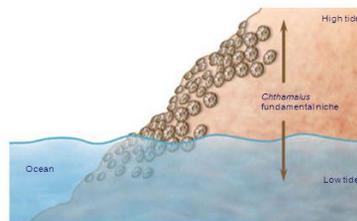
Ecologist Joseph Connell studied two barnacle species—*Balanus balanoides* and *Chthamalus stellatus*—that have a stratified distribution on rocks along the coast of Scotland.



In nature, *Balanus* fails to survive high on the rocks because it is unable to resist desiccation (drying out) during low tides. Its realized niche is therefore similar to its fundamental niche. In contrast, *Chthamalus* is usually concentrated on the upper strata of rocks. To determine the fundamental niche of *Chthamalus*, Connell removed *Balanus* from the lower strata.

RESULTS

When Connell removed *Balanus* from the lower strata, the *Chthamalus* population spread into that area.



CONCLUSION

The spread of *Chthamalus* when *Balanus* was removed indicates that competitive exclusion makes the realized.

- Classic experiments confirm this.

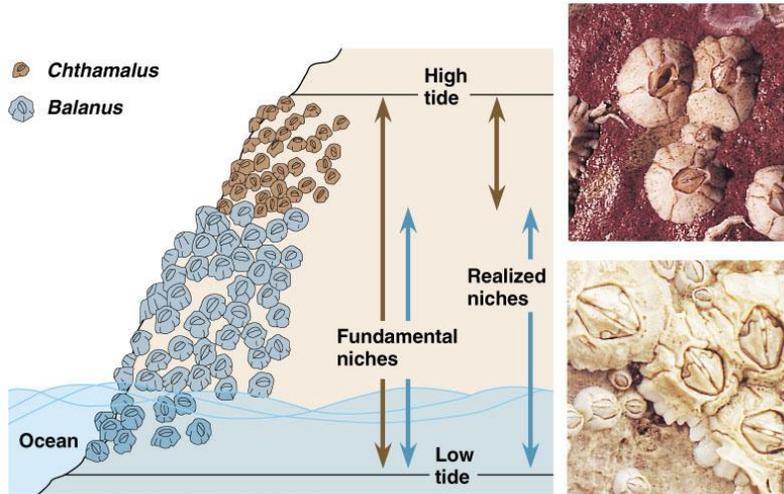
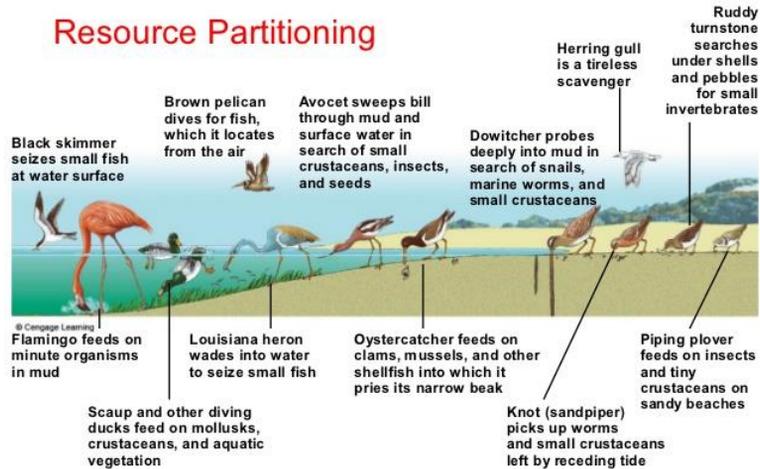


Fig. 53.2

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Resource _____ : splitting the niche



Environmental Science: Problems, Concepts, and Solutions. (12th ed.) by G. Tyler Miller, Jr. and Scott Spoolman

- Predation.
 - A **predator** eats _____.
 - **Herbivory**, in which animals eat _____.
 - In **parasitism**, organisms live on/in a _____ and depend on the host for _____. This is _____ predation.
 - Predator adaptations: many important feeding adaptations of predators are both obvious and familiar.
 - _____, _____, fangs, poison, _____, speed, and agility.



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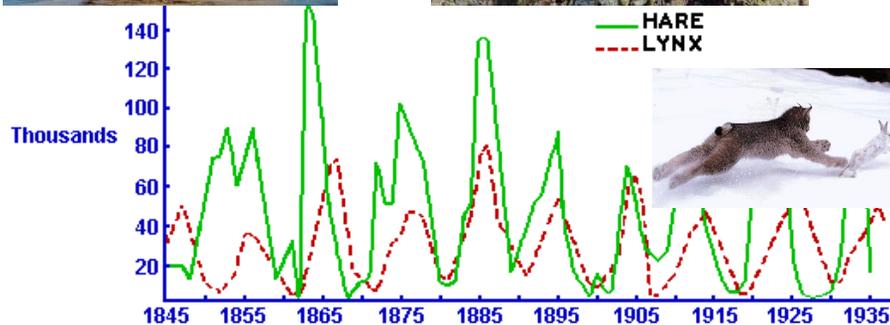
Oscillations in Predator-Prey Interactions



GW
Shark
and
Seal



C.O.T
Sea Star
And
Coral



_____ is when organisms _____ other species for _____
Blenny (*Aspidontus taeniatus*) mimics Hawaiian cleaner wrasse



Shortnose wrasse mimics **Potter's Angelfish** which sports a defensive spine



Keystone Species

A species whose presence in the _____ creates a significant _____ on the _____ of that community.

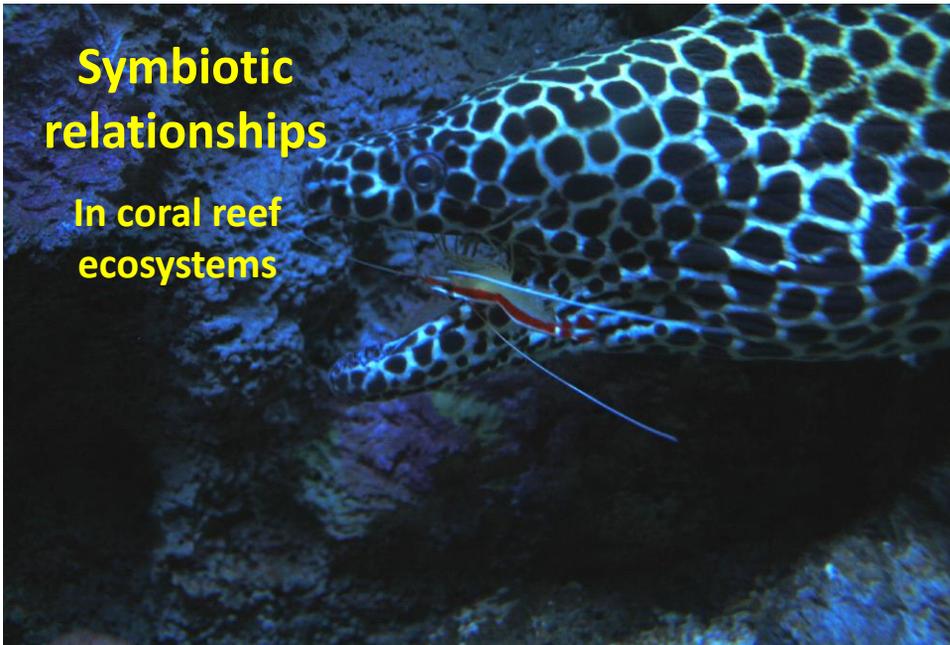
Keystone Species

Kelp Forests



Symbiotic relationships

In coral reef ecosystems



- **Symbiosis** (Greek roots sym: “ _____ ” and bio: “ _____ ”) is a close, _____ association between organisms of _____ species that may _____ one or both members (parasitism; commensalism; mutualism).



Parasitism (_____)

- _____: benefits _____ species and _____ the other (+,-).
- Examples: the Sea Lamprey feeding on the blood of a host fish; the isopod feeding on the tongue of a host fish



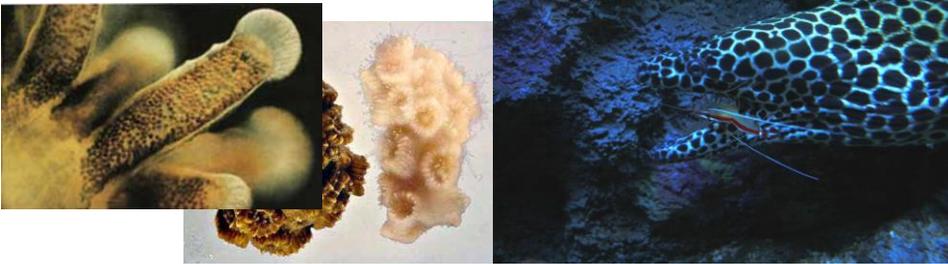
Commensalism (_____)

- _____ is a relationship in which _____ partner derives some benefit while the other is _____. Ex: the man-of-war fish, which lives among the tentacles of the Portuguese man-of-war; the remora, which attaches itself to larger pelagic animals including sharks and rays for protection, transportation and scraps of food.



Mutualism (_____)

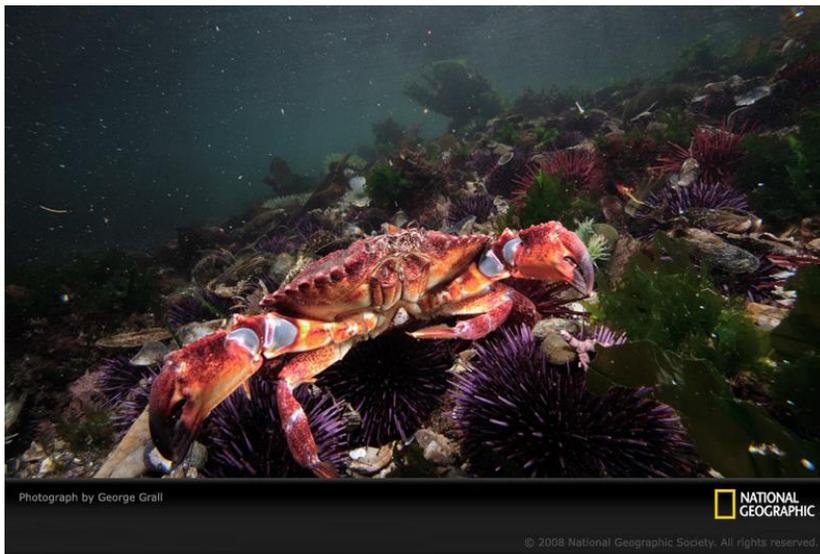
- _____ is a symbiotic relationship in which _____ organisms _____. The organisms may be animals, plants, algae or bacteria. Ex: the clown fish and the anemone; coral polyps and zooxanthellae (algae); and cleaner shrimp, which clean a wide variety of other parasites from reef fishes such as the moray





MUTUALISM AND HOUSING

The fish and the shrimp live together in a symbiotic relationship where the shrimp digs and cleans up a burrow and the fish warn the almost blind shrimp against predators.



MUTUALISM AND TRANSPORTATION

The crab carries a pair of sea urchins in its claws. When predators approach the crab, it waves the urchins, which present their sharp spines. The crab gets protection and the sea urchins get the particles of food that are dropped by the crab. The urchin gets transported to more food sources.



COMMENSALISM AND CAMOUFLAGE

The seahorse is camouflaged by the sea fan, avoiding predation. Seahorse benefits and no harm is done to the host.



PARASITISM, HOUSING AND TRANSPORTATION

The barnacle penetrates the crab's shell rendering the crab infertile and impairing the crab's normal molting process. The female barnacle will lay her eggs in the crab's pouch. The crab's instinct will be to continue along caring for the eggs as if they were her own.



PARASITISM AND HOUSING

The pearl fish is a type of mesoparasite. It detects chemicals given off by the sea cucumber and enters the sea cucumber when it participates in gas exchange and breathes in water. The sea cucumber attempts to eject the pearl fish by expelling most of their digestive tract out through their anus. This can be detrimental for the sea cucumber.

Evolutionary significance

- **Mutualism** and **commensalism** are hypothesized to have _____ from _____ relationships.
- If this is true, then host organisms, through evolutionary adaptation, selected traits that allowed them to take _____ of _____ behavior and that _____ to _____ beneficial relationships in some cases.