

Tropical Communities & Symbiotic Relationships

COVID VERSION

Coral

- Hermatypic corals produce reefs and are found only in tropical regions. They have a small symbiotic plant cells called zooxanthellae living in their tissues.
- Ahermatypic corals are found throughout the world, do not produce reefs, and most do not have zooxanthellae.

Coral Reefs

- Coral reefs are massive deposits of calcium carbonate (CaCO_3) produced by corals. They are among the most productive systems in the world and have the greatest diversity per unit area of any marine ecosystem. Coral reefs are grouped into one of three categories
 - Atolls are horseshoe shaped reefs that rise out of very deep water and enclose a lagoon. The lagoon may contain lagoon reefs or patch reefs. Atolls are frequently formed on volcanic islands that have subsided.
 - Barrier reefs occur adjacent to landmasses, separated by a deep water channel.
 - Fringing reefs also occur adjacent to landmasses but are closer and not separated by a deep water channel.
- Six major physical factors limit coral reef development: Temperature (23-25°C), Depth (<40m), Light (high), Salinity (>25ppt), Sedimentation (low) and Emergence (limited)

Coral Reef Fishes

- Diurnal planktivores feed on plankton in large groups during the day. These fish generally have eyes close to the front of the head, small upturned mouths, highly protruding and toothless jaws. Major families include damselfishes, butterflyfishes and surgeonfishes.
- Nocturnal planktivores feed on plankton under low light, generally having larger eyes and black, red or silver coloration. Major families include squirrel fishes, big-eyes and cardinalfishes.
- Herbivorous fishes consume plant material that grows on the reef. They generally have deep and laterally compressed bodies, small mouths and long guts. Major families include Parrotfish, triggerfishes and blennies.
- Carnivorous fishes feed on other animals, including a wide range of invertebrates. Carnivorous fishes have the highest degree of feeding specialization, and are generally put into one of three categories:
 - Pickers feed on small benthic crustaceans. Families include damselfishes and butterflyfishes.
 - Crunchers crush the shells of sponges, tunicates, etc. Families include pufferfishes and wrasses.
 - Piscivores feed on other fish. Families include requiem sharks, morey eels and scorpionfishes.

Symbiosis

- Symbiosis is the interrelationship between two different species which are generally either harmless to either member, or, more likely, beneficial to one or both.
 - Commensalism is an association that is clearly to the advantage of one member while not harming the other member. The partner gaining the advantage is called the commensal and the other is the host.
 - Mutualism is the form of symbiosis in which two species associate for their mutual benefit. The partners are called symbionts.
- All known symbiotic relationships in the sea between plants and animals are between unicellular algae or their chloroplasts and a wide variety of marine invertebrate animals.
- The algal cell symbionts have been typically classified into groups on the basis of their color.
 - Zooxanthellae are brown, golden, or brownish-yellow cells
 - Zoochlorellae are green
 - Cyanellae are blue or bluish-green
- Marine commensals that live on other invertebrates are called epizoites. Those that live inside other animals but are not parasites are called endozoites.

Luminescent Bacteria

- Most common in mesopelagic fishes and squids, various marine animals incorporate luminescent bacteria into cavities near their outer surface. The light produced by the bacteria is usually continuous. As a result, the fishes and squids often develop elaborate modifications to control the light (ex. reflective surfaces, screens or shades).

Marine Organisms of the Day

1. Great Barracuda (*Sphyraena barracuda*): The Great Barracuda can grow up to 5 feet long and swim up to 36 mph in short bursts. It is an opportunistic feeder with a bad attitude, but rarely attacks humans. Even so, you should avoid wearing shiny jewelry when diving near barracuda.

https://www.youtube.com/watch?v=v07mr_s6Fvk (0-1:00)

2. Queen Angelfish (*Holocanthus ciliaris*): Angelfish are very common fish on coral reefs. The Queen Angelfish is particularly popular because it is very colorful. They feed primarily on sponges, but juveniles will act as a symbiont in cleaning parasites off other fish.

<https://www.youtube.com/watch?v=cjgLjEyonVk> (1:10)

3. (Bill) Yellow Longnose Butterflyfish (*Forcipiger flavissimus*): Butterflyfishes are another very common family of reef fish. The Yellow Longnose Butterflyfish is easily identified by their long snout and distinct eye spot. Eye spots are an adaptation to confuse predators.

<https://www.youtube.com/watch?v=NdXYuavMOU4> (0:51)

4. Red Mangrove Tree (*Rhizophora mangle*): The Red Mangrove is a tropical halophyllic tree that can be found as far north as North Carolina, but are most common in the estuaries and coastlines of tropical Florida. They are well known for their stilt roots, also called prop roots, which raise them up above the waterline.

<https://www.youtube.com/watch?v=s2DVjAJdXck> (2:09)

5. Parrotfish (Family Scaridae): Every night, certain species of parrotfish envelope themselves in a transparent cocoon made of mucus secreted from their head. Much of the sand on beaches is actually ground up, undigested coral that the parrotfish excretes.

<http://www.scientificamerican.com/video/parrot-fish-poop-makes-beautiful-beaches/> (2:13)

6. Star Coral (*Montastraea cavernosa*): Star Coral is a common coral species found throughout the Caribbean and up the southeast coast of the United States, including North Carolina. As with all corals, they need clear, warm waters to facilitate their symbiotic relationship with zooxanthellae.

<http://video.nationalgeographic.com/video/coral-reefs> (3:00)

7. Pearlfish (Family Carapidae): Pearlfish are very vulnerable, slender fish that come out at night to feed on plankton. During the day, they live inside invertebrate hosts. These include sea cucumbers, to whom they have a commensalistic relationship.

<https://www.youtube.com/watch?v=K2Eyup8Jk3w> (1:43)

Finding Nemo Clips for This Exam

3 – First Day of School

30 – Back on the Reef

Exploring the Reef