

APES Coral Reef Ecology Activity

1. Look at the interdependency table below and construct a simple food web on a separate piece of paper for the organisms listed below.

INTERDEPENDENCY CHART

Algae	<u>Energy from:</u> Food Source photosynthesis	<u>Energy to:</u> Food For angel fish coral sea urchins
coral	algae phytoplankton zooplankton	angel fish, sea stars
crabs	sponges sea slugs zooplankton	giant grouper, sea anemones, octopus
giant grouper	crabs sea slugs sea urchins angelfish	shark
octopus	crabs sea slugs angelfish giant grouper	giant grouper, sharks
phytoplankton	photosynthesis	Zooplankton, coral, sponges
sea anemone	crabs angelfish sea slugs sea stars	sea slugs, sea stars, angel fish
sea stars	coral sea urchins sea slugs crabs	sea stars, crabs, giant grouper
sea urchins	algae zooplankton	Angelfish, sea stars
sharks	giant grouper octopus	people
sponges	phytoplankton zooplankton	sea slugs, sea stars, angelfish, crabs
zooplankton	phytoplankton	Coral, sponges

2. Visit the website

http://oceanservice.noaa.gov/education/tutorial_corals/

Follow the instructions below, and write your answers on the same sheet of paper your food web in on.

1. Click on the [What are Corals?](#) link. Describe the basic structure and biology of a coral polyp.
2. Go back to the first page, and click on the [Zooxanthellae What's That?](#) Link. Describe the relationship between Zoxanthellae and coral polyps. What kind of symbiotic relationship would this be?
3. Click on the [How Do Stony Corals Grow?](#) Describe the role of CaCO_3 and how it is used in the construction of "hard corals". List 3 of the major types of hard coral forms, and draw a diagram of one.
4. Click on the [How Do Coral Reefs Form?](#) Link. Read the information and describe the process to from a coral reef atoll. Describe the timescale required to form a mature coral reef.
5. Click on the [Where Are Coral Reefs Found?](#) Link. Describe the abiotic factors and range of tolerance for corals to flourish. Click on the world map on the right and read the information. Where are the vast majority of coral reefs in terms of latitude.
6. Click on the [How Do Corals Reproduce?](#) Compare and contrast the sexual vs. asexual reproduction of corals. Describe some of the variables that influence the timing of coral spawning.
7. Click on the [Importance of Coral Reefs](#) link. Describe the relative biodiversity of coral reef. List and describe at least 3 biologic, environmental, or economic benefits that coral reefs provide.
8. Click on the [Natural Threats to Coral Reefs](#) link. Describe the effects that El Nino's and Crown of thorns stars have on the health of coral reef ecosystems.
9. Click on the [Anthropogenic Threats to Corals](#) link and simply read the information.
10. Click on the [Coral Diseases](#) link. What three factors are identified as major causes of coral reef disease, and how have these factors influence the frequency of disease outbreaks?
11. Click on the [Protecting Coral Reefs](#) link. What is the CRTF? Describe the types of data the Coral Reef Conservation would acquire to assess the health or coral reef ecosystems.

3. Skim the topic scenarios listed below. Choose 3 of the scenarios, and explain the potential effect of the scenario on the health of the coral reef ecosystem in detail. Address any potential economic, ecological, aesthetic, impacts, you can foresee as a result of the environmental problem described in each of the 3 scenarios you choose, and list one potential solution for each scenario.

Scenarios

- **Overfishing** in the Philippines, Guam, and Indonesia has caused the disappearance of many types of food fish (groupers, snappers, emperors) from entire areas. Without these predators in the area, the sea urchin population has increased. Sea urchins kill live coral as they feed on algae. Eventually, algae growth overtakes the coral, and new polyps cannot grow. Explain the effect these changes might have on the food web you have made.
- Since the 1960's, thousands of fishermen in Asia and Indonesia have been using sodium cyanide to collect live fish (such as angel fish) for the **aquarium trade**. They squirt the chemical onto coral colonies, then pry the coral apart with crowbars to capture stunned fish that are hiding in the crevices. It is estimated that 330,000 pounds of poison have been sprayed onto 33 million coral polyps each year for the last ten years. One half of the fish that are live-caught die during capture and transport, and another 30% die within six months because the cyanide poisons their major organs. The aquarium industry grosses millions of dollars a year worldwide, and the biggest market is in the United States. The use of cyanide for this business has been outlawed, but it is difficult to patrol the vast oceans. The business of selling fish for aquariums is not illegal. Explain the effects the aquarium business has on the coral reef ecosystem and your food web.
- Many sunken treasure ships have become overgrown with coral and form the basis of coral reefs. When **treasure hunters** discover the wreckage, they must cut away the coral structure surrounding the ships to find the treasure they are seeking. Explain what might happen to the coral reef if it is cut away to expose the ship within it. (One 6 pound chunk of dead coral removed from the Great Barrier Reef contained 1441 worms from 103 different species.) Explain how the removal of parts of the reef might affect the ecosystem and your food web.
- **Tourists** bring business to many of the countries that are surrounded by coral reefs, but the damage they do is putting the future of both tourism and the coral reef in jeopardy. Most people do not realize how fragile the reef is and carelessly destroy it without thinking. Ecologists have discovered patches of dead coral in the shape of diver's footprints. Boat anchors can break off a quarter century of growth in an instant, and if allowed to drag, can leave a trench of dead coral in their wakes. Explain what might happen to the coral reef and your food web if tourists are allowed to continue to destroy it.
- Coral reefs, made up mostly of animals and minerals, are efficient ecosystems that thrive in water low in nutrients. If more **nutrients** are added to the water, phytoplankton and algae produce more food and become overabundant. When this

happens, many of the phytoplankton, including the larvae of many mollusks and crustaceans, die. Algae overgrows the coral, and an imbalance occurs. It is estimated that 700 tons of nutrients are dumped into the ocean off the coasts of Florida each year. Most of the nutrients come from fertilizer in run-off from the land. The fertilizer encourages plant growth. Explain the effects this sewage dumping might have on the coral reef and your food web.

- **Coral bleaching** occurs when coral polyps are under stress. When this happens, the polyps expel algae (zooxanthellae) from within their cells which, in turn, exposes their white limestone skeletons. The algae provides food for the coral and also holds the colony together. The bleaching of the coral indicates the absence of the algae and signals trouble for the reef. Without the algae, the coral will not reproduce and will eventually die. Sometimes coral bleaching can be attributed to hurricanes, pollution, or disease, and, when it occurs in small amounts, can be stopped so that the coral will eventually renew itself. In other cases, when the cause cannot be pinpointed but can be associated with rising water temperatures or when it occurs in large amounts, the reef becomes imperiled. Explain what effect coral bleaching could have on your food web.
- Although blast **fishing with dynamite** has been outlawed, it is still a popular way for Asian fishing companies to meet the demands of the fishing industry. Dynamite is dropped onto the coral reef where many fish are known to be, and when it explodes, the dead fish float to the top and are scooped up in waiting nets. The fish are cleaned, processed, frozen, and shipped off to market leaving the destruction from the dynamite behind. Explain the effects this type of fishing could have on the coral reef and your food web.
- **Coastal development** increases the amount of sediment in the water, and when and abundance of construction activity occurs on a coast close to a coral reef, the extra soil particles drift down through the water and block the pores of sponges as they take in nutrients. If the pores are blocked, food and wastes cannot flow through the animals, and eventually they will die. Explain the effect a decrease in the sponge population might have on the coral reef ecosystem and as well as your food web.
- The lips of a lumphead wrasse are considered a **delicacy** in Hong Kong and sell for \$225.00 a plate. Giant grouper is equally expensive, as are other food fish of the coral reef. Fishermen set traps and nets to catch these animals, which decrease their population within the reef, and also pulls up any additional animals that happen to fall into the catch. Explain the effect of the loss of the giant grouper on the coral reef ecosystem and on your food web.

Be sure to list which scenarios you are addressing on your paper. Remember you must choose three different scenarios, and each scenario discussion should be about a paragraph or two in length!

