Under tropical waters around the world lies an oasis in the ocean desert—the coral reefs.With thousands of permanent residents and nomads from the open seas, life on the coral reef is a day-to-day adventure. Coral reefs are beautiful and an important part of our island life. They provide us with many types of healthy food and resources.

The reef is home to a diversity of life. From urchins to angel fish, giant clams to seasnakes, each organism is an important part of the reef ecosystem. An ecosystem is a living system in which everything is connected. All the organisms in a coral reef ecosystem interact in one way or another.

In this video, we will explore the coral reef ecosystem. We will also look at the relationships humans have with the coral reef. To understand this beautiful and complex world, we must first look at the corals as reefbuilding organisms.

Biology of Corals

Every organism in the reef ecosystem is part of a vast and complex web of life. At the heart of this web of life are the reef builders—the corals.

Corals are made up of a colony of polyps. Polyps are tiny cylindrical animals with many tentacles for capturing food. Coral polyps secrete an external skeleton of calcium carbonate. This is the same substance that strengthens bones, teeth, and seashells. After thousands of years, the buildup of many coral skeletons creates a coral reef. The coral shown here has its polyps pulled inside its protective skeleton.

Corals come in many colors. They have pigments or coloring substances within their tissues—just like you have pigments that give your skin its color. Corals also have microscopic algae called zooxanthellae. The colors of the zooxanthellae in the coral polyp tissues also help to color the coral.

Corals come in different shapes and forms. Polyps that secrete calcium carbonate to create a hard skeleton beneath them are hard corals. They build the coral reef. Corals that do not have a hard outer skeleton are called soft corals. They have small pieces of calcium carbonate within their tissues giving them support. Corals are found in tropical shallow waters accessible to the sun's rays. This is because of a special relationship between the coral polyps and the zooxanthellae and their tissues. The zooxanthellae use the coral's waste products with the sun's energy to make food.

Let's now look at more of the special relationships found in the coral reef ecosystem.

Many reef organisms like the coral polyp and its zooxanthellae are in a special relationship called symbiosis. In a symbiotic relationship, two or more organisms benefit in some way from the relationship.

Clownfish and sea anemonies are a classic example of a symbiotic relationship. The sea anemone has tentacles with stinging cells that allow it to stun its prey. The tentacles can then carry the food to the mouth. Clownfish coat themselves in mucus produced by the anemone. This mucus protects the clownfish from the stinging cells allowing them to hide in the anemone's tentacles when threatened. The aggressive nature of the clownfish benefits both it and the anemone by keeping predators away.

Here is another symbiotic relationship found in sandy areas close to the reef. The fish is a goby. It is standing guard at its burrow—but the goby shares the burrow with a shrimp. If you look very closely, you may see that one of the shrimp's antennae is always touching the goby. This is because the shrimp is almost blind and depends on the goby to alert it to danger. Sometimes the burrow is shared by several goby and shrimp. Another type of fish, like this dart fish, may also live in the burrow.

This fish is doing a dance to let other fish know that it's ready for business. It's a cleaner wrasse. The cleaner wrasse picks off parasites and dead tissues from larger fish without being eaten. The cleaner wrasse gets a good meal and the larger fish gets a good cleaning.

The anemone and the clownfish, the goby and the shrimp, the cleaner wrasse and its host, represent some of the diversity of symbiotic relationships found in the coral reef ecosystem. These relationships form the strongest connections in this underwater web of life.

With the diversity of organisms in a coral reef ecosystem, a diversity of feeding behaviors has evolved. From different feeding times to special feeding structures, every organism has its own way of eating. Different organisms feed at different times. Daytime is the most active time around a reef.

Organisms that feed during the day are diurnal. During the night, the activity slows down and day creatures sleep within the protection of coral

structures. But not everything in the reef is sleeping. Organisms that feed at night are nocturnal. Crabs, shrimp, and shellfish are nocturnal feeders.

With so many organisms sharing the coral reef ecosystem, competition for food can be strong. Adaptations have evolved that give some of these organisms an advantage over others. These colorful spiral structures are found at the end of christmas tree worms. The spiral structures have a large surface area and act like a net as water passes through them. They filter organic particles from the water and send them to the worm's mouth. The feeding structures can be pulled in when threatened, but are soon extended again to continue feeding.

Parrotfish eat algae growing on the dead coral. Their sharp beak not only picks off the algae but also pieces of coral skeleton which pass through the fish's digestive system, coming out as sand. One parrotfish can make over one ton of sand each year.

Some feeders in the coral reef ecosystem are important recyclers. Sea cucumbers take in sand, bacteria, and organic material as they feed. They digest the organic material and release clean sand.

A goatfish is another important recycler on the reef. It collects food from the sand. The sand is taken in, then comes out clean.

Finding food in the coral reef ecosystem is easy if you have the right adaptations. Having different organisms feeding during the day and during the night gives everyone a chance for a good meal. Being able to pass coral and sand through the gut allows for some organisms to feed on what others cannot.

What about when the feeder becomes the food? Let's now look at how some organisms keep predators at their distance.

Defense is an important part of everyday life on the reef. Protection may take the role of camouflage, warning displays, or venom at the end of sharp spines. Camouflage may result from body features or from what an organism decorates itself with.

This decorator crab is well camouflaged by the anemones growing on its shell. These crabs can stop anywhere on the reef and blend into their surroundings.

A stonefish is a camouflage master. Its body features make it almost invisible. Can you see it? Look for its eye and frowning mouth. Because a stonefish is so well hidden, it can sit and wait for unsuspecting fish to pass by. But a stonefish has more than camouflage for defense—it also has spines full of venom.

A lionfish has several forms of defense. Its coloration and fin structure can be used as camouflage when in certain areas of the reef. When in the open, the lionfish may use an elaborate display as a warning for predators to stay away. A lionfish, like the stonefish, has very venomous spines.

Another animal with venomous spines is the crown-of-thorns starfish. The only real predator of the dark starfish is the triton. But triton are being over-harvested, allowing the starfish to increase its numbers.

Because the main food of the crown-of-thorns starfish is coral, and the starfish population continues to grow, the coral reef ecosystem is being thrown out of balance.

The white area on this coral shows where the coral polyps have been eaten. Defense on the reef takes the form of one or several adaptations—they include camouflage, warning displays, and venomous spines. Some adaptations work so well that an organism is threatened by very few predators. If these predators are taken away, there is a disruption in the coral reef ecosystem.

Many of you may never see the underwater coral world, but you should not forget their importance in providing us, as well as thousands of species of marine organisms, with food and other resources. Some of the benefits provided by coral reefs include food for local use, the restaurant trade, and the export market; recreation, including economic benefits from tourism through diving, snorkeling, and fishing.

Coral reefs create barriers against storms and sea level rise that may last for millions of years. They provide coral rubble and sand which helps to build up shorelines and beaches. Many times we affect of our environment more than we understand. This is happening to the coral reef ecosystem.

Some threats caused by humans include overfishing and collecting, creating an imbalance in the food chain; destructive fishing methods, like dynamite use, which physically destroys the coral reef and kills many organisms; anchor damage, caused by poorly managed boating, diving,

and other recreational activities. Development on coastlines and clear cutting land for logging and agriculture cause soil erosion.

Rivers carry soil and excess nutrients to the reef. An increase of soil in the water prevents the zooxanthellae from capturing sunlight, thus killing the coral. Excess nutrients carried with the soil causes rapid algae growth. This growth displaces corals minimizing their expansion.

Pollution from improper sewage and rubbish disposal may increase nutrients in the water and quicken algae growth. Pollution from factory and industrial waste may put chemicals and heavy metals into the water, affecting many organisms in a coral reef community.

It is vital that every one of us knows the importance of a coral reef ecosystem. Whether we get our food directly from the reef or a restaurant, whether we are in the tourist industry or live on the shorelines that the reefs build up and protect, we are all dependent on the resources from a coral reef ecosystem. When we disrupt this ecosystem directly or indirectly, we affect ourselves. We must educate ourselves and others about coral reefs and how important they are to our island life. Remember, their health—our future.

We looked at the coral reef community relationships. A sea anemone does not eat the clownfish living in its tentacles. The clownfish gets free protection while they ward off the anemone's predators. A goby and a shrimp will share the same burrow—where the goby acts as the eyes of the partly blind shrimp. Cleaner wrasse clean the parasite and dead tissues off larger fish without fear of being eaten. These are all symbiotic relationships—two or more organisms benefit from the relationship.

We looked at feeding behaviors. Some organisms are diurnal and feed during the day. Others are nocturnal and feed at night. Some organisms have adaptations for finding or capturing food. Christmas tree worms have netlike feeding structures. Their large surface area filters food from the water. Parrotfish have a sharp beak to get at the algae growing on dead coral. Sea cucumbers and goatfish eat organic material out of the sand, recycling the waste of others.

We looked at defense adaptations. Decorator crabs and stonefish are experts at camouflage. They blend effectively into their surroundings. A lionfish can be camouflaged but may also put on a display warning other organisms to keep their distance. A stonefish, lionfish, and crown-of-thorns starfish have venomous spines keeping most predators away.

We looked at humans and the coral reef. Humans benefit from the reef by getting food for local use, restaurant use, and the export market. Coral reefs are important recreation areas for locals and tourists. Reefs provide barriers against high seas. The rubble and sand produced build up shorelines.

While we benefit from coral reefs, humans also damage them and the organisms that live within the ecosystem. Threats include overfishing and collecting, which remove food and predators. Dynamite use and anchors in reef areas physically damage the corals that build the reefs. Soil erosion blocks the sunlight needed by the zooxanthellae and coral polyps. Pollution poisons organisms in the coral reef ecosystem.

You should now have a better understanding of the diversity of organisms connected to form the web of life in a coral reef ecosystem. Because humans and other organisms depend on these precious coral reefs for so many resources, let's all work to take care of them.