

CORAL REEF ECOSYSTEMS / INSTRUCTOR INFO

Summary

This lesson includes vocabulary, content, and creative activities to help students learn about coral reefs and the animals that live there. Students will learn what types of animals can be found in or near coral reefs, the special adaptations that they have to help them survive and thrive there, and the food chains that exist within a coral reef ecosystem.

Part 1. Introduction

Part 2. All About Coral

Part 3. Life in a Coral Reef

Part 4. Coral Reef Conservation

Activity 1. Coral Reef Lap Book

Goals & Objectives

The students will:

- Learn what a coral reef is;
- Learn about the adaptations of animals that live in coral reefs;
- Learn what a food chain is;
- Learn the potentially negative effects of removing an animal from a food chain.

Helpful Tips

1. The content in this lesson is related to OCEARCH and the Global Shark Tracker. Spend a few minutes getting familiar with the website and the tracker if you have not done so already. The Global Shark Tracker is also available as an app for iPhone and Android.
2. This lesson plan is designed to be adaptable to suit your specific needs. Use the entire lesson plan or just parts of it. This material can be expanded to be an entire unit or condensed for just one day in the classroom.
3. Vocabulary words will be underlined as they appear in the lesson plan. A complete list of vocabulary words is included as well.
4. Answers to questions and prompts for discussions will appear in italics.
5. Optional activities and content (side notes) will appear in a box. Use these to enhance your lesson and adapt it to suit your needs!
6. Have questions for OCEARCH Expedition Leader, Chris Fischer? Email info@OCEARCH.org to schedule a Skype session and let your students/child talk directly to Chris and the OCEARCH crew!
7. Email all questions about this lesson to info@OCEARCH.org.

// STANDARDS

This lesson aligns with the following TEKS:

Grade 3 Science: 1B, 2C, 2F, 3A, 3D, 9A, 9B, 10A

Grade 4 Science: 1B, 2C, 2F, 3A, 3C, 9A, 9B, 10A

Grade 5 Science: 1B, 2D, 2F, 2G, 3A, 3D, 9A, 9B, 9C, 10A

This lesson aligns with the following Next Generation Science Standards:

Ecosystems: Interaction, Energy, and Dynamics – 5-LS2-1

Science and Engineering Practice

Developing and Using Models

- Modeling in 3–5 builds on K–2 models and progresses to building and revising simple models and using models to represent events and design solutions. (5-LS2-1)

Connections to Nature of Science

- Science explanations describe the mechanisms for natural events. (5-LS2-1)

Disciplinary Core Ideas

5-LS2-1 Interdependent Relationships in Ecosystems

- The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as “decomposers.” Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. (5-LS2-1)

Crosscutting Concepts

Systems and System Models

- A system can be described in terms of its components and their interactions. (MS-LS2-4)

STEM

This lesson plan aims to assist teachers in implementing a STEM-based program into their classroom while inspiring the next generation of explorers, scientists, and stewards of the ocean. Based on real science and the Global Shark Tracker™, this lesson is intended to promote environmental awareness and to prepare students for STEM careers.

CORAL REEF ECOSYSTEMS / VOCABULARY

Adaptation - A characteristic that helps an organism survive in their environment.

Apex Predator - A predator residing at the top of a food chain upon which no other creatures prey.

Camouflage - An adaptation that hides or disguises an organism.

Coral Reef - A diverse underwater ecosystem.

Ecosystem - A biological community of interacting organisms and their physical environment.

Environment - the surroundings or conditions in which a person, animal, or plant lives.

Habitat - The natural home or environment of an animal, plant, or other organism.

Organism - An individual plant, animal, or single-celled life form.

Polyp - In corals, they are tiny, soft-bodied organisms related to sea anemones and jellyfish.

Predator - An animal that naturally preys on others.

Prey - An animal that is hunted and killed by another for food.

CORAL REEF ECOSYSTEMS / PRE-LESSON ASSESSMENT

Use the following true/false and multiple-choice questions as an introduction/warm-up to the lesson topics. You can do this in a verbal or written format, as a game, individually, or as a whole class! A handout is provided if you wish to hand the questions out in a quiz format.

The questions do not need to be graded. They are intended to give the students an idea of what they will be learning and to see what they already know.

1. True or False

Coral is classified as a plant.

Answer: False

2. True or False

The Sun is the ultimate source of energy that begins a food chain.

Answer: True

3. What temperature range does coral grow the best?

- a. 0°F to 30°F
- b. 73°F to 84°F
- c. 85°F to 120°F

Answer: b

4. Which of these animals lives in or near coral reefs?

- a. Moray eel
- b. Stingrays
- c. Parrot fish
- d. All of the above

Answer: d

5. On average how many sharks are killed by humans each year?

- a. 100 million
- b. 100,000
- c. 500,000
- d. None of the above

Answer: a

Name: _____

Date: _____

Coral Reef ecosystems

Select the correct answer(s) to each of the following questions.

1) True or False

Coral is classified as a plant.

2) True or False

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3) What temperature range does coral grow the best?

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CORAL REEF ECOSYSTEMS

/ LESSON PLAN

PART 1. INTRODUCTION 5-10 mins.

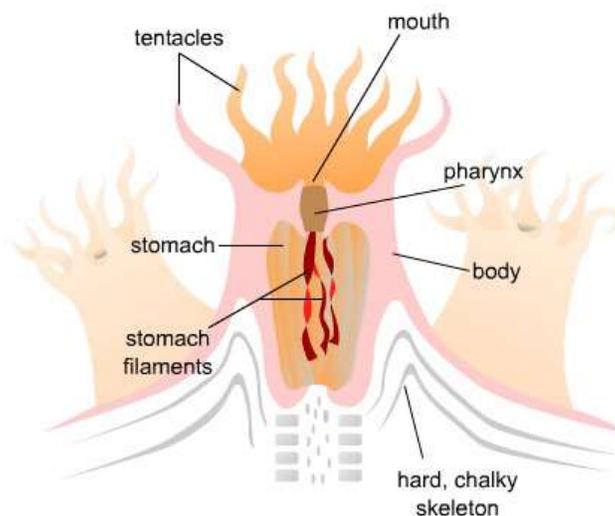
Ask students to think about whether coral is a plant or an animal. Show them pictures of corals if necessary. Ask the students to raise their hands if they think coral is a plant. Record the number of responses on the board. Now ask the students who think coral is an animal to raise their hands. Record the number of responses on the board.

Despite their plant-like appearance, corals are actually animals! Specifically, they are colonies of tiny organisms called polyps. As the colonies grow they merge with other colonies to create coral reefs. Coral reefs are very diverse ecosystems that are crucial to the ocean and the animals that live there. Did you know that 25% of all the ocean species depend on coral reefs for food or shelter at some point in their lives? Considering there are over 1 million known ocean species, that's a lot of organisms that depend on coral reefs!

PART 2. ALL ABOUT CORAL 5-10 mins.

There are 5,000 different kinds of coral! As we've mentioned before, corals are actually colonies of tiny animals called polyps. Polyps are rounded and have a ring of tentacles with a mouth in the middle. The bottom of the polyp sticks to something hard, like rocks.

Since coral doesn't move, then they need to use the waves to catch their food. Some coral have stinging cells on their tentacles and use them to catch food drifting in the water.



There are 2 different kinds of coral – hard and soft. Hard corals are reef builders, because their skeletons stay hard even when the polyps die. Soft corals are flexible and bend, but their skeletons dissolve in the water when they die.

Everyone picture a coral reef in their mind. Are they brightly colored or dull and boring? That's right! Corals are brightly colored. They get their color from the algae that grows all over them. Everybody say "zooxanthellae" (zoe-zan-THELL-ee). This is a big word for this colorful algae. From now on we'll just call it "algae". This plant uses sunlight to make food for itself and for the coral polyp. Hard coral polyps get most of their food from these algae! What kind of relationship does the coral polyp have with the algae?

Corals have complex relationships with many other organisms living in the coral reef...

PART 3. LIFE IN A CORAL REEF 5-10 mins.

As we discuss the different types of animals found in a coral reef, we will also learn how they interact with each other. We will focus on two different types of relationships: predator/prey and partners. Write these two relationships as headings on the board. With each animal, students will determine what their relationship is with other organisms. Record their responses on the board under the correct category.

Butterfly Fish

This fish has a special pointed mouth to help it live and survive on a coral reef. What might a butterfly fish eat with such a pointed mouth? Butterfly fish use their mouth to pick out and eat the algae found in the polyps of coral.

What kind of relationship does the butterfly fish have with coral? That's right it's a predator/prey relationship. Write Butterfly/Coral on board under "Predator/Prey". Point out that a creature can be both a predator AND a prey (hard coral polyp is predator of tiny animals and prey of butterfly fish).

Moray Eel

This eel has a special relationship with tiny neon gobies. The neon goby, as well as some types of shrimp, clean other fish. They are called "cleaners". They pick parasites and bacteria off of the fish, keeping that fish healthy and strong. Sometimes cleaners have to work INSIDE the mouth of the fish! The fish picks off parasites and bacteria as food.

What kind of relationship does the moray eel have with the neon gobies? That's right they are partners. Write Moray Eel/Neon Gobies on the board under "Partners".

Clown Triggerfish

This colorful fish has powerful jaws and chisel-like teeth. What kind of creature would this fish hunt? Hard-shelled creatures or those with some sort of spiny defense such as the sea urchin. The triggerfish uses its teeth to carefully grab the spines of the urchin and flip it over. The urchin's underside is spineless and defenseless. The triggerfish can also sometimes use a jet of water, squirted out of its mouth to flip the urchin over.

What kind of relationship does the clown triggerfish have with the sea urchin? That's correct they are predators and prey. Write the Clown Triggerfish/Sea Urchin on the board under "Predator/Prey".

Clownfish

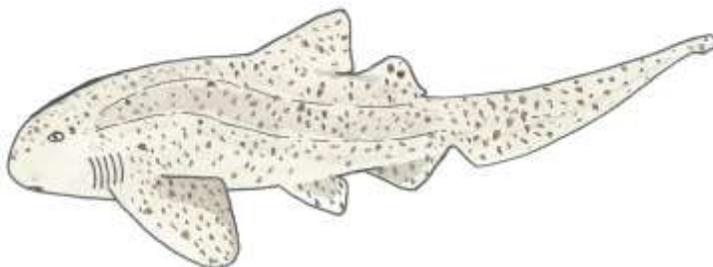
This fish is called a clownfish because of its distinctive markings. The clownfish lives in the tentacles of an anemone, which is closely related to coral. The clownfish is covered with a slimy coating that protects it from the stinging tentacles of the anemone. The clownfish chases away predators that might try to eat the anemone's tentacles, and it can hide from its own enemies in those same tentacles. Usually, more than one clownfish will live together in an anemone.

What kind of relationship does the anemone have with the clownfish? You are right they are partners! Write Clownfish/Anemone on board under "Partners".

Zebra Shark

This reef dweller has very distinctive coloring. People often get confused about its name because the adult has spots, not stripes! However, young zebra sharks have stripes to match their name. Its long and flexible body lets it wiggle in and out of crevices in the reef while it hunts for reef fish and invertebrates (animals without backbones) such as crabs.

What kind of relationship does the shark have with the fish and sea star? That's right they have a predator/prey relationship. Write Shark/Fish and Crabs on board under "Predator/Prey".



Adult zebra shark.

Artwork: Sarah Rich - Landry's Downtown Aquarium, Houston

These are just a *few* examples of life in coral reefs. Coral reefs are much more complex than what we've just discussed. They are also very fragile...

PART 4. CORAL REEF CONSERVATION 10 mins.

It takes a really long time for a coral reef to grow! It takes about 250 years to grow just three feet of reef. Not only do they grow slowly, but they are also very fragile. People have to be really careful – just stepping on coral can destroy it! Boat anchors can also do a lot of damage. Pollution can muddy the water, and without sunlight, the algae in the polyps die. The polyps don't have enough nutrients to continue living without the algae, so they die as well. It's plain to see that coral reefs are easily threatened. And as we have learned, many animals depend upon coral reefs for survival, including sharks!

Sharks are apex predators, which means that are at the top of a food chain. The job of an apex predator is to control the populations of the animals they eat. How do you think they do this? They do this by eating a lot of fish and by eating sick and old animals. This keeps populations from getting out of control and makes sure only strong, healthy animals survive to reproduce. This keeps the entire ocean healthy.

Coral reefs have a high population of fish and other organisms that sharks feed on. If sharks were suddenly all gone, then the prey that they feed on would not get eaten and would overpopulate the reefs. What happens to an ecosystem when

there is overpopulation? The overpopulated animal consumes all of its prey because they are no longer being preyed upon. Eventually they run out of food or have to switch to another prey item. The end result of this situation would be the collapse of an ecosystem.

Unfortunately, this situation is very real. Over 90 million sharks are killed each year by humans. Sharks are killed for a variety of different reasons. One is for their fins. Poachers catch sharks and cut off their fins to sell for (unfortunately for sharks) a lot of money. The fins are the main ingredient in shark fin soup, which is a popular delicacy in the Eastern parts of the world.

Shark populations are also dwindling due to by-catch. By-catch is when fishermen catch animals in their nets or long lines that they were not intending to catch. These animals very rarely survive. Sharks that are caught on long lines usually die by the time the lines are brought up to the surface.

So what can you do to help?

If you want to help protect sharks and coral reefs, all you have to do is learn about them and pass the knowledge along to your friends and family. Encourage others to learn about coral reefs and how important they are to us and the entire world! Teach your friends and family about sharks and how important they are to coral reef ecosystems.

Practice making "green" choices that help protect the planet. Use less electricity, conserve water, use reusable water bottles and bags instead of plastic, ride your bike instead of driving, and more! What are you doing right now to help the ocean?

When you get older, you can become an activist, a researcher, a marine biologist, a policy maker, a teacher, or you could work in an aquarium and teach the public about the ocean and its inhabitants. So there is a lot you can do!

CORAL REEF ECOSYSTEMS

ACTIVITY 1. CORAL REEF LAP BOOK

INTRODUCTION

In the lesson, students learned all about coral, how diverse coral reefs are, how animals depend on coral reefs for survival, and how they can help protect coral reefs. During this activity, students will research information about coral reefs and the animals that live there to create a "lap book".

MATERIALS

- Construction paper
- File folders
- Markers, crayons, color pencils
- Glue

INSTRUCTIONS

1. Students should research coral reefs and the animals that live there using the internet and library books. As they research, students should brainstorm what they are going to include in their "lap book".
2. Use the materials to create a lap book:

How to Create a Lapbook



Fold the two sides inward so they meet in the middle.

Tape another file folder on the inside with clear packing tape.

Trim the inner file folder so the outer flaps can fold over top (as seen in the first photo).

3. Get creative! A variety of subjects and activities can be put into the lap book, such as pictures of different animals that live in coral reefs, a short story about the life of animals living in a coral reef, fun facts about coral reef, a Venn diagram showing the differences and similarities between hard coral and soft coral, a pamphlet giving conservation information about coral reefs, information about the special adaptations that animals have to help them survive in a coral reef, and so much more!