

OCEAN CLASSROOM

The Study of Corals

Types of Coral Reefs

EDUCATOR GUIDE

THE
UNIVERSITY
OF RHODE ISLAND
GRADUATE SCHOOL
OF OCEANOGRAPHY

Guiding Question

“What types of coral reefs exist?”

Day 1

Time: One Class (45-minute period)

Procedure: Have the students get into their groups. They are to read the informational essay **Types of Reef Formations** and highlight important facts. As a class, show the videos listed and tell students to add any additional facts.

Science Notebooks: Have the students write the heading of each of the four reef formations in their science notebooks. Below each heading, they are to write at least five facts about that particular reef.

Lastly: Have the students take the **Quiz on Coral Reefs**.

- <https://quizizz.com/admin/quiz/5ac2809d6288c8001b24e5e1/coral-reef>

Day 2

Time: One Class (45-minute period)

Virtual Field Trips and Word Art

Procedure: Have the students take out their sheet of **Virtual Field Trip** sites. They can watch these sites for 15 minutes or so.

Assignment: “The teacher will assign one of the four types of coral reefs to your group . You have read about each one and have seen some informational videos. On a large piece of construction paper, draw the **outline of the shape of your reef** lightly in pencil. Then, the group needs to come up with **words that describe** your particular reef . Fill in the outline with the words using different colors and fonts. When the inside space is full, erase the outline and put a **title** at the top of your paper.”



Guiding Question

“What types of coral reefs exist?”

Day 3

Time: One Class (45-minute period)

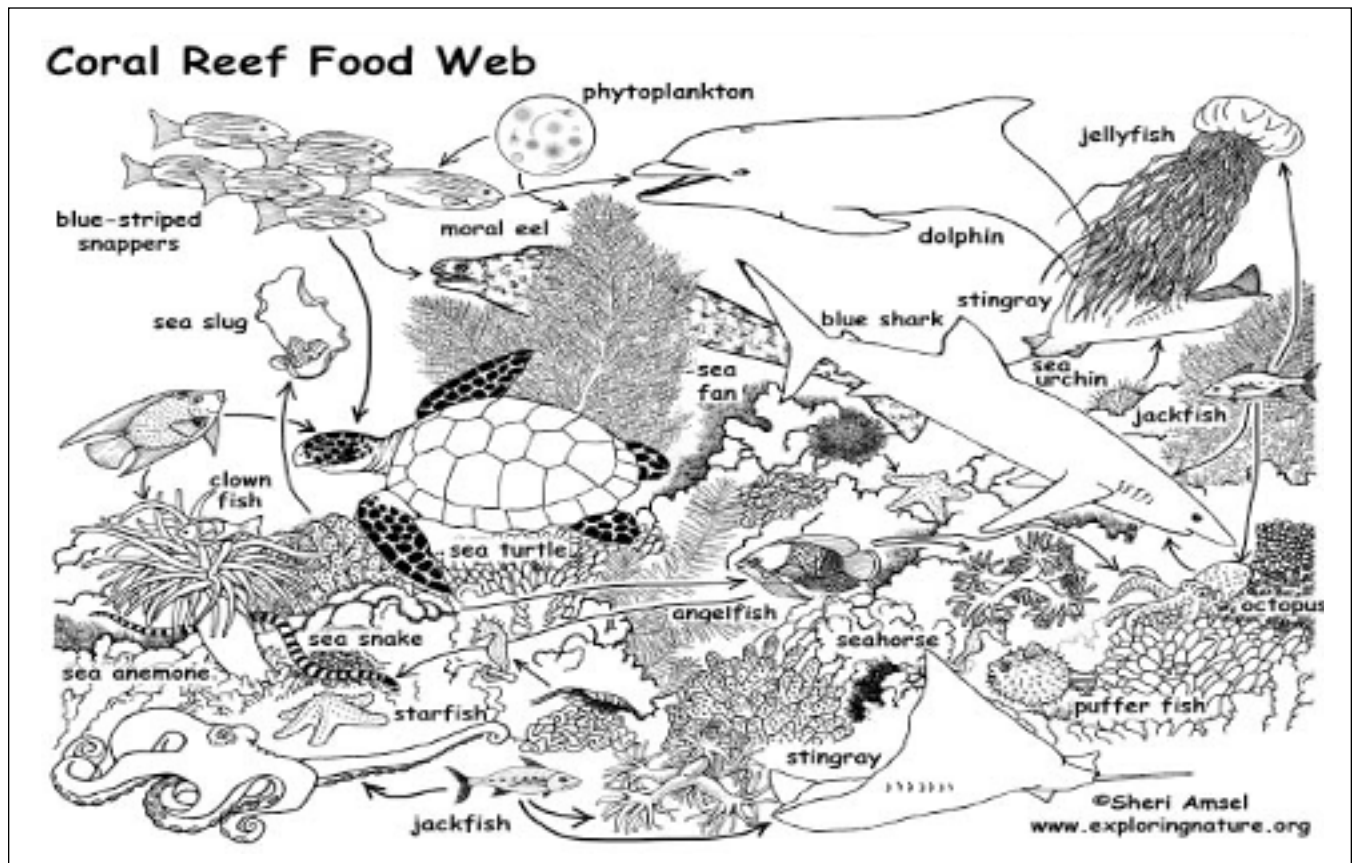
Coral Reef Food Web

Procedure: Review the types of organisms found in a food chain/web as told in the information at the top of the worksheet. Then ask students to get into their groups and work quietly together to complete the **Coral Reef Food Web** sheet.

Let students go on this site to learn more about organisms of the coral reef:

- <https://www.montereybayaquarium.org/animals/habitats/coral-reefs>

When everyone is done, correct the sheet together



Day 3 (continued)**Coral Reef Food Web
Answer Key****Producers**

(plants): phytoplankton

Primary Consumers

(herbivores) moray eel
blue striped snapper
zooplankton

Secondary Consumers

(carnivores) all the rest of the organisms

Omnivores plankton

Go to this site to learn more about organisms of the coral reef.

- <https://www.montereybayaquarium.org/animals/habitats/coral-reefs>

Guiding Question

“What types of coral reefs exist?”

Day 4

Time: One Class (45-minute period)

Essay and Videos on the Importance of Coral Reefs

Preparation

Ask the students if they can tell you why coral reefs are important? As a class, show them the videos listed.

Then ask them to gather in their groups. They are to read the essay, **Importance of Coral Reefs**, and highlight important facts.

There are three real-life posters for the students to view as examples. Now they are ready to create a group poster that teaches the value of coral reefs and the great need to save them.

Group Assignment: Make a Valuable Poster

Student Sheet

“Now that you know a lot about coral reefs and their importance, your group must work together and **create a poster** about the value of coral reefs. Three examples are given below. Include a title, some facts and lots of color!”

Guiding Question

“What types of coral reefs exist?”

Day 5

Time: One Class (45-minute period)

“True or False?” Game

Directions: Have the class sit in their cooperative groups to play this game. The teacher puts a name for each group on the board so he/she can tally the points. Each group takes turns and the teacher reads one statement per group. Students must decide if the statement is true or false. Each correct answer gets one point.

Note: **All** the facts below are “**true**.” Be sure to make some facts “**false**” now and then as you read them to the groups.

- Corals are made of millions of tiny, alive, sac-shaped creatures called polyps. Large group of polyps (of the same species) forms a colony.
- Type of coral can be determined based on the size, shape and color of the colony.
- Polyps have a hard, limestone skeleton at the base of the body which joins with skeletons of other polyps of the same type. This leads to the formation of a colony.
- As colonies of coral merge with other colonies, a coral reef is formed.
- Billions of colorful algae, called zooxanthellae, that live in corals, are responsible for the beautiful colors of the coral reefs.
- There are three main types of coral reefs: barrier reef, fringing reef and atolls.
- A Barrier reef is usually located in deep water, away from the shore.
- A Fringing reef is fringe-shaped and located in the shallow water.
- Atolls are island-shaped. They grow on the edges of the lagoons.
- A coral reef is a living community and the largest living structure on Earth that is created by animals.
- Corals grow very slowly, but hard corals grow faster than soft corals.

Day 5 (continued)**“True or False?” Game**

- One of the oldest and largest coral reefs on the planet is the Great Barrier Reef in Australia. It was created five to 10 thousand years ago. (It occupies 2,600 miles of sea floor, crosses 500 islands and consists of 900 smaller reefs.)
- Coral reefs increase stability of the sea bed, and they protect beaches from the waves and erosion (hence the name “barrier reefs.”)
- Most corals feed at night, especially hard corals. But soft corals feed during the day and night.
- Corals collect zooplankton and small fish with the help of stinging tentacles that are located around the mouth opening.
- The coral and the algae have a mutual, symbiotic relationship. One needs the other to survive, and if one partner dies, the other dies too.
- Hard corals build coral reefs, but soft corals cannot build reefs due to their lack of a hard skeleton.
- Once per year, all corals in the reef release (reproductive cells) at the same time. This is called spawning.
- 25% of marine creatures depend on the coral reefs, despite the fact that corals cover less than 1% of the sea floor.
- The Great Barrier Reef is the largest barrier coral reef and is located in Australia. It can actually be seen from outer space.
- Corals are often restricted to shallow water, which provides plenty of sun, so the zooxanthellae algae in the coral can carry out the process of photosynthesis (using sun, water and carbon dioxide to make food)
- Corals are greatly affected by temperature and salinity. When it gets too hot, they turn white.
- The four types of coral reefs are fringing, barrier, atoll and patch reefs.
- Although many types of animals live within a coral reef, we say it has biodiversity because there is a vast array of plant life in the coral.
- Corals are naturally colorful because of the algae. If the coral reef appears white, called coral bleaching, this means there is a pollution problem.
- Corals are classified as carnivores and are animals, not plants
- Coral reefs are made of polyps which are tiny organisms that look like sacs. As they develop and grow, so does the coral reef.
- A colony of coral is made up of many identical polyps.

Educational Standards

NGSS Middle School Standards

MS-PS1: Matter and Its Interactions

- MS-PS1-1** Develop models to describe the atomic composition of simple molecules and extended structures.
- MS-PS1-2** Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred

MS-LS1: From Molecules to Organisms: Structures and Processes

- MS-LS1-1** Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.
- MS-LS1-2** Develop and use a model to describe the function of a cell as a whole and ways the parts of cells contribute to the function
- MS-LS1-3** Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells
- MS-LS1-4** Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively
- MS-LS1-5** Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
- MS-LS1-6** Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.
- MS-LS1-7** Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.

NGSS Middle School Standards (continued)**MS-LS2: Ecosystems: Interactions, Energy, and Dynamics**

- MS.LS2-1** Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
- MS.LS2-2** Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
- MS-LS2-5** Evaluate competing design solutions for maintaining biodiversity and ecosystem services

MS-LS4 Biological Evolution: Unity and Diversity

- MS-LS4-4** Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.
- MS-LS4-6** Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.

MS-ESS3 Earth and Human Activity

- MS-ESS3-4** Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems
- MS-ESS3-5** Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.

Educational Standards

ELA Standards

Common Core State Standards Connections: Reading Standards for Literacy in Grades 6 through 8

Science and Technical Subjects

- RST.6-8.1** Cite specific textual evidence to support analysis of science and technical texts.
- RST.6-8.2** Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
- RST.6-8.3** Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks

Reading Informational Texts

- CCSS.ELA-Literacy.RI.6-8.1** Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
- CCSS.ELA-Literacy.RI.6-8.2** Determine a central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments.
- CCSS.ELA-Literacy.RI.6-8.3** Analyze in detail how a key individual, event, or idea is introduced, illustrated, and elaborated in a text (e.g., through examples or anecdotes).

Speaking and Listening

- CCSS.ELA-Literacy.SL.6-8.1** Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts and issues, building on others' ideas and expressing their own clearly.
- CCSS.ELA-Literacy.SL.6-8.2** Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study.
- CCSS.ELA-Literacy.SL.6-8.3** Delineate a speaker's argument and specific claims, distinguishing claims that are supported by reasons and evidence from claims that are not.
- CCSS.ELA-Literacy.RH.6-8.7** Integrate visual information (e.g., in charts, graphs, photographs, videos, or maps) with other information in print and digital texts.

Resources

- <https://mass.pbslearningmedia.org/resource/25bf4738-d657-492a-b4f7-777725701b47/coral-spawning-life-on-the-reef/>
Learn about reproduction, spawning, of coral in this seven minute clip from life on the reef
- <https://mass.pbslearningmedia.org/resource/dio14.stem.coral/how-coral-grows/>
This video from DIORAMA and SciTech Now takes a close look at coral polyps, the tiny animals that make giant coral reefs. Meet dinoflagellates, algae that lives inside coral polyps.
- <https://mass.pbslearningmedia.org/resource/c0b990c3-2d46-49fa-ae00-095b959a106c/corals-the-birds-and-the-bees/>
This four minute video shows us how coral colonies ensure their own survival generation after generation. Corals reproduce sexually (mass spawning and brooding) and asexually (budding and fragmentation).
- <https://mass.pbslearningmedia.org/resource/hew06.sci.life.reg.foodweb/energy-flow-in-the-coral-reef-ecosystem/>
This three minute video shows how energy from sunlight is transferred through the inhabitants of the coral reef ecosystem. Photosynthesizing plants and algae convert light energy into chemical energy, which then gets passed through the food web to plant eaters, flesh eaters, and ultimately to scavengers and decomposers.
- <https://mass.pbslearningmedia.org/resource/46dbe69e-32c5-4488-841c-df40aa312bb3/coral-what-does-it-eat/>
This video explains what and how corals eat. Coral polyps are mostly stomach, with a mouth on top. Symbiotic algae, zooxanthellae, live in the coral and provide them with energy. Corals also snatch zooplankton and other food particles right out of the water.
- <https://mass.pbslearningmedia.org/resource/coral-reef-symbiosis/exploring-ecosystems/>
Learn how species interact on a coral reef and how biodiversity plays a role in coral reef symbiosis in this five minute video.
- https://oceanservice.noaa.gov/education/tutorial_corals/coral05_distribution
Reef Building Coral Tutorial by NOAA.gov
- <https://oceantoday.noaa.gov/coralforestsforthedeep/welcome.html>
Coral forests of the deep information shown in a short video and followed by its transcript.

Resources (continued)

- <https://www.montereybayaquarium.org/animals/habitats/coral-reefs>
Scroll down to learn the inhabitants of a coral reef, how species interact on a coral reef and how biodiversity plays a role in coral reef symbiosis
- <https://www.calacademy.org/educators/how-do-humans-depend-on-coral-reefs>
Worldwide, reefs protect hundreds of millions of people living in coastal communities as shown in this video.
- https://www.youtube.com/watch?v=eNqbSi_6KdA&ab_channel=NaturalHistoryMuseum
This two minute video made by the Natural History Museum shows us that coral are more than just colourful underwater scenery, coral reefs have huge benefits for life on land
- https://www.youtube.com/watch?v=Pcau276KN0I&ab_channel=WhatIf
What if Earth lost all its coral reefs? (Run time: four minutes)
- <https://sanctuaries.noaa.gov/vr/florida-keys/>
Welcome to the virtual dive gallery of Florida Keys National Marine Sanctuary where students can get a 360° view by clicking on the live coral reef.
- <https://sanctuaries.noaa.gov/vr/florida-keys/cheeca-rocks/>
Live footage of soft corals and brain corals in Cheeca Rocks Sanctuary Preservation Area in Florida Keys National Marine Sanctuary. This is the only area in the upper keys designated to specifically protect inshore patch reefs.
- <https://sanctuaries.noaa.gov/vr/american-samoa/tafeu-cove-underwater/>
The diversity of corals typical of American Samoa's marine environment is seen in Tafeu Cove, along with a diver who is helping to collect these stunning 360° views of the underwater world.
- <https://sanctuaries.noaa.gov/vr/american-samoa/big-momma/>
Get a virtual glimpse inside the "Valley of the Giants" which shows coral heads like "Big Momma" that are protected within National Marine Sanctuary of American Samoa on Ta'u. Big Momma is more than 500 years old and over six meters high, and has a circumference of 41 meters. This Porites coral may be the largest one in the world.
- <https://sanctuaries.noaa.gov/vr/american-samoa/channel-at-rose-atoll/>
The Muliāva Area of National Marine Sanctuary of American Samoa overlays Rose Atoll Marine National Monument and also surrounds a national wildlife refuge managed by the U.S. Fish and Wildlife Service. Rose Atoll is the easternmost Samoan island and the southernmost point of the United States and its territories