OCEAN CLASSROOM

The Study of Corals

Types of Corals

STUDENT GUIDE

THE
UNIVERSITY
OF RHODE ISLAND
GRADUATE SCHOOL
OF OCEANOGRAPHY

Guiding Question

"What types of coral exist?"

Essay:

Hard Corals

Characteristics

Hard corals grow in colonies and are the builders of coral reefs. Hard corals, also known as stony corals, include such species as brain coral and elkhorn coral. They create skeletons out of calcium carbonate (limestone), a hard substance that eventually becomes rock. Hard corals are **hermatypes,** or reef-building corals, and have polyps that secrete a hard cup (calyx) in which they live, and in which it can withdraw for protection. Hard coral polyps have eight tentacles that are usually smooth.

Most hard coral have microscopic algae that live within their tissue called **zooxanthellae** which they need to survive. The corals and algae have a **symbiotic relationship,** which means one cannot survive without the other. The coral provides the algae with a protected environment and ingredients they need for **photosynthesis**. In return, the algae produce oxygen and food, as well as help the coral to remove wastes. Most importantly, zooxanthellae supply the coral with the products needed to produce calcium carbonate for their skeleton. The shape and appearance of each hard coral are dependent upon factors such as its species type, location, depth, and water movement. Yet, hard coral are transparent; it is the zooxanthellae-algae that give corals their unique colors. Unfortunately when corals become physically stressed, the polyps expel their zooxanthellae-algae and the colony takes on a white appearance. This is commonly described as **coral bleaching.** If the polyps go for too long without zooxanthellae, coral bleaching can result in the coral's death.

Where Hard Corals Are Found

Many of the reef-building corals are warm-water corals that live in tropical and subtropical areas where the water is salty, warm and clear. The corals actually grow faster when they have more access to the sun. They can build large reefs like the Great Barrier Reef in warmer waters.

Then there are corals found in unexpected areas. Hard coral reefs and solitary corals have been found in the deep, dark sea, even as far down as 6,500 feet. These are the deep-water corals, and they can tolerate temperatures as low as 39º Fahrenheit.

Hard coral species can be found in all of the world's oceans, yet their populations are expected to decrease due to global changes and **ocean acidification.** Over time, mankind's industrial and agricultural activities have changed the chemistry of the seawater. There has been an increase in CO_2 absorbed by the ocean, ocean water temperatures are rising, and the rising pH of the ocean water means it is becoming more acidic.

Soft Corals

Characteristics

Soft corals often resemble plants and trees. They are soft and bendable and fleshy true soft corals have **no rigid internal skeleton** at all. These types of corals do produce very little or no calcium carbonate, and they have **spiny skeletal sclerites** or spines, which offer protection and support. Instead, soft corals grow **woodlike cores** for stability. These cores are made of structural proteins similar to those of nails and horns of other animals. Soft corals have polyps that secrete a hard cup (calyx) in which they live. Their polyps have eight tentacles that are usually feathery. They may have a variety of shapes, including fan-like, whip-like or feather-like, or even leathery or encrusting.

These types of coral are referred to as **ahermatypes** or non-reef building corals. Examples of soft coral in the Bahamas and Caribbean include sea fingers or sea whips. This type of coral also **does not** always have a symbiotic relationship with zooxanthellae. Though many benefit from them, soft corals will typically eat any type of organism passing by. Corals that do contain zooxanthellae algae, brilliant colors can be produced. Other soft corals may be colored by bright pink, blue or purple pigmentation.

Where Soft Corals Are Found

Soft species also prefer to live in nutrient-rich waters with less intense light. They are found worldwide, primarily in tropical or subtropical waters. Soft corals **do not** produce reefs but may live on them. They may also be found in the deep sea.

Soft corals may be harvested for use in aquariums. Wild soft corals may also attract tourism in the form of dive and snorkeling operations. Compounds within the tissues of soft corals may be used for medicines. Threats include human disturbance (through humans stepping on corals or dropping anchors on them), overharvesting, pollution, and habitat destruction.

Both Types of Coral

How They Eat

Both hard and soft coral are classified as **carnivores** because they eat meat (zooplankton, small fish), but the zooxanthellae algae is a **primary producer** because it is a plant. Most hard corals feed **at night** while soft coral feed during the day or night. The coral polyps are very similar to sea anemones, as they also have stinging cells called cnidocytes or **nematocysts.** Nematocysts are specialized cells found on the tentacles of sea anemones, jellyfish, corals and hydras. Their function is to inject toxins into prey, such as zooplankton and small fish. Soft corals actually produce a board range of chemicals to avoid predators. The prey is ingested, and any waste is expelled out the mouth. Nematocysts also help the coral to defend itself against predators. Coral ecosystems have a unique food web. Click here to see:

- https://mass.pbslearningmedia.org/resource/hew06.sci.life.reg.foodweb/energy-flow-in-the-coral-reef-ecosystem/ (Energy Flow)
- https://mass.pbslearningmedia.org/resource/46dbe69e-32c5-4488-841c-df40aa312bb3/coral-what-does-it-eat/ (What Corals Eat)
- https://mass.pbslearningmedia.org/resource/coral-reef-symbiosis/exploring-ecosystems/ (symbiosis)
- https://oceantoday.noaa.gov/coralforestsofthedeep/welcome.html (deep water coral)

How They Reproduce

Both corals can reproduce both sexually and asexually. Coral reproductive methods vary according to the species. Some species, such as brain and star corals, are **hermaphrodites,** meaning they produce both sperm and eggs at the same time. Trillions of eggs and sperm are simultaneously released into the surrounding water. When this happens, the eggs and sperm fertilize in the water. This process is called coral **spawning.** In some areas, mass coral spawning events occur on one particular night per year and scientists can predict exactly when this will happen.

Other corals, such as elkhorn and boulder corals, are **gonochoric**, meaning that they produce single-sex colonies. In the gonochoric species, all of the polyps in one colony produce only sperm, and all of the polyps in another colony produce only eggs. They reproduce by **brooding,** when only sperm are released, and these are captured by female polyps with eggs. Once the egg is fertilized, a larva is produced and eventually settles to the bottom. Once in the sea, larvae are naturally attracted to the light. They swim to the surface of the ocean, where they remain for days or even weeks. If predators do not eat the larvae during this time, they fall back to the ocean floor and attach themselves to a hard surface. It morphs into a coral polyp and Asexual reproduction occurs through splitting, in which a polyp splits into two, or **budding** when a new polyp grows out of the side of an existing polyp. Either way, the polyps make exact genetic copies of themselves. As more and more polyps are added, a coral colony develops. Eventually the coral colony becomes mature, begins to reproduce, and the cycle of life continues. To learn more, click the link below:

- https://mass.pbslearningmedia.org/resource/25bf4738-d657-492a-b4f7-777725701b47/coral-spawning-life-on-the-reef/ (Spawning)
- https://mass.pbslearningmedia.org/resource/dio14.stem.coral/how-coral-grows/ (how corals grow and reproduce)
- https://mass.pbslearningmedia.org/resource/c0b990c3-2d46-49fa-ae00-095b959a106c/corals-the-birds-and-the-bees/ (Coral Reproduction)

Guiding Question "What types of coral exist?"

Graphic Organizer

Work quietly within your group. Fill in each column with at least 10 facts.

Hard Corals	Soft Corals

Guiding Question "What types of coral exist?"

Graphic Organizer

Work quietly within your group. Fill in this sheet with at least 10 facts that hard and soft corals have in common.

<u>Both</u> Hard and Soft Corals

Types of Coral Relay Game

Your group must use your Types of Coral Graphic Organizers to create a Class Relay Game! You will be given 10 index cards. On each index card, write one detailed fact. Pick facts from both pages of the graphic organizer. Be sure to write neatly and clearly. Please proof-read your Fact Cards for errors.

Preparation

1. The teacher will collect and review the group Fact Cards, then make a copy of each one. Now there will be two piles of the same Fact Cards.
2. Glue RED paper on or color the back of one set of cards, and do the same with the other set of cards using BLUE paper (or color).
3. Mark two starting lines in tape at the back of the classroom.
4. At the front of the classroom, place three chairs against the wall, each taped with one of these headings:

Hard Coral

Soft Coral

Both Types of Coral

Explain Rules to the Class

1. Each correct Fact Card is worth one point.
2. BUT, the teacher can take points away from a team for too much noise, starting ahead of the taped line, or for not crossing the tape line when you return to tap the next person.
3. The team with the most points wins the relay!

Types of Coral Relay Game *(continued)*

To Play

1. Divide the class into two teams and each team must line up in single file behind the starting tape.
2. Place one pile of Fact Cards on the floor to the left of each team (Red and Blue teams)
3. When the teacher says “GO”, the first person in line must pick up the first Fact Card and read the fact outloud to his/her team.
4. Then, he/she must decide which chair the fact belongs on. (If he/she needs help, the student can quietly ask the team members for help.)
5. The student runs to the front of the room and places the card on the appropriate chair.
6. The student runs back to their team,crosses the tape line and tags the next person. The runner goes to the back of the line.
7. The next student must take the next Fact Card from the pile and read the fact aloud...and the game goes on!
8. When all the Fact Cards are gone, the team must sit quietly on the floor.
9. Once both teams have finished and are sitting on the floor, the teacher sends everyone back to their seats.
10. The teacher reads each Fact Card aloud to the class and together they determine if it was placed correctly. The teacher tallies up the points for each team and a winner is announced.

Vocabulary Terms

This is a group activity. Divide the number of vocabulary terms within the group. Each person must look up the words he/she was given. Be sure to write clear and detailed definitions. When everyone is done, share the definitions until everyone has copied the definitions for all the vocabulary terms.

1. Ahermatypes

2. Brooding

3. Budding

4. Carnivore

5. Coral bleaching

6. Gonochoric

7. Hermatypes

8. Nematocysts

9. Ocean acidification

10. Photosynthesis

11. Primary producer

12. Sclerites

13. Spawning

14. Symbiotic relationship

15. Zooxanthellae

Guiding Question

"What types of coral exist?"

Activity:

Identifying Coral Types

Study the drawing below and mark the hard corals with an "H" and the soft corals with an "S."