

LESSON 1 Living Spaces of the Coral Habitat

Lesson at a Glance

In this lesson, students will compare a coral reef to a rainforest in order to introduce the different living spaces available in the coral reef habitat. The teacher then uses images given in a PowerPoint to engage students in observing different body shapes, and appendages of reef organisms that enable them to survive in these various reef spaces. To further investigate structures and adaptations of reef organisms the students break into groups and play a short card game where they sort the organisms into particular groupings specified by the teacher. The lesson wraps up with the students interpreting a chart and graph, comparing the features of various reef organisms.

Lesson Duration

Two 45-minute periods

Essential Question(s)

What are the unique features of organisms that enable them to survive in the different living spaces of the coral reef habitat?

Related HCPSIII Benchmark(s):

Science SC.5.3.1
Describe the cycle of energy among producers, consumers, and decomposers

Key Concepts

- The complex structure of a coral reef creates living spaces that support a large diversity of organisms.
- Reef organisms have unique body shapes and appendages that enable them to find food and shelter in the living spaces of the coral reef.
- Mobile and sessile organisms have different body features that enable them to survive.
- Energy flows through a coral reef food chain from producer, to consumer, to decomposer.

Instructional Objectives

- I can classify reef organisms as mobile or sessile.
- I can identify, and describe three different living spaces available in the coral reef habitat.
- I can describe the body features of reef organisms that help them find food and shelter in the coral reef habitat, and enable them to survive.
- I can describe the roles and flow of energy among coral reef organisms within the reef ecosystems food chain.
- I can read, and understand information in a chart and graph.



Assessment Tools

Benchmark Rubric:

Topic		Cycles of Matter and Energy	
Benchmark SC.5.3.1		Describe the cycle of energy among producers, consumers, and decomposers	
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Explain and give detailed examples of the cycle of energy among producers, consumers, and decomposers	Describe the cycle of energy among producers, consumers, and decomposers	Describe a part of the energy cycle with an example (e.g., describe one or two parts of a food chain)	Recognize an example of part of an energy cycle

Assessment/Evidence Pieces

<p>Lesson</p> <ul style="list-style-type: none"> • Student Worksheet <i>Coral Reef Organisms</i> • Food Chains created by small groups
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Materials Needed

Teacher	Class	Group	Student
<ul style="list-style-type: none"> • Method to project PowerPoint 	<ul style="list-style-type: none"> • None 	<ul style="list-style-type: none"> • None 	<ul style="list-style-type: none"> • Student Worksheet <i>Coral Reef Organisms</i> • 4-5 sets of Coral Reef Organism Cards

Instructional Resources

PowerPoint: *Adaptations for Living Spaces of the Reef*
 Teacher Reading: *Rainforests of the Sea*
 Student Worksheet: *Coral Reef Organisms*
 Teacher Answer Key: *Coral Reef Organisms*
 Student Worksheet: *Coral Reef Organism Cards*



Student Vocabulary Words

appendage: a part or organ, such as an arm, leg, tail, or fin, that is joined to the trunk of a body.

filter feeder: an organism that filters food particles from its surrounding water environment by using specialized appendages (i.e., gills or baleen of a whale).

food chain: a series of organisms linked by the order in which they eat and are eaten by one another.

invertebrate: an animal without a backbone.

mobile: able to physically move from one location to another.

sessile: permanently attached or fixed; not free-moving.

tube feet: tentacle-like tubular appendages on the body surface of most echinoderms

(sea stars, sea cucumbers, sea urchins) having a sucker at the end and used for locomotion and respiration.

vertebrate: an animal with a backbone.

Lesson Plan

Lesson Preparation

- Review the Science Background provided in the Unit’s Overview and the Teacher Reading *Rainforests of the Sea*.
- Preview the PowerPoint *Adaptations for Living Spaces of the Reef* and make arrangements to project it.
- Make copies of the Student Worksheets *Coral Reef Organisms*, one per student.
- Make copies of the Student Worksheet *Coral Reef Organism Cards*, only need one copy per group of four students.
- Create a space in the classroom as a Word Wall. This could be a large piece of paper taped to the wall, or a section of the board. You will use the Word Wall to write vocabulary words that are important. Add to the Word Wall as you go through each lesson.

I. Structure/Behavior Adaptations for Living Spaces on the Reef

- A. Show the PowerPoint *Adaptations for Living Spaces of the Reef*. (NOTE: Different presentation slides will be used throughout the lesson, so keep the presentation readily available.)
- B. Show the first slide, comparing a coral reef to a forest, and discuss the living spaces available for organisms. Make sure the students understand that there are living spaces above, on, and in the coral reef habitat. Ask the students to list the different types of organisms that can be found in the living spaces of a forest, and describe how each organism moves to find food and shelter.
- C. Show the images in the presentation of different types of coral reef organisms. Go to slides 10-14 and then ask the students to classify each organism as ‘mobile’ or ‘sessile,’ and discuss the features (body shape and/or appendage) of each type of organism. Make sure the students understand that different types of organisms use the living spaces of the coral reef habitat, and have different ways to find food and shelter.
- D. To further enforce structure/behaviors and adaptations the class will play a short card game. Divide the students into groups. Provide each group with a set of *Coral Reef Organism Cards*.
 - 1) Have the students look at their reef organism cards and ask them to divide them into a “mobile” grouping and “sessile” grouping. Ask student groups to explain why they placed the cards in the groups like they did. Explain their rationale. Discuss what features made the students’ group an organism as “mobile” or “sessile.”
 - 2) Next, have the students set aside the coral cards or “sessile” grouped cards and group the rest of the cards into “vertebrates” and “invertebrates.” Ask student groups to explain why they placed the cards in the groups like they did. Explain their rationale. Discuss the terms vertebrate and invertebrate to make sure students understand the concept.
 - 3) For the last time the students’ sort the cards have them do “fish” and “not fish or other.” Explain why they grouped the organisms as they did. Ask the students to identify the adaptations that help these organisms survive. (i.e., the colors of certain fish tell the predator that they taste bad.)
- E. Distribute the *Coral Reef Organisms* Student Worksheet to each student. Allow the students to complete the worksheet individually, then discuss as a group to ascertain student understanding.

II. Coral Reef Organisms and the Food Chain

- A. Review with the class the definition of a food chain. Discuss what types of organisms make up a food chain (i.e., producers, consumers, and decomposers).
- B. Break the class into small groups again. Have the students get back out the set of *Coral Reef Organism Cards* used in the last activity. Make sure each group has a set. Have the group look through the cards and sort the organisms into groups according to their role within the reef ecosystem (i.e., producer, consumer, or decomposer). Remind the students about how different structures and adaptations of an organism can help it to survive in this ecosystem. Explain that this may help them in determining the role of the organism within this ecosystem.
- C. After each group has had a chance to sort their cards have a few of the groups share with the rest of the class the reasoning behind the method of how the group sorted their cards. (i.e., producer, consumer, or decomposer). Discuss what body structures or adaptations help that organism to survive in its role within the reef ecosystem. Discuss which organisms are predators and which are prey. The teacher may want to make a list on the board of which organisms are predators and which are prey. (Students may need to use this for the next step.)
- D. Now have each group take their *Coral Reef Organism Cards* and create a food chain. Give a prize for the longest food chain. Take the longest food chain and explain to the students about the cycling of matter through that food chain.

Extended Activities

Have students create illustrations, or models of their reef organisms, using construction paper, and various craft materials. Attach the organisms to the coral reef habitat wall mural (drawn on butcher paper) in the appropriate living spaces. (Use the NOAA cross section of a typical fringing reef provided in the teacher information pages as the basic line for the background.)

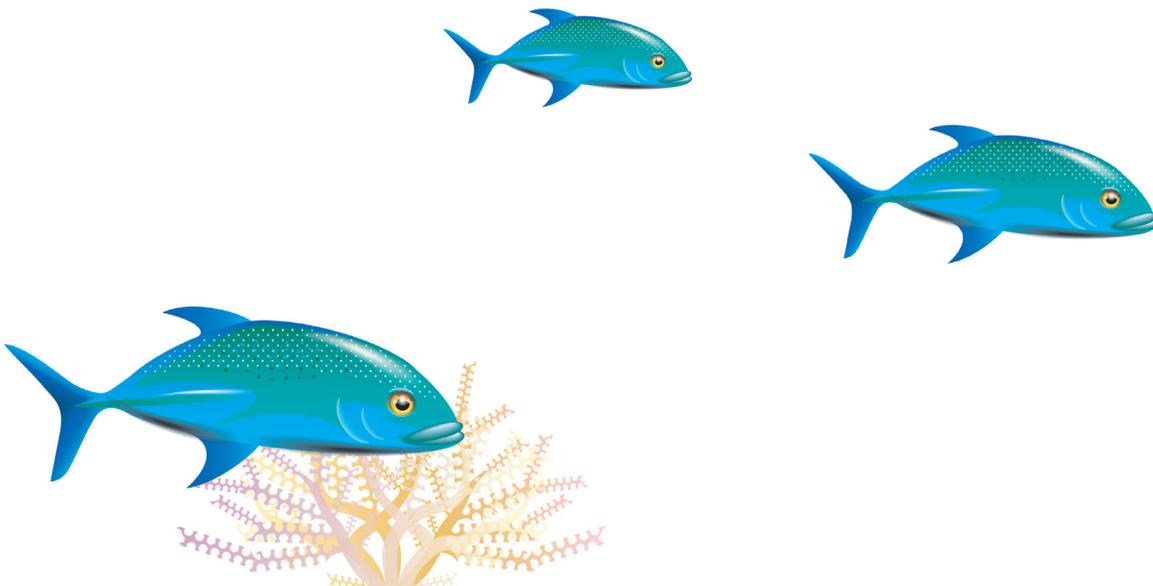


LESSON 1 - Teacher Reading

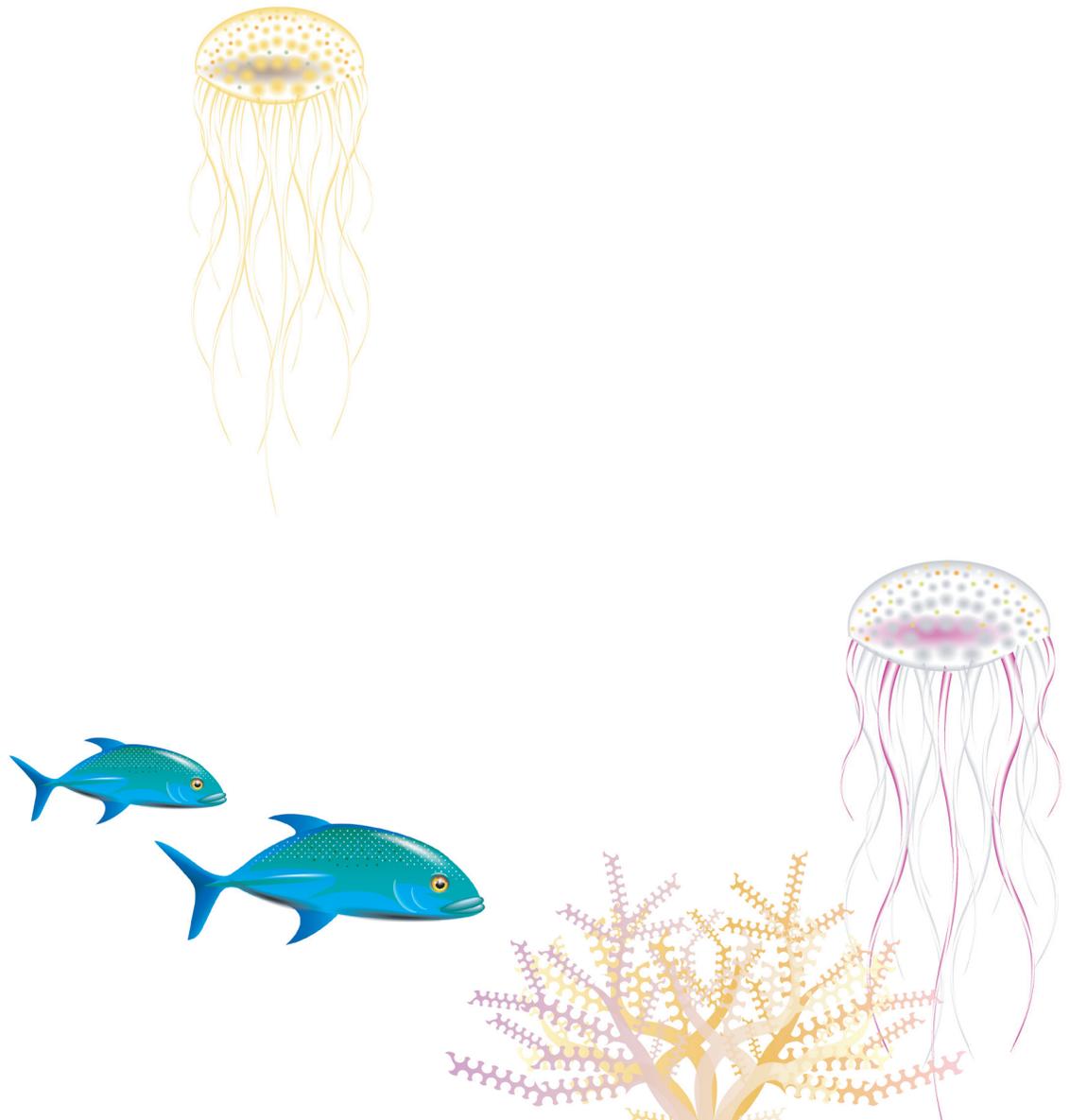
Rainforests of the Sea

Coral reefs are sometimes referred to as “Rainforests of the Sea.” The complex structure of a coral reef is similar to that of a rainforest; they both provide extensive habitat for a diversity of organisms. Coral reefs, and forests, provide many different living spaces for plants and animals to find food and shelter. A typical rainforest contains several different species of trees; each tree provides different living spaces. Many different organisms are adapted to find food and shelter above the forest canopy, on tree branches, in tree bark, and under the ground among tree roots. Similarly, coral reefs are composed of several different species of coral, providing different living spaces for plants and animals. Coral reef organisms have special adaptations for living above, on, and in the complex structure of the reef. The diversity of organisms supported by coral reefs exhibits many different shapes, sizes, and lifestyles. *Mobile* organisms are those that are able to move to different locations on the reef. *Sessile* organisms are permanently attached to the reef substrate, and cannot move to a different location on the reef. *Mobile* and *sessile* reef organisms have different body features that enable them to survive in the different living spaces of the coral reef habitat.

Vertebrates, such as fish and sea turtles, inhabit the living space above the reef. Green sea turtles (*honu*) graze on algae growing on the surface of the reef. Fast-swimming predators, such as sharks, barracuda, and other open water fish frequently use the reef for feeding grounds. These types of fish have streamlined (torpedo-shaped) bodies and forked tail fins, which help them swim through the water at top speeds to capture prey, or evade danger. Most reef fish are laterally compressed (flat from side to side), which helps them to maneuver above the reef, and between the corals to find food and protection. These types of fish have fins designed to hover near the reef. Some slow-swimming reef fish (e.g., *puffer* fish) have a round body shape that makes them difficult to swallow by a predator, and small fins used to dart around the reef. Fish that live on the surface of the reef, or on the seafloor near the reef, have bodies that are flat on the bottom, and fins adapted for resting, or perching on the coral or seafloor. Moray eels live in narrow spaces in the coral reef. Moray eels have an elongated body shape, and no paired (pectoral and pelvic) fins to get in the way, as they move within crevices in the reef.



Mobile invertebrates swim, walk, crawl, creep, and slither around, using a variety of unique body shapes and appendages. These invertebrates roam around on the reef looking for food, and have body shapes adapted for hiding in small cracks and crevices. *Arthropods*, such as crabs, lobsters, and shrimp, use legs to walk, crawl, and swim on the surface of the coral, or within the reef. *Echinoderms* (sea stars, sea cucumbers, and sea urchins) have many tube feet used to creep along the coral reef. Brittle stars are echinoderms that use many wiry arms to move among the cracks and crevices in the reef. The octopus, a mollusk, is another invertebrate that can use arms to maneuver around the reef. Brittle stars, and octopuses are just two of the myriad of organisms that hide in crevices and caves of the reef for part of the day, and emerge (usually at night) to roam around in search of food. Some mollusks, such as limpets, cowries, and nudibranchs, use a large muscular foot to move around on the reef. Other mollusks (oysters, and mussels) are sessile and unable to move around to look for food or escape danger. These animals feed on plankton by filtering water through their gills, and can tightly close their shells for protection. A majority of *sessile* reef invertebrates are filter feeders. Sponges filter tiny plankton from the water using specialized cells. Other filter feeders, such as corals, barnacles, and tubeworms, use tentacles to capture plankton. Tubeworms bore into the reef, expose their colorful tentacles when feeding, and retract the tentacles for protection.



LESSON 1

Name: _____ Date: _____

Coral Reef Organisms

PART ONE:

Directions: Read the chart, and answer the questions below.

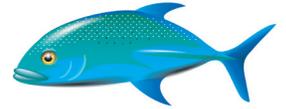


CHART:

	FINS	LEGS	TUBE FEET	TENTACLES	ARMS	FOOT MUSCLE
CRAB		X				
HAWKFISH	X					
OCTOPUS					X	
SEA STAR			X		X	
SEAHORSE	X					
SHARK	X					
OPIHI						X
TUBEWORM				X		
URCHIN			X			
LOBSTER		X				
CORAL				X		
BRITTLESTAR					X	

- What would be the best title for this chart?
 - Coral Reef Animals
 - Features of Coral Reef Animals
 - Who's Who on the Coral Reef
- Which two animals have tube feet to help in movement, feeding or protection?
 - Brittle star and octopus
 - Crab and lobster
 - Sea star and opihi
 - Urchin and sea star
- Which feature is especially useful when sticking on to rocks in areas of strong wave action?
 - Arms
 - Fins
 - Foot muscle
 - Legs
- Which animal uses more than one structure to assist it in moving and obtaining food?
 - Hawkfish
 - Lobster
 - Octopus
 - Sea star

PART TWO:

Directions: Read the following graph, and answer the questions below.

GRAPH:

30						
25						
20						
15						
10						
5						
	FISH	TURTLE	CRAB	SPONGE	OYSTER	WORM
	Above the reef		On the reef		In the reef	

- What would be the best title for this chart?
 - Types of Animals Found in the Coral Reef
 - Read the Graph
 - Animals Seen in the Living Spaces of the Coral Reef
 - Coral Reef Critters
- How many crabs were seen on the coral reef?
 - 30
 - 25
 - 15
 - 10
- Which animals were seen the least?
 - fish
 - sponges
 - turtles
 - worms
- What is the total number of animals that were seen on the reef?
 - 45
 - 40
 - 25
 - 15



PART THREE:

Direction: Name an organism that lives on the reef and has a body part or body shape that is used to capture food or escape danger.

1. _____ has tentacles to capture food.
2. _____ uses its arms for capturing food and traveling.
3. _____ has a body that helps them easily move within cracks and crevices in the reef.
4. _____ has legs to walk, swim, and crawl on the surface of the coral, or within the reef.
5. _____ has tube feet that are used to creep along the coral reef.
6. _____ has a muscular foot to move around on the reef.
7. _____ has a hard shell that can tightly close for protection.

PART FOUR:

Direction: Complete the short answer question.

Name the three different living spaces available in the coral reef habitat and the body features or structures of the organisms that live in those spaces.



LESSON 1 - Teacher Answer Key

Coral Reef Organisms



Reading a chart (Part 1):

1. b
2. d
3. c
4. d

Reading a graph (Part 2):

1. c
2. b
3. c
4. b

Identifying organisms by their body parts or shape (Part 3)

1. tubeworm, coral
2. octopus, sea star, brittle star
3. crab, moral eel, octopus
4. crab, lobster, shrimp
5. sea star, sea cucumber, sea urchin, brittle star
6. opihi, cowrie, nudibranch
7. oyster, clam, mussel

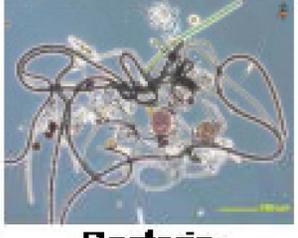
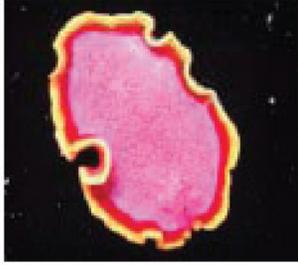
Short Answer Question (Part 4)

The three different living spaces available in a coral reef ecosystem are above the reef, on the reef and in the reef. Answers may vary for the rest of the question (See the PowerPoint).



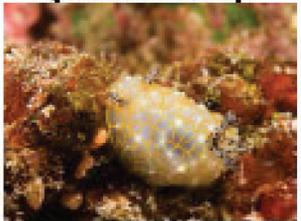
Lesson 1

Coral Reef Organism Cards

			
Shrimp	Snowflake Eel	Bacteria	Coral
			
Puffer Fish	Parrotfish	Flat Worm	Hawaiian Cleaner Wrasse
			
Pencil Urchin	Millet Seed	Hermit Crab	Tubeworms
			
Green Sea Turtle	Humuhumunukunukuapua'a	Giant Octopus	Clown Fish

Lesson 1

Coral Reef Organism Cards

<p>Goatfish</p> 	<p>Sea Cucumber</p> 	<p>Nudibranch (Golden Lace)</p> 	<p>Trumpet Snail</p> 
<p>Starfish</p> 	<p>Pink Sponge</p> 	<p>Rice Coral</p> 	<p>Lobe Coral</p> 