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**PITTSBURGH ZOO  
& PPG AQUARIUM**

**Coral Critters**

**Grades 1 - 3  
Teacher Packet**

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# Coral Critters

## Academic Standards for Environment and Ecology

### 4.2. RENEWABLE AND NONRENEWABLE RESOURCES

- 4. 2. 4 B Identify products derived from natural resources.
- 4. 2. 4 C Know that some natural resources have limited life spans.

### 4.3. ENVIRONMENTAL HEALTH

- 4. 3. 4 B Identify how human actions affect environmental resources.
- 4. 3. 4 C Understand that the elements of natural systems are interdependent.

### 4.4. AGRICULTURE AND SOCIETY

- 4. 4. 4 B Know that food and fiber originate from plants and animals.

### 4.6. ECOSYSTEMS AND THEIR INTERACTIONS

- 4. 6. 4 A Understand that living things are dependent on nonliving things in the environment for survival.

### 4.7. THREATENED, ENDANGERED, AND EXTINCT SPECIES

- 4. 7. 4 A Identify differences in living things that relate to their survival.
- 4. 7. 4 B Know that adaptations are important for survival.

### 4.8. HUMANS AND THE ENVIRONMENT

- 4. 8. 4 C Explain how human activities may change the environment.
- 4. 8. 4 D Know the importance of natural resources in daily life.

## Academic Standards for Science and Technology

### 3.1. BIOLOGICAL SCIENCES

- 3. 1. 4 A Know the similarities and differences of living things (life processes, external characteristics, basic needs).

### 3.4. EARTH SCIENCES

- 3. 4. 4 E Know that oceanography is the scientific study of oceans.
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## Background Information

Coral reefs first formed more than 500 million years ago in warm tropical climates. Covering less than 0.2% of the ocean floor, it is estimated that coral reefs now contain approximately 25% of the ocean's species. Approximately 5,000 species of reef fish and more than 2,500 species of coral have been identified. About 4,000 species of mollusks alone live on the Great Barrier Reef in Australia. The vast diversity of life has given coral reefs the name "rainforests of the sea".

### THE BODY OF CORAL

The body of a coral animal is called the polyp. A polyp is a hollow, sac-like structure that is often smaller than a pencil eraser. At its free end, there is an opening surrounded by tentacles. This opening is both the animal's mouth and anus. The tentacles contain harpoon-like stingers called nematocysts, which are used to paralyze passing prey so the polyp can gather food. Inside its body is a stomach. Even though the polyp has a mouth and stomach, it does not have a head or teeth for chewing. In fact, corals can derive 80 to 90% of the nutrients they need from algae that live within their tissues. Called zooxanthellae, these algae photosynthesize energy from sunlight and provide corals with their great variety of colors.

### TYPES OF CORAL

#### HARD CORAL

Reef-building corals, which secrete a hard limestone skeleton, are commonly known as hard (stony) corals. They usually have tentacles in multiples of six and can be found either living individually or in colonies. Hard coral colonies exhibit three basic growth forms: branching, massive and plate. Common types of hard coral are brain coral, mushroom coral, pillar coral, stag horn coral, and plate (or table) coral.

#### SOFT CORAL

Some types of corals secrete a flexible or soft skeleton. These are called octocorals and typically have eight tentacles. Octocorals include the soft corals, sea fan, black coral, whip coral and blue coral. Octocorals live in colonies on the reef but do not build reefs. They have branching, ribbon-like shapes and their soft internal skeletons allow them to bend, wave, and sway in the water.

### LOCATIONS OF CORAL REEFS

Coral need plenty of sunlight to grow, so optimum growth occurs in clean water at depths of less than 30 meters. Coral reefs thrive in shallow, clear, sunlit saltwater with a temperature between 79°F and 81°F. Most coral will die if this temperature range is not maintained for a prolonged period of time. Because of light and temperature requirements, most coral reef growth occurs in equatorial areas of the world's oceans.

## TYPES OF REEFS

There are three major types of coral reefs: fringing reefs, barrier reefs and atolls. Fringing reefs are found in tropical areas and grow directly from the shoreline of continents and islands. Barrier reefs are found further out. They are separated from shore by a lagoon or a stretch of protected water. The Great Barrier Reef is the largest structure built by living organisms on Earth and is the only such living structure visible from outer space. Located along the northeast coast of Australia, it measures 1,240 miles long. Atolls are offshore, ring-like coral formations that surround a shallow, central lagoon.

## THE CORAL REEF ECOSYSTEM

Coral reefs provide the basis for the most productive shallow water ecosystems in the world. An ecosystem is a group of living things, such as coral, algae and fish, along with their environment, including elements such as rocks, water, sunlight and sand. Each influences the other, and both are necessary for the maintenance of life.

## BENEFITS AND THREATS

Coral reefs enrich the life of our oceans. They provide food and shelter to countless species of plants and animals. People also benefit directly from the reefs. Coral reefs protect the shorelines from erosion and keep the coastline intact by breaking waves. They also supply fish upon which many national economies depend. Recently, scientists have found treatments for cancer, AIDS, arthritis, asthma and even broken bones buried deep within the coral reef ecosystem.

Coral reefs are highly sensitive to environmental conditions. Natural changes do affect the reefs, but threats caused by human activity do much more damage. The Greenhouse Effect (global warming), harmful fishing practices, damage from boats and divers, coral mining for the pet trade and pollution all disturb the delicate balance of ecological conditions that coral reefs need to maintain life.

## WAYS THAT KIDS CAN HELP

Children should understand that there are many ways that they can help keep planet Earth clean, healthy and full of plants and animals. Education is the first step in preserving this natural wonder. Learn all you can about coral reefs, marine life and the threats they are facing, then educate others. Conserving energy whenever possible reduces global warming and the greenhouse effect. Simple things like turning lights out and furnaces down, taking public transportation, walking or riding bikes, recycling glass and plastic can make a big difference. Not littering is important. Planting a tree with mom and dad can add oxygen to the air we breathe and provides homes for many creatures.



## Vocabulary

**algae** - primitive aquatic plants ranging from microscopic single-celled organisms to large multicelled plants such as seaweed.

**anemone** - a marine invertebrate related to corals and jellyfish.

**camouflage** - an animal's ability to hide or blend with its surrounding using color, pattern or shape.

**carnivore** - an animal that eats other animals.

**colony** - a connected, interrelated group of coral polyps.

**conservation** - the wise use of natural resources in order to insure continued availability to future generations.

**coral** - colonial marine animals characterized by tentacles, stinging cells and a hollow gut.

**coral reef** - a large limestone structure built by successive generations of coral.

**ecosystem** - an ecological community together with its environment, functioning as a unit.

**equator** - an imaginary line of latitude that encircles the center of the Earth, dividing the Earth into Northern and Southern hemispheres. It represents zero degrees latitude.

**food chain** - the transfer of energy through an ecosystem from its source, the sun, through a series of plants and animals.

**habitat** - the place an animal lives.

**hard corals** - reef-building corals that secrete limestone skeleton cups and typically have tentacles in multiples of six.

**herbivore** - an animal that eats only plants.

**invertebrate** - an animal without a backbone.

**omnivore** - an animal that eats both plants and animals.

**polyp** - the tiny cylindrical body of a coral animal which has a mouth opening surrounding by tentacles.

**predator** - an animal that kills and eats other animals.

**prey** - an animal that is hunted or killed for food.

**soft coral** - coral polyps that don't leave behind skeleton cups; also called octocorals.

**skeleton** - structure that supports the frame of an animal.

**symbiosis** - mutually beneficial relationship between two different species.

**tentacles** - flexible, unsegmented feelers used for feeding, touching, and smelling.

**vertebrate** - an animal with a backbone.



## Suggested Reading List

**Big Al** by Andrew Clements (Scholastic, 1988).

**Coral Reef Hideaway. The Story of a Clown Anemonefish** by Don Boyle  
(Sound Prints, 1995).

**Curious Clownfish** by Eric Maddern (Little Brown and Co., 1990).

**A House for Hermit Crab** by Eric Carle (Simon and Schuster, 1987).

**How to Hide an Octopus and Other Sea Creatures** by Ruth Heller (Grossett and Dunlap).

**The Magic School Bus on the Ocean Floor** by Joanna Cole (Scholastic, 1992).

**Our Ocean Home** by Robert Lyn Nelson (NorthWord Press Inc., 1997).

**The Rainbow Fish** by Marcus Pfister (North-South Books, 1992).

**Swim for Cover** by Sue Vyner (Crown Publishers, 1995).

## Teacher Resources

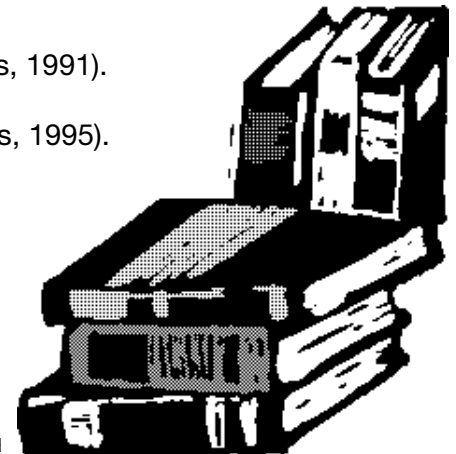
**Coral Reef** by Barbara Taylor (Dorling Kingdersley, Inc., 1992).

**The Ocean Book** by The Center for Marine Conservation (John Wiley & Son, In., 1989).

**Ranger Rick's Nature Scope: Diving into the Oceans**, Vol.4 No. 2 Ed. By Judy Braus  
(National Wildlife Federation, 1992).

**A Reef Comes to Life** by N. Segaloff and P. Erickson (Franklin Wiatts, 1991).

**Sharks: The Perfect Predators** by Howard Hall (Silver Berdett Press, 1995).



## What Are Corals?

Pre-Visit Lesson  
Time: 30 minutes

### **OBJECTIVES:**

3. 1. 4 A Know the similarities and differences of living things (life processes, external characteristics, basic needs).  
TSW identify coral as an animal.  
TSW label seven parts of a coral polyp.

### **MATERIALS:**

Poster or photo of a coral reef, “The Coral Polyp” student page, crayons

### **PROCEDURES:**

#### **ANTICIPATORY SET:**

Introduce coral reefs to the class with a photo or poster. Ask the students what they see. “Do you see any coral?” “Is coral a rock, plant or animal?”

#### **DEVELOPMENT OF LESSON:**

1. Explain that coral is made up of tiny animals called coral polyps. Tentacles surround its free end, the mouth. Coral polyps live in colonies with their outer skin connecting each polyp. Hard corals use the calcium in the sea for a limestone base. In time, this limestone base turns into a coral skeleton where new polyps will form. In this way, one coral polyp at a time, the coral reef is built.
2. Give each student a coral polyp student page. Ask the students to describe what the polyp looks like. Notice how the base of the polyp appears to be glued in place, but the tentacles look as though they can sway like arms.
3. Read aloud the paragraph that is at the top of the coloring sheet. After each sentence, help the students to label the polyp with the words that are underlined. Older students may do this independently.

Answers:      1. Stinging cells      2. Mouth      3. Stomach  
                  4. Tentacles            5. Stomach lining      6. Algae  
                  7. Skeleton cup

#### **SUMMARY:**

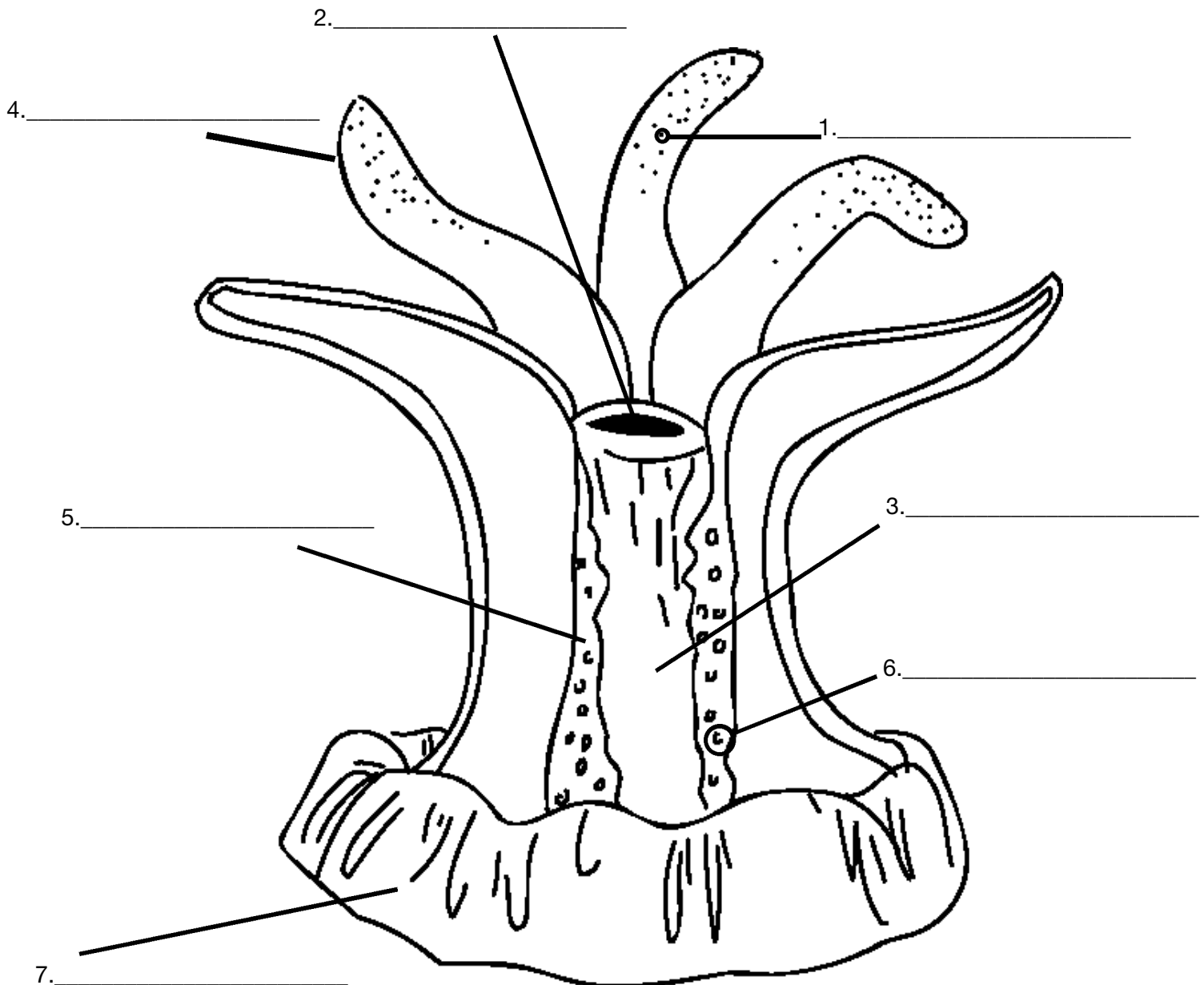
The students can color their polyp - remind them that corals come in many different colors. Notice that the outer skin of the polyp extends to the base to join other polyps.

### **EXTENSIONS:**

- Use Lego blocks to build a reef. Each block is like one coral polyp. See how big your reef can get!
- Do the “Salt Dough Reef” activity to create a coral reef in your classroom.
- Expand your vocabulary with the “Coral Critters Word Search”.

## The Coral Polyp

A coral polyp is an animal that looks like a little hand with moving **tentacles**. The tentacles have special **stinging cells** that paralyze its food as it moves by. The tentacles then move the food into the polyp's **mouth**, which is in the center of the tentacles. The food then moves into the polyp's **stomach** for digestion. **Algae**, small plants, grow in the **stomach lining**. This helps supply calcium so that the polyp can build the **skeleton cup** that protects its soft body. Use the underlined words to label the parts of the coral polyp below.



## Aquarium Scavenger Hunt

In-Zoo Activity  
Time: 45 minutes

### **OBJECTIVES:**

- 3. 1. 4 A Know the similarities and differences of living things (life processes, external characteristics, basic needs).
  - 4. 7. 4 A Identify differences in living things that relate to their survival.
- TSW be able to identify at least 3 aquatic animals.  
TSW be able to identify characteristics of aquatic animals.

### **MATERIALS:**

“Scavenger Hunt” sheet, Coral reef picture bank (younger students), pencils or markers, clipboards or hard writing surface, blow-up beachball globe

### **PROCEDURES:**

#### **ANTICIPATORY SET (1 OF 3):**

Before arriving at the zoo, toss the blow-up globe around your classroom for the students to catch. Ask the students to locate an ocean and a continent that touches it; or the equator; or one of the tropics (Tropics of Cancer or Capricorn). Continue until each student has a turn.

-or-

Before arriving at the zoo, your class may complete the enclosed map activity to prepare the students.

-or-

The zoo class, “Coral Critters,” may be taken prior to the scavenger hunt.

#### **DEVELOPMENT OF LESSON:**

1. After passing out the clipboards and pencils, have students pair up. Depending on the age and level of your students, this activity may be completed without partners. Chaperones may be included in this activity, if appropriate.
2. Starting at the entrance of the Aquarium, give a guided tour of the animals seen at each exhibit. The graphics will help with this, or use the background information included in this packet. Casually mention in your tour the features on the scavenger hunt the students are searching for. If your class is older or has completed the “Coral Critters” class, you can make the “hunt” more challenging by not giving “hints” during your tour.

#### **SUMMARY:**

Discuss the answers with the students at the end of the “hunt,” either in the zoo (at the Plaza for example), or back at your school.

## Aquarium Scavenger Hunt

### FIND AN ANIMAL THAT:

1. has stripes \_\_\_\_\_
2. can camouflage \_\_\_\_\_
3. has sharp teeth \_\_\_\_\_
4. has no eyes \_\_\_\_\_
5. is made up of polyps \_\_\_\_\_
6. is poisonous \_\_\_\_\_
7. has tentacles \_\_\_\_\_
8. has a false eyespot \_\_\_\_\_
9. has whiskers like a cat \_\_\_\_\_
10. creates reefs \_\_\_\_\_

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### Helpful Hints

Teachers: Please include this word bank if the scavenger hunt is too difficult for your students.

*Hint: The animal can be used more than once.*

Cave fish   Lionfish   Octopus   Catfish   Corals   Shark   Jellyfish   Butterfly fish   Pipefish  
Peacock bass

## Invent an Animal

Post-Visit Activity  
Time: 30 minutes

### **OBJECTIVES:**

- 4. 7. 4 B Know that adaptations are important for survival.
- TSW identify adaptations of coral reef animals.
- TSW discuss how these adaptations aid in the animal's survival.
- TSW use adaptations to create a new coral reef creature.

### **MATERIALS:**

Paper, crayons or markers, "Adaptations List"

### **PROCEDURES:**

#### **ANTICIPATORY SET:**

Review what the students have learned about coral reefs, including where they are found, how they form, products from them, etc. Have the students name some of the coral reef animals discussed in their class and what they saw at the Pittsburgh Zoo & PPG Aquarium. Brainstorm adaptations these animals have to survive. List them on the board. A possible list of adaptations and their purposes follows the lesson.

#### **DEVELOPMENT OF LESSON:**

1. Discuss how these adaptations aid in the animal's survival.
2. Explain that animals often have multiple adaptations to help them survive, and that no two are exactly alike.
3. Pass out paper and crayons. Ask the students to pick at least two adaptations from the list to create their own reef animal. Students may work individually or in small groups.
4. Have students name their creature and write a brief natural history: what it eats, where it lives, how it hunts, the adaptations it uses, etc.

#### **SUMMARY:**

Share creatures with the class. Display them in the classroom.

### **EXTENSIONS:**

- Carefully cut out the pictures. Use them to create a coral reef bulletin board or display in your classroom.
- Collect (clean) garbage: cereal boxes, paper tubes, pop cans, fabric scraps, etc. Make your invented animal out of recycled materials, using masking tape to hold them together. Use paper mache to make a smooth surface. You may wish to try using fabric scraps instead of newspaper - just use white glue in place of the flour. Paint the creatures and decorate with glitter, pipe cleaners, googly eyes, etc. Display them proudly!

## Adaptations List

**False eye spot** - distract predator

**Camouflage** - blend in to surroundings to avoid detection (predators and prey)

**Disruptive coloring** - breaks up the outline of the animal's body

**Warning colors** - alerts others to danger to avoid attack

**Stinging cells** - defense and hunting

**Tentacles** - allow to grasp prey

**Thin body** - allows to fit in tight places and turn quickly

**Cartilaginous skeleton** - lots of flexibility

**Streamlining** - allows rapid movement through water

**Flippers or fins** - aids in swimming

**Scales** - protect body

**Denticles** - allow sharks to move quickly through the water

**Multiple rows of teeth** - ensure rapid replacement of lost teeth

**Symbiotic relationships** - working together for mutual benefit

**Hard shell** - protection

**Spines** - protection

**Tube feet** - locomotion

**Lateral line** - detect vibrations of sound and movement

**Ampullae of lorenzii** - detect faint electrical current produced by living organisms

**Barbels/whiskers** - feel objects in mud or murky water (find food)

**Photoreceptor** - detect light and dark without vulnerability of an eye

**Claws** - defense and manipulate objects

**Long, pointed mouth** - nipping off tentacles or coral polyps

**Sharp teeth** - eating meat

**Hard plate** - crushing shells (for food)

**Mouth at bottom of head** - eating food on bottom of sea

**Mouth in the middle of head** - catching and consuming prey in surrounding water

**Mouth at the top of head** - bottom dwellers that catch food swimming above

**Fishing lure** - attract prey

**Bioluminescence** - hunting or attracting mates in very dark waters

**Flat body** - lie on bottom for better camouflage

**Small size** - hide in small places

**Large size** - discourage smaller predators, speed

