

## Lesson #4: Introduction to Coral Reefs

### Introduction/Rationale

Coral reefs are known as the "rainforests of the sea." They cover less than one percent of Earth's surface, but are home to one quarter of known marine fish species. Scientists estimate that there are one to eight million undiscovered species living in and around the reef.

Just like species in the rain forest, reef animals and plants contain medicinal compounds, many of which are just being discovered. Several important drugs have already been developed from chemicals found in coral reef organisms. AZT, a treatment for people with HIV infections, is based on chemicals extracted from a Caribbean reef sponge. Compounds from coral reefs have also yielded treatments for cardiovascular diseases, ulcers, leukemia, and skin cancer. In addition, coral's unique skeletal structure has been used to make the most advanced forms of bone grafting materials. More than half of all new cancer drug research focuses on marine organisms.

Coral reefs are in trouble around the globe. Already, 20% of the world's coral reefs have been lost and another 16% were severely damaged during the 1998 El Niño event. Scientists predict that another 25% may be lost by the year 2035 if human threats are not reduced.

The purpose of this lesson is to introduce students to coral reefs by identifying their locations, both in the water and around the globe.

### Lesson Concepts and Skills

- Warm water rises, cooler water sinks
- Reef building corals live in the top layer of the ocean because the water is warm, and it is where sunlight penetrates

### Materials

Access to a computer lab

"Why Is the Ocean Salty?" Norwegian Tale

Copies of "Corals' Comfort Zone" packets for each student

Prepare the following materials for each group of 4-6 students:

- 2 L (64 oz.) glass jar or glass bowl
- 2 L (8 c.) warm water

- 78 mL (1/3 c.) salt
- blue food coloring
- measuring cup
- spoon
- mixing bowl
- paper cup
- pencil or pen with point
- refrigerator or freezer

Political map of Earth, per pair of students, with clearly marked lines of latitude and longitude

Shoebox for each student

Teaching Strategies Employed

Read aloud

Cooperative learning

Discovery model

Time Frame

Two 45-minute class periods

Target Audience

Grade five

National Content Science Standards

As a result of activities in grades 5-8, all students should develop

- Abilities necessary to do scientific inquiry
- Understandings about scientific inquiry

As a result of activities in grades 5-8, all students should develop an understanding of populations and ecosystems.

Behavioral Objectives

Students will identify the relative depth of corals in the ocean by observing the behavior of cold and warm saltwater in an experiment.

Students will gain a global understanding of coral reef life by reading for information and creating a model of a reef.

### Engagement

Tell students that they are going to be learning about ocean life in today's lesson. Ask students to think of facts they know about ocean and seawater. Elicit that oceans and seas are saltwater environments. Read aloud the tale from Norway that explains the saltiness of seawater (or, if desired, distribute copies of the tale to students and have them take turns reading aloud).

### Exploration

Tell students that they are going to determine the layer of the ocean at which corals thrive by conducting an experiment. Distribute "Corals' Comfort Zone" packets to all students. Read and discuss as a class. Instruct students to complete the hypothesis section. Divide class into groups of four to six students, and distribute materials to each group. Circulate to assist students as they work. They should answer the questions at the end of the packet.

### Explanation

Distribute copies of the Time for Kids article "Can We Rescue the Reefs?" found at <http://www.timeforkids.com/TFK/magazines/story/0,6277,59687,00.html>. Read the article as a class, skipping the "Precious Underwater Habitats" and "Sucking the Life out of the Reefs" sections. (This content will be covered in a later lesson.) Discuss the content, reinforcing how valuable and fragile the reefs are.

Explain to students that corals thrive in saltwater environments where the temperature is between 20 and 32°C for a sustained period and the water is clear so that light can penetrate.

Visit the site <http://reefgis.reefbase.org/mapper.asp> and click "topography" on the side menu to show students the locations of coral reefs around the world. Point out that most corals live between 30° N and S latitude.

Discuss students' responses to questions at the end of "Corals' Comfort Zone."

### Extension

(This activity could be completed in class or as a long-term home assignment.) Create a shoebox reef by following the directions on the "Shoebox Coral Reef" handout.

### Evaluation

Review the fact that corals live in warm water in the top layer of the ocean. Tell students that they actually are quite fragile creatures. Ask students to brainstorm some risks to corals that might occur because of their location. (Destruction from careless boating, harmful fishing practices, i.e. cyanide fishing and blast fishing, pollution, climate change, tourism, etc.)

Revisit the global map of coral reefs at <http://reefgis.reefbase.org/mapper.asp>. Select on "Protected Areas" on the left hand menu, then click "Refresh Map."

### Assessment

Assign students to work with a partner. Distribute political maps of the Earth to each pair. Instruct the students that one partner must identify a location on the Earth by using the atlas or a classroom global map. The other partner must decide whether or not a coral reef could exist there, given a general knowledge of the conditions necessary. That partner must say, "It's possible," or "It's impossible," then explain why.

Next, have students refer back to the site <http://reefgis.reefbase.org/mapper.asp> and click the pushpin button on the right of the map. A window will pop up in which students must type the latitude and longitude of a given location. That location will be displayed, and the presence or absence of brown spots will identify it as a coral reef. *N.B. Instruct students that they should substitute "south" and "west" with a negative sign.*

### Bibliography

Castaldo, N.F. (2002). *Oceans: an activity guide for ages 6-9*. Chicago: Chicago Review Press, Incorporated.

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The Coral Reef Alliance. (2004). *Why should I care?* Retrieved July 12, 2004, from <http://www.coralreefalliance.org/aboutcoralreefs/care.html>.

West, K. (2002). *Hands on projects about oceans*. New York: The Rosen Publishing Group, Inc.

## Why Is the Ocean Salty?

### A Tale from Norway

Once upon a time there were two brothers, one rich and one poor. It came to pass that on Christmas Eve the poor brother came asking the rich one for something to eat. The rich brother was tired of hearing his brother ask for things, so before the poor brother had even reached the house, he called out to him, "If you will promise to do as I ask, I will give you one of the large hams that is hanging from the chimney."

The poor brother called back to him, "I promise."

With that the older brother threw down the ham and said, "Good. Now go away and never come begging back here again."

The poor brother took his ham and walked away. On his way he met a man with a long, white beard.

"Good evening," said the old man. "Where are you headed?"

The poor brother stopped and nodded at the old man. "I am going home to my wife."

"If you go just a bit farther you will come to an enchanter's castle. Go inside. You will be asked by the enchanter's trolls to sell your ham. Do not sell it, but instead trade it for an old coffee mill that rests beside the door you entered. Return to me with the coffee mill and I will tell you how to use it."

The poor brother thought it a bit strange but thanked the man and went on his way. After quite a while he finally reached the castle. He knocked on the huge door in front of him and instantly it opened. The trolls quickly surrounded him and asked for the ham, just as the old man had said. After much discussion, the trolls reluctantly agreed to trade the ham for the coffee mill.

The poor brother carried the coffee mill back to the place where he had met the old man. The old man had waited for his return and quickly showed the poor brother how to use the coffee mill. To set the mill in action he merely had to tell it what he wished for and turn the handle, but to make it stop he needed to turn it on its side. After thanking the kind old man, the poor brother turned toward his home. By the time he arrived, it was very late. His wife had waited for his return before beginning to prepare their holiday meal. When he arrived it was much too late to prepare anything. The poor brother placed the coffee mill on the table, wished for a splendid meal, and turned the handle of the mill. In an instant

the table was covered with a beautiful tablecloth, candles, and enough food for a king! The two sat down and enjoyed the feast.

During the week after Christmas, the man and his wife gave a grand party for all of their friends and family. They used the coffee mill to provide food and drink for the party. The rich brother came and saw his brother's new wealth.

"How is it, Brother, that you come to have this grand party and yet last week begged at my door?" asked the rich brother.

His brother was reluctant to tell his secret, but after a few days, he told him everything. Well, his brother decided that he must have the coffee mill and offered his brother a large sum of money for it. The previously poor brother agreed to sell it to him after the summer because he figured that he would use the coffee mill to get everything he needed before then and then sell it to his brother for a fine price.

The end of summer finally arrived, and the coffee mill was sold. The other brother was in such a rush to get it home that he did not wait for directions. That night he wished for a delicious soup. His wish was answered and answered and answered, for he had not learned how to stop the mill. The soup filled all the dishes and all the pots and nearly flooded the house. He ran to his brother and demanded that he take the mill back.

The previously poor brother said he would take it back, but he would charge his brother the same price he had sold it to him for. The brother agreed. The previously poor brother was now incredibly rich. He used his money to buy his wife a castle by the sea with gold turrets. Many people came to the castle to see who lived there. One visitor was a sea captain who saw the castle from his ship. When he arrived at the castle, he was greeted kindly and shown the now famous mill.

"If I had this mill I would no longer need to sail the seas to buy cargoes of salt," he said to his host.

"Indeed," said the previously poor brother. "I will sell the mill to you, if you so desire."

The sea captain paid a large sum for the mill and was so eager to get it to his ship (for he feared the man would change his mind) that he did not ask for directions on how to use the mill. Once the ship was far enough away from land, the captain took the mill out onto the deck.

"I wish for salt," he said to the mill. He turned the handle, and the mill began to give him salt. Since he did not know how to stop the mill, the salt

kept coming. It filled the deck and then the ship. Eventually the ship cracked under the weight of the salt and sank to the bottom of the sea. The mill fell into the sea, where it is still grinding salt. And that is why the sea is salty.



## Corals' Comfort Zone activity

**Problem:** Coral reefs are found in warmer water. (There are corals that grow in deep seas that are soft corals and not reefs.) By creating a model of ocean water, we will observe what happens when cold and warm saltwater are poured into the same container. Then, we can conclude in what layer of the ocean corals thrive.

**Hypothesis:** I predict that \_\_\_\_\_  
\_\_\_\_\_ because \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### Materials

2 L (64 oz.) glass jar or glass bowl  
2 L (8 c.) warm water  
75 mL (1/3 c.) salt  
Blue food coloring  
Measuring cup  
Spoon  
Mixing bowl  
Paper cup  
Pencil or pen with point  
Refrigerator or freezer

### Procedure

1. Pour 1.5 L (6 c.) of warm water into the large glass jar. Add the salt and stir until it is completely dissolved. Stick your finger in and take a taste. This is about the amount of salt in the ocean water.
2. Measure 250 mL (1 c.) of the saltwater and pour it into the mixing bowl. Add drops of blue food coloring until the water is dark blue. Put the bowl in the refrigerator or freezer until the water is cold.
3. Use the point of the pencil or pen to poke a hole into the bottom of the paper cup and rest the cup on the rim of the jar. The bottom of

the cup should be underwater. (If you're using a bowl, a partner will need to hold the cup over the water.)

4. When the blue water in the refrigerator is cold, pour it very slowly into the cup and observe.

Observations & Conclusions

1a. Was your hypothesis correct? Describe what happened to the cold blue water when it was poured into the warm water.

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b. Use crayons or colored pencils to draw what you observed. *Label the drawing.*

2. If corals grow in the warmer waters of the ocean, would a diver have to swim very deep to observe the animals? Explain.

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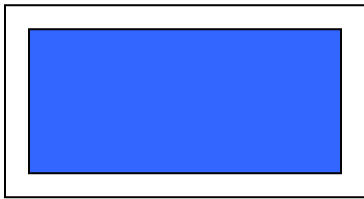
## Shoebox Coral Reef activity

### Materials

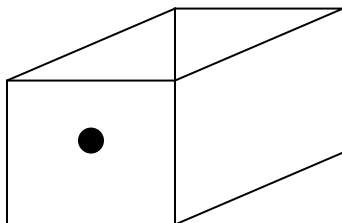
Shoebox with lid  
Scissors  
Blue tissue paper  
Blue construction paper  
Pencil  
White craft glue  
Card stock or oak tag  
Shells (optional)

### Procedure

1. Poke a hole in the shoebox lid with the scissors, about 1.27 cm ( $\frac{1}{2}$  inch) from the edge of the lid. Cut a window in the lid, leaving a 1.27 cm ( $\frac{1}{2}$  inch) border all around the edges.



2. Place the lid on the tissue paper and trace around the outside edge of it with a pencil. Cut out the completed rectangle and glue it to the underside of the lid to cover the window. Place the lid aside.
3. Using scissors, cut a small peephole in the center of a small end of the shoebox.



4. Place the lid gently on the box and take a peek inside through the peephole. The blue tissue paper will let just enough light in to make your reef appear to be under the blue ocean waves. Start picturing your reef inside the box. Glue some blue paper or tissue paper to the inside of the box to cover the cardboard.
5. Visit <http://www.coexploration.org/bbsr/coral/lessons/coralws.pdf> to print out copies of coral reef creatures. They will need to be colored and cut out. (Or, copy the illustrations from *One Small Square Coral Reef*, by Donald M. Silver.) Mount them on pieces of card stock or oak tag, checking to make sure that the box lid will fit with the coral pieces standing straight up.
6. Create a tab by folding down the bottom of the **coral** card stock so that it will be able to stand in your box after it is glued to the bottom.
7. Glue the first piece of **coral** toward the front of your box. Gradually work towards the back with the remainder of the creatures, checking through the peephole to make sure they are visibly positioned.
8. After the coral is positioned, color, cut out, and mount the reef creatures. Glue them to the back wall of the box, the side walls, or even the coral. If desired, add shells to the floor of the box to make it resemble the sea floor.
9. Place the lid on the box once you are finished. Take a peep through the peephole.

- Modified from *Oceans: an Activity Guide for Ages 6-9*, by Nancy F. Castaldo.