REEF BUDDIES

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GRADES 3-5

OVERVIEW

This lesson provides students a basic understanding of coral reefs and their inhabitants. Video segments have been selected to introduce students to several different species of invertebrates and vertebrates which typically live on productive coral reefs. Video, hands-on investigative and interactive activities were chosen to enhance the learning process as students discover what life is like for the animals on a coral reef. Students will discover how species of animals help each other survive on the reef habitat and how scientist participate actively in protecting and restoring damaged reef structures.

ITV SERIES

Wonders of the Sea: Coral Reefs
Reading Rainbow: Dive to the Coral Reefs #61

LEARNING OBJECTIVES

Students will be able to:
* list names of different coral reef formations and show the relationship between name of formations and the structures
* identify a reef animal's position in a marine food chain and relate that position to a land food chain
* list procedural steps in transplanting coral and give rationale for each step
* identify nocturnal animals which inhabit the coral reefs
* list fish which are considered predators on the coral reefs and relate these predators with land predators
* calculate, using metric measurement, the distance traveled by a marine reef animal given a specific path

VOCABULARY

invertebrates vertebrate
neutral buoyancy
plankton parasite
gender nocturnal
transplant

MATERIALS

(per class)
Several sheets of chart paper
Different colored markers
Variety of coral specimens

(per student)
Copies of cards: "PLANT", "ANIMAL", "ROCK"
Coral Life Cycle Viewers (22-25)
Activity #1
Activity #2
Activity #3

(per group of three students)
3 - clear plastic cups
1 cup of water for two cups
1 1/2 cup of white vinegar
3 - calcium supplement tablets
1 - container of salt

PREVIEWING ACTIVITIES

Pass out "Plant", "Animal", "Rock" cards to students. Show students each of the different types of corals such as brain coral, elk horn coral, fan coral, branching coral. After you show a particular piece of coral to the students, ask them to hold up their card to show whether they think what you are showing is a plant, animal, or rock. Allow time for students to decide what they think each type of coral really is. ¨ Each of the pieces you have held up are corals. Tell them that coral is an animal and what they have been seeing are the skeletons of many of those animals. Say, "Our bodies use calcium to keep our bones strong and growing. Coral animals or polyps make their skeletons by taking calcium out of the sea water and depositing it as calcium carbonate or limestone around the outside of the lower half of their bodies. So many coral animals live so closely to each other that their skeletons stick together to form large formations called reefs." Ask students to look at their "Coral Life Cycle Viewer". Make sure the viewers are all on the #1 slot. Ask students to turn viewer to see how each coral polyp is formed and how more polyps begin making a coral reef. Say, "First, the egg becomes a baby coral called a planula. Next, the planula sticks itself to a safe spot. It grows twelve tentacles to form a coral polyp. The polyp ð grows a hard white skeleton and makes other polyps like itself. When it is a year old, the polyp group is ready to release eggs. Finally, the coral eggs pop out and begins the cycle all over again."

FOCUS FOR VIEWING

If scuba diving equipment is available, bring goggles, snorkel, fins and breathing apparatus to wear for beginning of video. Inform students that they will be seeing firsthand what a coral is and be able to visit coral reefs to get a better understanding of coral reefs and the animals which inhabit the area around the reefs. Say, "This first video is hosted by marine biologists from the Texas State Aquarium in Corpus Christi. They took a trip down to Cozumel, Mexico which is an island off the Mexican coast in the Caribbean Sea. The water there is very clear and a terrific place for scuba diving." To give the students a specific responsibility for viewing say, "Watch the video and listen to the divers as they explain how they best observe the coral reef."

VIEWING ACTIVITIES

Begin tape where shore of beach is seen and boat ride begins off waters of Cozumel. Divers are suiting up.

Pause tape when divers take the plunge into the sea and diver says, "Let's go take a look." Ask, "What did the divers say was the procedure for viewing the coral reefs down in the water?" Allow students time to discuss currents, drift diving, and neutral buoyancy. Write the word "neutral buoyancy" on vocabulary chart and describe to students how to achieve "neutral buoyancy" by exhaling all of the air out of their lungs while in the water and adding air to their flotation vests until they are floating at one particular depth in the water. When the divers exhale they will slowly sink and when they inhale they will begin to rise again. By breathing naturally they will stay at one particular depth in the water and allow the current to carry them along the reef structure without touching any of the coral formations which could cause severe damage to the reef structure.

Say, "Now that the divers are in the water, they will begin looking for coral reef formations. Listen to the divers to see what the different reef formations are called and be prepared to list them." **Resume tape**.

Pause tape when divers are entering a cave. Diver says, "It looks like we're seeing a little bit of everything here." Ask students to look at their Activity Sheet #1. Say, "On Activity Sheet #1, the first question is: What are the different names for the formations? Let's list them on your activity sheet under the question and next to each formation tell why you think they are given these names." (List on chart paper the different types of coral formations named: As follows reef walls, patch reefs, caves made of coral.)

Say, "We now know that there are different kinds of reef formations. On these formations are several types of corals. On the next part of our dive in Cozumel, the divers will point out what types of corals these are. "Let's watch the video to see how many different kinds of corals you can name that live on the reefs of Mexico." **Resume tape**.

Pause tape when you see a side view of a scuba diver and narrator says, "It could kill it. " Say, "Who can name one or more of the corals named in the video?" (Brain or mound coral, star coral, branching coral and soft coral like gargoneous.) Ask,

"Did anyone hear the word "gargoneous" during the video and know what it means?" (It is a type of coral that looked like little trees.) Write the words on the vocabulary chart. Ask students, "What is an invertebrate?" (An animal without a backbone.) Write the words vertebrate and invertebrate on the vocabulary chart. Say, "The next part of the video discusses some invertebrates that live on the reef. Watch the next section of the video and discover what a grazer on a coral reef is and who the main grazer on the reef is." **Resume tape**.

Pause tape on bristle worm. Narrator says, "Ouch!"
Ask students, "What is algae?" (Algae is a plantlike organism that lives in water.) Ask students, "What does the word graze mean and give me an example of an animal that does this on land?" (To graze is to feed on plants such as grass or algae and that an animal such as a cow or horse grazes on land.) Ask, "Can anyone describe how the bristle worm gets its venom that is on the tips of the bristles along the sides of its body?" (It eats hydrozoan which are coral like animals that look like a plant. The hydrozoan has the venom in its cells and when the bristle worm eats the hydrozoan, it keeps the venom in the bristles.)

Hold up an example of a natural sponge for students to view. Ask, "Can anyone tell me what this is?" (A sponge.) Then ask, "Was this sponge ever a living plant or animal? " (Yes; some students may believe that is was a plant. Say, "A sponge is another animal that lives on the reef formations. The next part of the dive on the coral reefs will tell us a little more about sponges. Listen carefully and be ready to tell me how sponges feed in the water." **Resume tape.**

Pause tape on sea anemone audio cue is "...plankton and other nutrients are filtered out." Say, "So a sponge is a living animal. What I am holding here is what is left behind when the animal dies. Right now it feels hard and scratchy. What will happen to the sponge when it gets wet?" (It will feel softer and absorbs liquids.) Demonstrate by dipping sponge into a glass of water. Ask, "Who can describe how a sponge gets nutrients from the ocean water?" (A sponge filters water through their tissues and get all the nutrients they need to survive.)

Say, "Isn't it fascinating how these different animals have different ways of eating on the reef. The next part of the dive on the reef you will see a sea anemone. It too has an interesting way of obtaining food from the ocean water. Let's watch the anemone in action. Be prepared to describe how the sea anemone collects its dinner." **Resume tape**.

Pause tape on picture of diver holding an arrow crab and audio is "...mouth in the center of its body." Ask, "In specific detail, can someone tell me how a sea anemone feeds itself?" (A sea anemone catches plankton with its sticky tentacles and moves it to its mouth in the center of its body.) Ask, "What is plankton?" (Allow various answers; some students may know that some plankton is a microscopic plant.) Say, "Plankton can be both microscopic plants or animals that live in the water. It can also be tiny babies of other invertebrates and vertebrates." Ask, "Have you ever been swimming at the beach and have your bathing suit get full of some scratchy stinging objects? Those little scratchy things were actually baby crabs. They are so small that you couldn't really see them. You certainly felt them! Sea Anemones catch these tiny organisms with their sticky tentacles and move them into their mouth." Write the word plankton on the vocabulary chart.

Ask, "Has anyone ever been on a scavenger hunt?" (Various answers.)

Ask, "What did you have to do while you were participating?" (They hunted around for particular items listed on the scavenger hunt. Say, "A scavenger in the ocean then must look around for things to eat. The next animals on the video are considered scavengers. Let's see if you can name them and give me one interesting characteristic about each of them after viewing this part of the video." **Resume tape.**

Pause tape on banded coral shrimp and narrators says, "Fish are really spectacular!" Say, "That was really quite a variety of invertebrates. What do all of them have in common?" (They are all scavengers.) Ask, "What was the special job of the banded coral shrimp on the coral reef?" (It helps keep the fish free from parasites and other debris.) Ask, "What is a parasite?" (A parasite is an organism that feeds off another organism). Write the word "parasite" on the vocabulary chart. How many different species of scavengers can you remember from the video?" (Arrow crab, tropical lobster, and banded coral shrimp and any interesting species.) Say, "There are many more scavengers which help keep the coral reef clean of debris, but we will only list the ones we actually saw on the video."

Say, "Look at Activity Sheet #1. Here we see two food pyramids for all the plants and animals that live on land and in the water. How are these two pyramids similar?" (The algae is like the producers on a land food pyramid.) Producers are always at the bottom. Then the animals which eat the producers or consumers are

further up the pyramid. Ask, "We have already talked about the producers, the plankton, and the scavengers. Who would be some of the major consumers on the coral reef?" (Fish will be the major consumers on the reef.) Say, "Fill in the two pyramids with animals which are consumers on land and consumers you think might be on the coral reef?" Allow students time to complete both pyramids and then check their understanding about herbivorous animals and carnivorous animals on both pyramids. Say, "The next part of our dive on the coral reef will show several different species of fish. While you are viewing the tape, listen for reasons why these same species of fish have different coloration. Be prepared to list them." **Resume tape**.

Pause tape on beginning scene with moray eel. Audio says, "..he isn't too happy that our camera is on his turf." Say, "Activity Sheet #2 asks the question: Why do some fish look different from each other even though they are the same species? Please write your answer using complete sentences and then we will discuss your answers" (Allow students time to respond. Some students will indicate that the age of the fish effects the coloration. Other students may respond that the gender or sex of the fish is another reason why they have different coloration.) Ask, "What does the word gender mean?" (It means whether the anumal is boy or girl.) Write the word 'gender' on the vocabulary chart.

Say, "The next group of animals we will see and hear about on the video are nocturnal. Can anyone tell me what nocturnal means?" (Possible answers that it is an animal that only comes out at night.) Say, "There are animals on the coral reefs that only come out at night. Divers have special little waterproof flashlights like this one (hold up if available) to allow them to witness these special animals. While you are watching the video, listen for the names of some of these nocturnal creatures of the coral reef and be prepared to name them." **Resume tape**.

Pause tape at trumpet fish and audio says, "That's a pretty strange looking fish." Say, "Let's review the different species of nocturnal animals." Ask, "Can anyone name one or more of these species of nocturnal animals?" (Allow students to respond to question.) Say, "On Activity Sheet #2, the next question asks: "What kinds of animals could we see at night that we may not see during the day? Let's list those animals mentioned." (List animals on chart: green moray eel, spotted moray eel, snapper, octopus, banded coral snapper). Ask, "Did anyone learn why the moray eel has such a bad reputation?" (The moray looks mean because it opens and closes its mouth to breath. The teeth become visible while their mouth is open and looks fierce.)

Say, "Let's finish our tour of the Cozumel Reef by looking at some predators. Who can tell me what the word predator means?" (A predator is an animal that hunts other animals. Ask, "What kinds of animals do you think are predators on the coral reef?" (Allow different answers.) Say, "Listen for the kinds of fish on the coral reef that are predators. Be prepared to list some of them." **Resume tape**.

Pause tape on divers ascending scene audio says, "Let's go up." Ask, "What were some species mentioned who are considered predators?" (Trumpet fish, tarpon, and grouper.) Say, "Now on your Activity Sheet #2 where it asks the question: What kinds of fish are considered predators? List each of the predators mentioned on the tape and next to each one please write the name of a land predator which might be comparable in size to the coral reef predator." While students are writing down the names of predators, remove tape and get ready to insert next tape. Discuss answers with students.

Begin *Reading Rainbow's Dive To The Coral Reef.* Have tape cued up to segment after LeVar Burton has ascended from his dive to coral reef. He has his goggles on his forehead and discusses how fragile coral reefs are and states, "I am so amazed at how much life there is around these coral reefs."

Say, "Wouldn't it be wonderful to be able to help take care of these coral reefs and get paid for doing so? In the next video we are going to hear from a Reef Doctor who will explain how he works to restore coral formations which are damaged by human error." To give students a specific responsibility for viewing say, "Listen to the Reef Doctor to find out one way to restore the damaged reef. Be prepared to tell me in your own words what the doctor has planned." **Begin tape.**

Pause tape when reef doctor gets into boat and places coral in trash can filled with sea water. Audio cue is "We carefully place it in sea water for the time it is above the surface." Ask, "What is one way that the reef doctor helps repair a reef that has been damaged?" (He "transplants" coral from a healthier reef to the damaged reef.) Ask, "What does the word transplant mean?" ("Transplant for the Reef Doctor means that he will move coral from a healthy reef structure to a place where a reef has been damaged by pollution or by damage from a ships anchor.) Write "transplant" on vocabulary chart. As we carefully watch the doctor at work, listen for the three types of coral he will be transplanting. Be prepared to list them by name." **Resume tape.**

Pause tape at picture of coral being held upside down and base is showing. Audio states, "We have a beautiful base for transplanting." Ask, "What were the three types of coral the Reef Doctor has chosen to transplant?" (Coral, brain coral, and staghorn coral.) Say, "Write each of these names of coral on Activity Sheet #3 and next to each name tell how you think they these coral got their names." Allow time for students to write their responses down and then discuss their opinions. Students may respond that the name came from the resemblance of the coral to elk's horns, how a brain looks, and the horns of a deer.

Say, "Listen to the reef doctor in this next segment of video as he describes in detail step by step how he transplants coral. Be prepared to list each step and justify why these steps are necessary." **Resume tape.**

Stop tape at completion of transplant scene where Levar Burton has goggles removed and audio says, "This is great!". Say, "Now try to remember the steps the reef doctor used to transplant coral and list them. Next to each step, describe why this particular step is necessary. Be prepared to share your justification with other students and compare answers." When students have completed their lists, go over the following lists to see how they did. Allow students to give justification for each step.

1. Locate a good stable rock.
2. Chisel a foundation for the new coral.
3. Check to make sure it will fit properly.
4. Send another diver up to the boat to get paste.
5. Shape the paste to fit the coral.
6. Put the paste on the rock where coral will sit.
7. Push coral down firmly onto the rock and paste.

POSTVIEWING ACTIVITIES

Say, "Coral polyps build reefs by laying down many layers of calcium carbonate. Calcium carbonate is a gray-white compound that makes up the shells of many underwater creatures. Shells from other creatures that drop onto the reef are encrusted by corals and become part of the reef. Although calcium carbonate is a solid, it is a soft rock that wears away easily. This makes the reef very fragile. Pollutants in our atmosphere can combine with rain which can damage a coral reef. In this activity, we will see how pollutants from the island, such as fertilizers and

other chemicals, as well as pollutants from the atmosphere can damage the calcium carbonate that makes the skeleton of the corals."

Say, "A good source of calcium for our strong bones can be found in calcium supplement tablets. In this activity we are going to experiment to see the effects of acid rain on calcium carbonate."
Follow these steps:"
1. Pour water into 1 clear cup, vinegar into another and an equal mixture of water and vinegar into the third. The volumes of liquid
in the 3 clear cups should be approximately the same. (To simulate seawater, add a small amount of salt to the water; this will not change the results.)

2. Drop a calcium carbonate tablet into the cup with water, and another into the cup with vinegar. (The calcium carbonate reacts with the acetic acid in the vinegar and gives off bubbles of carbon dioxide gas--indicating a chemical reaction; the water produces no visible change at first but the calcium carbonate will slowly dissolve.)

3. Have students using what they have just observed to predict what will happen when they drop a piece of calcium carbonate into the water and vinegar mixture. Let them test their prediction, and discuss the results.

4. Students should now be able to graph the results of the three liquids and the combining of calcium carbonate with the three liquids by bar graphs, line graphs etc..

Say, "In the video we learned about animals which were scavengers on the reef. One of these scavengers was the striped coral shrimp. Scavengers have to move around and hunt for their food. On Activity Sheet #3 at the bottom of the page are some paths that the shrimp might have to take in order to find food. Look at each of the paths and predict which path will be the shortest and which path will be the longest. Put a number in front of each path for the correct order from shortest to longest. Then, using the metric ruler in the bag, measure each path and write the measurement on the line provided. Compare your prediction and your actual measurement to see if your predictions were correct."

Allow students time to complete assignment and then discuss their findings making sure that they have measured correctly.

ACTION PLAN

Invite a scuba instructor from a local dive shop to bring scuba gear for students to see. Have students make a list of questions they would like to ask the instructor and invite him/her to discuss experiences of dives on a coral reef.

Have the class take a field trip to the Texas State Aquarium. Create a scavenger hunt of objects and organisms to look for.

Write to one of the following agencies to find out more information about what you can do to help fight pollution.

Center for Marine Conservation
1725 DeSales Street NW
Washington, DC 20036

The Oceanic Society
218 D Street SE
Washington, DC 20003

EXTENSIONS

Have students write to Texas Parks and Wildlife about information on the "Flower Garden" in the Gulf of Mexico to find out how it became a sanctuary. Posters are available from Texas Parks and Wildlife or National Marine Fisheries.

Have interested students create a mural about the different kinds of coral and animals living on or around coral. Present mural and reports to parent meeting.

Make a reef buddy wheel out of paper plates showing the several animals on a coral reef that depend upon each other. Write descriptions about how these animals are beneficial to each other.

Have students survey other students in their same grade level about which of the coral reef inhabitants were their favorites. Students can then create a bar graph or pictograph of the results of their surveys.

ACTIVITY #1

WHAT ARE THE DIFFERENT NAMES OF THE REEF FORMATION? TELL WHY YOU THINK THEY ARE NAMED THIS.

1._____
2._____
3._____

ACTIVITY #2

WHY DO SOME FISH LOOK DIFFERENT FROM EACH OTHER EVEN THOUGH THEY ARE THE SAME SPECIES?

_____
_____
_____

WHAT KINDS OF ANIMALS COULD WE SEE AT NIGHT THAT WE MAY NOT SEE DURING THE DAY? LIST LEAST FIVE.

1._____
2._____
3._____
4._____
5._____

WHAT KINDS OF FISH ARE CONSIDERED TO BE PREDATORS? WHAT LAND PREDATORS CAN YOU NAME?

1._____
2._____
3._____
4._____

ACTIVITY #3

NAME AND SKETCH THREE KINDS OF CORALS THE "REEF DR." IS TRANSPLANTING. TELL WHY THEY ARE GIVEN THESE NAMES.

1.

2.

3.

LIST THE STEPS THAT THE REEF DOCTOR USED TO TRANSPLANT THE CORAL.
NEXT TO EACH STEP TELL WHY THIS STEP IS IMPORTANT FOR A SUCCESSFUL TRANSPLANTING OF CORAL.

1._____
2._____
3._____
4._____
5._____
6._____
7._____