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Deep East 2001 Exploration

Coral Mania

Focus
George's Bank

Grade Level
5-6

Focus Question
Why are corals able to colonize a deep sea area like George's Bank where light does not reach?

Learning Objectives
Students will learn about the corals that live in the deep sea environment and why they are able to colonize this habitat.

Adaptations for Deaf Students
Vocabulary:
- Pre-teach all vocabulary.
- Add the following: photosynthesis, energy, colonization, and skeleton.

Activity 1
- For Step 6, have the students as a class write a paragraph about the structure and function of a coral polyp. Each student should generate at least one sentence.

Materials
Activity #1 - Internet and Drawing Activity

❒ Audio/visual media of living coral – clips from a video

❒ Gulf of Maine Poster (map) (REQUEST IN ADVANCE) Maine Coastal Program, State Planning Office, 184 State Street, Augusta ME 04333 (207) 287-3261

❒ Several samples of corals – any variety (These should only consist of those collected on a beach after animals have died or those purchased from an aquarium shop that sells no wild-collected animals.)

Activity #2 – The Edible Coral Polyp

For each student:

❒ 1/2 oz. white baking chocolate, candiquik mix, or other hard candy coating

❒ 1 large marshmallow (or section of banana or a strawberry)

❒ Toothpicks (for punching holes in marshmallows ONLY) - one per student

❒ 6 2-inch strips of red licorice (either whip or regular cut into thin strips)

❒ One teaspoon blue, red or green sprinkles

For each group of 4-5 students:

❒ Heat source (hot plate or microwave)

❒ Pan for candy coating

❒ One paper plate

Science Extension – Moraine Formation

❒ "Glaciers" (Prepared ahead by freezing a two-inch layer of water in a 5" x 9" loaf pan)

❒ Rubbermaid dishpan with ends labeled "Landward" and "Seaward"

❒ Substrate materials (sand and gravel, 2 liters of each)

Audio/Visual Equipment
❒ VCR

Teaching Time

Two to three periods of 45 minutes each

Seating Arrangement

Groups of 4 students

Maximum Number of Students

30 students

Key Words

Coral
Octocorals
Polyp
Symbiosis
Symbiont
Zooxanthellae
Substrate
Coral Reef
Tentacles
Glacier
Moraine (terminal moraine)

Background Information

Read "Coral Reefs: A Fact Sheet"
Used with permission from Coral Reefs: *An English Compilation of Activities for Middle School Students*. By Dr. Sharon Walker, Amanda Newton, and Dr. Alida Ortiz. 1997. USEPA NCEPI.
Original source: *Coral Forest Teacher's Guide*.
Coral Forest, 400 Montgomery Street, Suite 1040, San Francisco, CA 94104

The primary organisms of interest at the George's Bank location are assemblages of deep-water octocorals never before studied in depth. Virtually nothing is known about their reproductive biology and feeding habits. These corals are relatives of shallow water reef-forming corals but live in deep water habitats where photosynthesis cannot occur. Most shallow water corals have photosynthetic symbionts (a type of algae called zooxanthellae) that live inside their outer calcium carbonate skeleton and provide food for the polyps. Since no light penetrates to the depths where these deep sea corals exist, this is not an option for them as a means of obtaining nutrition. What these corals use as their source of energy is just one of the many questions which scientists hope to be able to begin to answer from data gathered from the Deep East 2001 Voyage of Discovery.

Another difference between shallow reef corals and deep corals is that shallow corals build the reef, whereas the deep corals need a hard bottom on which to settle. Therefore, a determining factor in the colonization of this area by these corals lies in the geological history of George's Bank. While there is not complete concensus among geologists regarding this, it is generally accepted that this formation represents a terminal moraine (the pile of sand, gravel and rocks left at the leading edge of a glacier when it recedes) formed by seaward glacial movement. Such activity would have left this area with much more hard substrate, in the form of rocks and boulders, than may otherwise exist. Larval forms of corals require hard substrates for colonization.

In Activity 1, students use the Internet to gather information about the general structure of coral polyps and the functions of each part of a polyp.

In Activity 2, students construct an edible polyp.

In Activity 3, students use near realtime photographic images from the Deep East Expedition posted daily by the Web Coordinator to learn more about size and distribution of the octocorals in the Canyons of George's Bank.

Learning Procedure

Activity 1 – Internet and Drawing Activity

1. Have students visit the following web site and learn about corals. www.enchantedlearning.com/subjects/invertebrates/cora/Coralprintout.html
2. Have students draw and label their polyp and include information about the functions of each part of the polyp.
3. Discuss zooxanthellae and their function for shallow water corals and why the means of obtain-

ing nutrition would have to be different for deep water corals.

4. Using the Gulf of Maine poster, talk about the area that will be visited by the Deep East Voyage of Discovery. This is one area where the deep sea octocorals exist.
5. Allow students to observe samples of corals. Remind them that what they are seeing is only the outer calcium carbonate skeleton, not the coral animal itself.
6. Have students write a paragraph about the structure and function of a coral polyp.

Activity 2 – The Edible Coral Polyp – see attached

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Activity 3 – Investigation of Corals Actually Being Sampled by ALVIN at George's Bank

1. Students visit the Deep East web site and obtain images from ALVIN dives posted daily by the Web Coordinator on the Deep East Voyage of Discovery. www.oceanexplorer.noaa.gov/deepeast01/deepeast01/html
2. Students visit the Task Force Atlantis web site and go to links to learn more and see pictures of these deep sea octocorals. www.atlantisforce.org

The BRIDGE Connection

www.vims.edu/bridge/data.html

Choose Ship Mates for a great site with data from the Gulf of Maine and an explanation of what it means.

The "Me" Connection

Have students revisit
www.coralreefalliance.org/aboutcoralreefs
and go to the links under "Coral Reef Information" to learn about the great importance of coral reefs to humans. Discuss whether any students have relatives who have been or could be helped by some of the medicines already discovered or being researched.

Connections to Other Subjects

1. Language Arts – Evaluate students' paragraphs about the structure and function of a coral polyp.

2. Language Arts – Evaluate students' understanding of new vocabulary.

Evaluation

Evaluate students' coral polyp paragraphs and drawings for completeness and accuracy.

Extensions

1. Math and Science - How big are these octocorals and how are they distributed?

a. Each day during Leg One of the Deep East Expedition, students visit the Web site to obtain images posted there by the Web Coordinator.
b. Laser scaling can be used to estimate size.
c. If sufficient information is available about the size of the field in images, general distribution of the octocorals can be estimated.

2. Science - How does a moraine form?

a. Refer again to the poster of the Gulf of Maine and George's Bank. Discuss moraine formation by glaciers and show the moraine on the poster (George's Bank).
b. Give each group of students a Rubbermaid dishpan with about 5 cm of mixed substrate and about 7 cm of water overlying it.
c. Explain that each group is going to receive a "glacier" (piece of ice) with which to simulate glacial movement across the substrate in the container.
d. Remove "glaciers" from freezer or cooler and provide one to each group
e. Instruct each group to move their "glacier" slowly across the substrate.
f. Tell them to observe the leading edge.
g. Have each student write a paragraph about

what occurred during the activity and draw a before and after picture of how they think their substrate looked from a side view.

h. Relate this process to the geology of the George's Bank study area. (Use the www.atlantisforce.org web site.)

3. **Science** - Allow students to go to the WebQuest Coral Reef project Web site. It contains a clever game charging the students with the responsibility to protect a coral reef. http://manteno.k12.il.us/drussert/WebQuests/KeithFinlayson/Coral%20Reef%20Project.html

4. **Science** - Go to the Waikiki Aquarium Research Web Site (www.mic.hawaii.edu/aquarium/research/) and click on "Research" under "Corals." Depending on the time in Hawaii, there is a nice live cam view of coral polyps. There are also a number of nice links to other sites about corals and protection programs.

5. **Math** - Word problems (for example, multiply numbers of tentacles in a colony of octocorals with a certain number of polyps.)

6. **Language Arts** – Using the information from Web sites (both in the lesson and extensions) and what has been learned about the deep sea octocorals, have students write letters to legislators regarding having this type of coral assemblage added to a protection program.

7. **Language Arts** - Using information from Web sites and links, have students make a list of ten things that they can do to protect corals.

Resources

www.oceanexplorer.noaa.gov
(Click on Explorations, then Deep East for background information.)

www.atlantisforce.org/nonamecanyon.html

www.atlantisforce.org/gombankmap.html

www.terryparker.duval.k12.fl.us/reef.htm

National Science Education Standards

Content Standard C: Life Science

- Structure and function in living systems
- Diversity and adaptations of organisms

Content Standard D: Earth and Space Science

- Structure of the Earth system

For More Information

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