Fish Aren't Afraid of the Dark!

Summary

Overview: The ocean is divided into three light zones: the photic zone (less than 220 yards or 200 meters from the surface of the ocean), the "twilight" zone (between 220 to 1,100 yards or 200 to 1,000 meters from the surface), and the aphotic zone (more than 1,100 yards or 1,000 meters from the surface). In the "twilight" zone, it becomes increasingly difficult to see, and colors become obscured. The aphotic zone receives no light at all, and this region's inhabitants live in complete darkness…with the exception of the lights they emit from their own bodies. This phenomenon is known as "bioluminescence." While bioluminescent organisms can be found at all levels of the sea, their light-emitting capabilities come in particularly handy at the deeper levels. In this lesson, students will be introduced to the concept of bioluminescence and will consider how animals benefit from having their own light sources. They will look at pictures of bioluminescent marine animals, and will conclude by making collages or writing stories pretending they have just seen bioluminescent animals from a deep sea vehicle.

Time Frame

1 class periods of 90 minutes each

Materials

Computer with Internet access
Yardstick or meterstick
Four flashlights
Drawing materials
Crafts materials (if you opt to have students make collages)

Student Prior Knowledge

Acquiring Geographic Information
Organizing Geographic Information
Answering Geographic Questions
Analyzing Geographic Information

Intended Learning Outcomes

Students will
hypothesize what it might be like in the deep ocean;
describe what it's like to see in the dark;
brainstorm how marine animals might cope in dark conditions;
view pictures of bioluminescent animals;
discuss how light might help these animals; and
make collages or write stories about what it might be like to dive into the deep ocean and see bioluminescent animals.

Instructional Procedures

Opening:
Hold up a yardstick or meterstick, and have a student stand next to it. Tell the class that the very deepest place in the world's oceans (the Mariana Trench in the Pacific) is 11,933 of these yardsticks (or 11,000 metersticks) deep. That would be like extending enough yardsticks or metersticks to go almost seven miles (11.3 kilometers) down the road. (You may want to think of a good analogy for

your town, such as "from school to the airport.") It would also be like extending a line of children your students' age for five and a half miles (8.9 kilometers) or so. Ask students to guess what it might be like in the deep ocean, and discuss their ideas as a class. Perhaps they've seen pictures of deep sea creatures or read stories about the ocean; incorporate these experiences into the discussion.

Development:

Ask students to imagine that they can get into a special vehicle and travel down into the ocean. Explain that as they continued to go deeper, it would get darker and darker because the sunlight couldn't make it to such great depths. Once they got to approximately 220 yards (200 meters), it would become more and more difficult to see. Below about 1,100 yards (1,000 meters), there would be no sunlight at all. Ask students to look around the room and notice what things look like--colors, shapes, and sizes. Then turn off the classroom lights, and close the window shades if possible. Ask students to look around the room again. Do things look the same? Can they still see colors as well as they did before? Can they still make out all the shapes and sizes of things? [Note: If your school has emergency lights in every room that make it difficult to find a place that is completely dark, have students repeat this experiment at home with their parents' help.]

As an option, discuss students' other experiences in dark places, such as their bedrooms. How does darkness make it more difficult to do certain things? Does darkness make it easier to do other things?

Have students brainstorm, either in small groups or as a class, how fish and other marine animals might cope with living in the darkness of the ocean's depths. What special features might they need? What behaviors might they use to help them?

If students have brainstormed in groups, compare their ideas as a class. Did anyone suggest that animals might have their own lights? Explain that many marine animals indeed have special organs that create light, like little flashlights on their bodies.

Have students look at the pictures of bioluminescent animals. They should click on the individual photos in the left frame to see larger pictures of the animals in the right frame. Make sure students know that the last two animals in the left frame do not have lights (even though they look like they do), but the rest of the animals do.

Closing:

Conduct the following simple demonstrations to show the class two of the ways these animals use their lights:

Attracting prey: Have four to six student volunteers come to the front of the class. Give one student a flashlight and take this student to a far corner of the room, away from the other student volunteers. Secretly instruct him or her to pretend to be a very hungry marine animal with a light. Tell this student that his or her role is to "eat" another animal (represented by gently tagging another student volunteer on the shoulder or back). Tell the other student volunteers to be animals who are curious about the light. Have students act out their roles until the hungry animal "eats" one of the curious animals. Explain that this is one way fish and other animals attract food. Sometimes the prey are curious and come to the light; other times, the animals just use their lights to help them locate the food.

Signaling other members of their species: Have four student volunteers come to the front of the class, and give each student a flashlight. Announce that each of these volunteers is a marine fish or animal. Secretly tell each student a pattern to signal with the flashlights: have two students emit two long flashes of one second or more, and have the other students emit two very short, rapid flashes (make the patterns more or less complicated if you like). Don't let anyone know who's been assigned to which pattern.

Turn off the lights, and have students start flashing their patterns toward each other and toward the class. Have the student volunteers and the class participate in guessing which animals "match"--in other words, which ones signal the same light pattern. Explain that animals flash their lights in the ocean to find other animals of the same kind.

Extensions

Treat your class to some glow sticks, glow straws, or glow bracelets (available at many party supply stores). Give one to each student, and explain that these fun accessories give off light in a way that's very similar to how many marine animals emit light. There's a chemical reaction inside these glow sticks that produces light, much like the chemical reaction inside the animals' organs that creates the light.
Have students pretend to be bioluminescent marine animals. They can make up names for their creature and decide how it behaves and what it uses its light for.
Turn off the lights, and have individual students demonstrate to the class how they (as bioluminescent marine animals) behave and use their lights.
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Assessment Plan

Ask students to pretend they are deep sea explorers traveling through the ocean in a special vehicle that goes very deep into the ocean (show them a picture of such a vehicle, the DeepWorker, if possible). All of a sudden, they see lights everywhere. For students who aren't yet writing: Have students, either individually or in groups, use crafts materials to create collages illustrating the above scenario. Their collages should feature bioluminescent animals in a dark ocean. Display their collages in the classroom.
For students who can write sentences: Ask them to write their reactions to the scenario, explaining what the bioluminescent animals look like and what they might use their lights for. Have them illustrate their accounts in the form of drawings or collages.

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