

Source: This activity is adapted from Living In Water: an aquatic science curriculum for grades 4 - 6 produced at the National Aquarium in Baltimore, Maryland. Used with permission.

34. HIDE AND SEEK

WHAT DOES IT LOOK LIKE UNDER WATER? WHAT DO ANIMALS SEE? IS CAMOUFLAGE THE SAME BELOW WATER AS ABOVE?

Objectives:

- Students will be able to explain why color patterns that are easy to see in air may be hard to see under water.
- Students will experience the problems predators face when searching for camouflaged prey and develop foraging strategies for these prey.

Introduction:

Some colors of light (wavelengths) are absorbed faster than others when passing through water, particularly red and yellow. Blues are transmitted best. At night, red light is the least available. These facts have interesting consequences for color and color patterns and their distribution among animals that live in water. Fish that live in shallow, well-lighted water may have color vision. But what do most fish see? Fish that live in deep water or are active at night seldom have color vision. Fish that live in murky or muddy water may be almost blind and depend on touch or electrical fields to sense their surroundings.

In this exercise your students will experience what the world looks like to fish that live far enough below the surface that the world looks blue, the only color to effectively penetrate very deep. This activity also models shallow water species that are active at night. On coral reefs, red fish are nocturnal.

Materials:

For Class:

- blue cellophane from school art supply store
- stapler
- clear tape
- string
- underwater photographs cut from magazines that show bright colors and others that are of wide views that are predominantly blue; SCUBA magazines or *National Geographic* are good sources

For Each Student:

- red construction paper 4" x 8"
- other construction paper or poster stock 4" x 11"
- scissors
- pencil

Lesson Plan:

Before Class:

Have the students review their knowledge of fish anatomy in drawing and cutting out a fish made of red construction paper. Did they remember paired pectoral and pelvic fins, the tail (caudal), dorsal and anal fins? [Refer to diagram on page 52.] Explain that the red color is typical of many saltwater fish that hang out around rocks in 10 m (33 ft) or more of water. Many shallow water nocturnal fish are also red, and red is a very common color for deep sea animals generally.

Have each student construct a pair of goggles. Inexpensive blue cellophane available in rolls from school art supply stores is folded to make three or four layers over the eye holes. Tape the cellophane in place. Staple, tape or tie strings to hold the goggles in place. Explain they will use the goggles to see as fish see. Do not allow students to wear the blue goggles for more than five minutes. To do so longer will bleach (temporarily) some of their visual pigments.

During Class:

When the students are not in the classroom, distribute all the red fish around the room against *dark* backgrounds. Turn the classroom lights off and create dim light. It is darker in 10 m of water, or in shallow water at night, than at the surface. Pin or tape the fish to bulletin boards, prop on shelves, put them in corners on the floor. Hold a pair of goggles up to check that you are placing the fish against backgrounds with the same value.

Meet the class outside the room with the goggles. When the goggles are in place, have the students enter the room and sit down. Tell them they are predators searching for red fish in 10 m of water. They are wearing the goggles because blue is the primary color of light that penetrates very far into water. Have them start searching for the fish at the same time. Time them if you want to repeat the exercise without the goggles.

Stop them before all the fish are found and have them sit back down. Remove their goggles. Now can they see the fish they missed? Why were the fish hard to see? The filter allowed only blue light through. The fish reflect only red. Under water there would be no red to see. If you wish, repeat the exercise without the goggles to compare the time it takes to find the fish when red is visible.

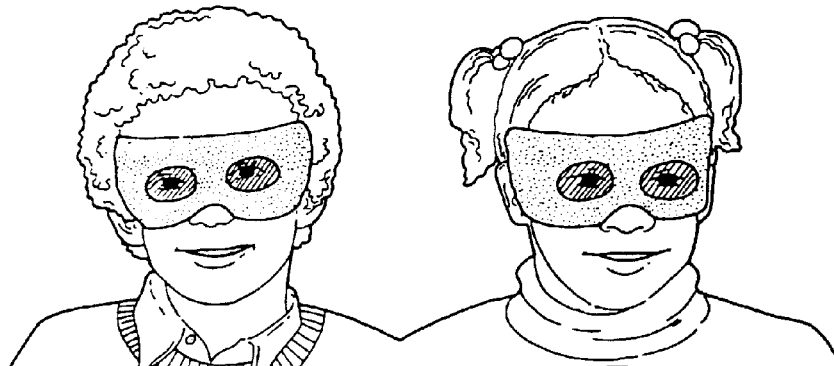
Results:

A fish that appears very colorful to us (red) may, in fact, be very well CAMOUFLAGED from predators. The fish is hard to see because red light is missing as it is being absorbed by the water and, therefore, cannot be reflected to the fish's predator's eyes.

Use the color photographs to illustrate. Any colorful underwater photograph was shot with a flash which provided all the wavelengths of light. Any photo in which the predominant color is blue shows what it really looks like under water.

Conclusions:

You cannot make judgments about animals based on human perceptions. Fish in shallow, clear water may see things in a way that is similar to us, but fish that live in dark, murky water or deep water probably do not have color vision and may use vision very little, depending on other senses.



Correlation to National Standards from McREL (<http://www.mcrel.org>) :

Life Sciences

6. Understands relationships among organisms and their physical environment