

# Hide and Seek

**Adapted from:** Activity 38 “Hide and Seek” Living in Water. The National Aquarium in Baltimore, 1997.

**Grade Level:** Basic

**Duration:** 40 minutes

**Setting:** Classroom

**Summary:** Students play a game of hide and seek to simulate how fish search for camouflaged prey in the water.

**Objectives:** Students will be able to explain why it is difficult to see certain colors under water. Students will understand how fish cannot rely on one sense alone (sight) to locate predators and prey.

**Vocabulary:** light refraction, binocular vision, monocular vision, turbid, otoliths, lateral line, camouflage, countershading

**Related Module Resources:**

- All About Fish Fact Sheet
- Fish Colors Fact Sheet
- Fish Senses: Sight Fact Sheet

**Materials (Included in Module):**

- 35 pairs of goggles
- stopwatch (clear box)
- red construction paper
- structure cards

**Additional Materials (NOT Included in Module):**

- scissors
- masking tape

## ACADEMIC STANDARDS: ENVIRONMENT & ECOLOGY

### 7<sup>th</sup> Grade

4.3C Explain biological diversity

- Explain the complex, interactive relationships among members of an ecosystem

4.6A Explain the flows of energy and matter from organism to organism within an ecosystem

- Describe and explain the adaptations of plants and animals to their environment

### 10<sup>th</sup> Grade

4.7B Explain how structure, function, and behavior of plants and animals affect their ability to survive

- Describe an organism’s adaptations for survival in its habitat

### 12<sup>th</sup> Grade

4.6A Analyze the interdependence of an ecosystem

- Analyze the relationship among components of an ecosystem

**BACKGROUND:** Fish have fine tuned senses. A fish’s sight, hearing, smell and taste are achieved through specialized body parts. A fish does not have eyelids, tearducts, or irises like humans do. Instead, they have lenses in their eyes that move back and forth much like a camera lens (PA Fish & Boat Commission, 2000). Since fish live in the water they must adapt to a property of light called refraction. **Light refraction** occurs when light travels from air into the denser water causing it to bend. To a trout, a mayfly at the surface appears higher than it actually is. Binocular vision helps to judge distances, but monocular vision is better because fish are near sighted and can see things close to them better than far away images. Fish have **binocular** (using two eyes) and **monocular** vision (using only one eye). They can see in almost all directions except for small blind spots directly in front of and behind them. Fish can also see in three dimensions. Fresh water fish are thought to see in color and can tell the difference between light and dark (PA Fish & Boat Commission, 2000). Fish are also believed to have cones and rods in their eyes, which enable them to detect colors and ultraviolet light as well as seeing movement and contrast. Walleyes have a reflective layer in their eyes that helps them to see better in dark or cloudy water (PA Fish & Boat Commission, 2000).

Water absorbs light that is essential to almost all living things. Plants depend on light directly or indirectly for food and in turn fish are dependent on the plants for food. As water gets deeper it becomes darker. Even very clear water that is free from floating debris becomes dark at about 150 meters. There are two consequences to the lack of light. The first is that algae or plants in deep lakes grow well only within 100 meters of the water's surface in very clear water. In water that is **turbid** (cloudy with sediment or phytoplankton), the algae and plants must grow even closer to the surface. Second, the rooted plants or seaweed that grows from the bottom up live in shallow water near the shore.

Light is also necessary for vision. Animals that depend on light to see are restricted to relatively shallow water. Fish that search for prey or need to find others of their own species in shallow murky water or in deeper dark water use their other senses. Adaptations for the production and reception of sound (vibrations in the water), chemical information, or electrical fields are made. In addition to the lack of light, colors (wavelengths of light) are absorbed differently by water. Red and orange are absorbed first and blue penetrates the best. As you travel deeper into water red and orange wavelengths of light are absorbed by the water more quickly than blue wavelengths of light. The further you go down blue wavelengths are transmitted, casting a blue hue through the water. Color vision is common in fishes that live in shallow water, but not those that live in turbid water. Fish that live in murky or muddy water may be almost blind and depend on touch or electrical fields to sense their surroundings.

Some animals have developed colors, patterns, and shapes that help blend them into their surroundings. This is called **camouflage** and helps make prey, or in some cases a predator, difficult to spot in a natural background. Fish that live in weeds generally have vertical bars or stripes. The fish that live in open water have horizontal stripes or **countershading**, where the belly is lighter than the back.

**OVERVIEW:** Through a game of hide and seek students will understand how fish locate predators and prey in dark water. Students will also construct fish and review fish anatomy.

**PROCEDURE:**

**Teacher Preparation:**

1. Each student is to construct two fish using the red construction paper provided in the module. Pass out the anatomy cards to help the students review the fin types to include on their fish. The fact sheet "*All About Fish*" is a good review of fish anatomy.
2. Ask the students to label their drawings and look up fish in the *Pennsylvania Fish and Boat Commission Books* and *Peterson Field Guides* that resemble their fish.
3. Have half of the class put their goggles on and place their heads down on their desks they are the "seekers." Ask the other half of the class to hide their fish throughout the

room, they are the “hidiers.” Remind students to hide the fish where they will be visible. Do not hide the fish inside drawers or under desks!

4. Explain to the students that they are predator fish in search of prey and they need to find as many fish as they can in 5 minutes.
5. Set the stopwatch for 5 minutes. Tell the students to stand up and begin looking for the fish from their seat and start the stopwatch. You may choose to have the students walk around the room and “catch” the fish or have the students stand in place at their desks and simply see the fish. Record the number of fish each student located on the chalkboard.
6. After 5 minutes, ask the students to sit down and take off their goggles. *Students should not wear the goggles for more than 10 minutes at a time. Selective visual pigments can temporarily bleach, making their surroundings a different color when the goggles are removed. This is not a permanent change and does not hurt the student, but it can be disconcerting if the student does not understand.* Record the number of fish each student saw on the board.
7. Repeat steps #3 through #6 and have students switch roles (hidiers and seekers).
8. You may choose to hide the fish again and have the students play without the goggles on and compare the numbers of fish “caught” to the original count.
9. You may also choose to return the fish to the students and ask them to camouflage their fish to hide against a certain background. For example, against a poster, the flag, or bulletin board.

### **Student Activity:**

1. Construct two fish using the red construction paper provided and refer to the anatomy cards and the fact sheet *"All About Fish"* to review fish anatomy. Your goggles have blue cellophane in the lenses to simulate a fish’s vision that lives in deep, clear water. You are creating fish on red paper because red wavelengths of light are absorbed more quickly by water and blue wavelengths penetrate the water deeper than red wavelengths.
2. You are a predator fish in water that is approximately 10 meters deep. The classroom is dark because light does not reach water this deep. You are going to search for fish that are located around the room. They are not easy to see, so you must develop foraging strategies to help you find your dinner.

### **DISCUSSION:**

Which fish that were hidden were the easiest to see? *Answer will vary depending upon the hiding places chosen by the students.*

If you were a fish living in shallow, clear, bright water, what color would best camouflage you? *Red because red wavelengths are absorbed first in water, making red fish harder to see.*

What time of day would you be the safest from predators? *During the night. Red is the first wavelength to disappear and red fish are invisible because there is no red light to see them by.*

How would fish survive in very turbid water? *They may develop more specialized senses such as touch to feel their way through the water.*

### **EVALUATION:**

- Explain the adaptations the fish have to enable them to see and hear in their habitat.
- List the similarities and differences between fish sensory organs and human sensory organs.
- What happens to colors of light as you travel into greater depths of water?
- Why can't fish rely on only one sense to locate predators and prey?

### **EXTENSIONS AND MODIFICATIONS:**

- Examine other animals that have special adaptations to their environments that enable them to communicate with other animals of their species. For example: fireflies use bioluminescence.
- Investigate the properties of light and water and the processes involved.
- List all sources that cause water to become more turbid. Draw a picture or mural depicting the sources.

### **NOTES (PLEASE WRITE ANY SUGGESTIONS YOU HAVE FOR TEACHERS USING THIS ACTIVITY IN THE FUTURE):**

Your Fish Should Include:

- Pectoral Fins
- First Dorsal Fin (Spiny)
- Anal Fin
- Caudal Fin
- Pelvic Fins
- Second Dorsal Fin (Soft)
- Lateral Line
- Gill Cover

*Label these parts on your fish.*

Your Fish Should Include:

- Pectoral Fins
- First Dorsal Fin (Spiny)
- Anal Fin
- Caudal Fin
- Pelvic Fins
- Second Dorsal Fin (Soft)
- Lateral Line
- Gill Cover

*Label these parts on your fish.*

Your Fish Should Include:

- Pectoral Fins
- One Dorsal Fin
- Anal Fin
- Caudal Fin
- Pelvic Fins
- Adipose Fin
- Lateral Line
- Gill Cover

*Label these parts on your fish.*

Your Fish Should Include:

- Pectoral Fins
- One Dorsal Fin
- Anal Fin
- Caudal Fin
- Pelvic Fins
- Adipose Fin
- Lateral Line
- Gill Cover
- Barbels

*Label these parts on your fish.*

Your Fish Should Include:

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- One Dorsal Fin
- Anal Fin
- Caudal Fin
- Pelvic Fins
- Adipose Fin
- Lateral Line
- Gill Cover

*Label these parts on your fish.*

Your Fish Should Include:

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