

5 Senses & Fish Identification

Grade Level(s): 3rd & up
Time: 20 - 25 minutes
Group Size: 20-25 students
Setting: Outdoors area that can get wet

NYS Learning Standards Core Curriculum MST

Standard 4: Living Environment
Students will: understand and apply scientific concepts, principles, and theories pertaining to the physical setting and living environment and recognize the historical development of ideas in science.

- Key Idea 5: Organisms maintain a dynamic equilibrium that sustains life.
- Key Idea 6: Plants and animals depend on each other and their physical environment.
- Key Idea 7: Human decisions and activities have had a profound impact on the physical and living environment.

Summary

As with humans, fish have five senses. These senses are utilized to assist in acquiring food (prey), to defend against predators, and in some cases for schooling with others of their own species.

Students will be introduced to some of the animals that live in an aquatic environment, and will participate in an activity to learn how fish utilize their senses to acquire prey and defend themselves.

Key Concepts

Fish senses; similarities and differences between humans and other vertebrates; humans can impact critical environments and habitats.

Materials

- Artificial lures without hooks
- Fish mounts, pictures
- Stink bait (Power bait)
- Soft sponges or “koosh” balls (enough for each student)
- Squirt gun
- Blindfold
- Water cooler filled with water

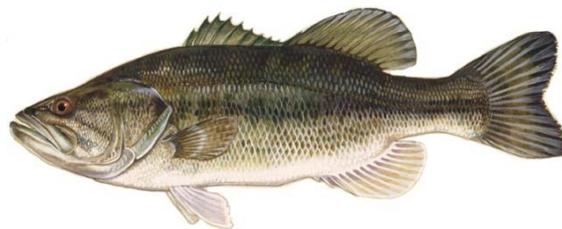


Illustration by Duane Raver

Objectives

After this presentation, students will be able to:

- Explain the sensory organs in fish, and how they are used.
- Identify 3-5 fish species found in local aquatic ecosystems.
- Discuss human impacts on the environment and possible solutions.

Vocabulary

- **Anal Fin:** Posterior bottom fin located near the anal opening; for balance and steering.
- **Caudal or Tail Fin** - fin at the tail of a fish; used for propulsion.
- **Dorsal Fin** – top fin on a fish; used for balance and protection.
- **External Anatomy** - the outside body parts, such as, fins, scales, mouth.
- **Gills** – organ that exchanges oxygen & carbon dioxide, and removes nitrogen waste.
- **Lateral Line** – organ of microscopic pores that sense vibrations and water pressure.
- **Nares** - organ that detects scent or smells in the water; similar to human nostrils.
- **Otoliths** –bone structures in the inner ear; sensitive to vibration, gravity, linear acceleration, and horizontal movement.
- **Pectoral Fin** - fins on the sides; used for balance and assist turning.
- **Pelvic Fin** - belly fins on a fish; used for balance and steering.
- **Scales** - protective cover on a fish; similar to skin.
- **Slime** – slippery covering on scales, protecting from bacteria, parasites, etc.
- **Swim bladder** – found only in “ray-finned” fish; a double sac used to assist in buoyancy and sensing vibrations in the water.
- **Vertebrate** – an organism with a backbone or spine.

Background

The Five Senses

Sight

The eyes of a fish are not much different than that of a human. However, they lack true eyelids. Why? Because their eyes are under the water at all times, and thus no need for eyelids. Some fish have better vision than others. Some only have the ability to see light and dark and others can see in color.

Smell

Fish have nostrils called nares which are located on the snout above their mouths. Under the skin just below the nare openings are small sacs which contain smell receptors. Water, carrying scent, moves through the sacs. The sacs are connected to the brain by nerves, allowing the fish to smell. Some fish, like sharks, have an extremely acute sense of smell.

Taste

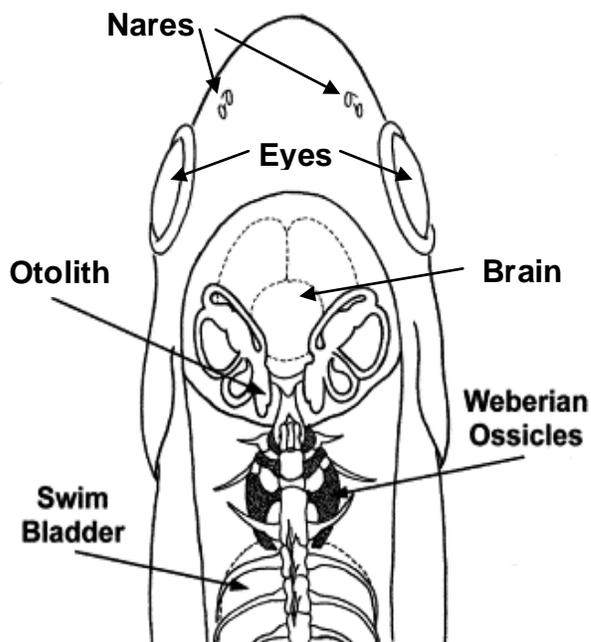
Fish are able to taste with their snout, mouth, tongue, and throat. A fish’s tongue has taste buds just like a human; however they are unable to retract their tongue. Walleye have taste buds located on their heads, as well as in their mouths, and can actually taste lures or bait by bumping into them with their face. Catfish have whiskers called barbels, loaded with taste buds. They use their whiskers to feel around in the mud and when they find something tasty they stop and bite it! For fish, the tongue can only move when the lower jaw of the fish moves.

Hearing/Feeling

Fish have two ways in which they can hear; via otoliths, or a lateral line. **Otoliths** are inner ear bones in a fish's skull. Tiny hairs called cilia are located on the otolith which can be stimulated by vibrations in the water. These vibrations are interpreted as a sound by the fish's brain.

Some fish have a heightened sense of hearing due to the close proximity of the swim bladder to the otolith. In carp and catfish, the swim bladder is located close to the otolith and connected to it by a system of bones called the Weberian Ossicles, thus giving better auditory skills. Fish with reduced or no swim bladder, such as flat fish, have a lower hearing ability.

Fish also have another sensory organ called the **Lateral Line**. A lateral line is a sense organ of microscopic pores used to detect movement and vibration in the surrounding water. Located just under the skin, the lateral line consists of sensory receptors called neuromasts. When the cilia in the neuromasts vibrate, the fish can feel. The lateral line can also sense and detect water pressure (depth), prey and predators movements, currents, and objects. All fish have some form of a lateral line, some having a more developed one than others. Lateral lines are usually visible as faint lines running lengthwise down each side, from the vicinity of the gill covers to the base of the tail.



Compare & Contrast

Even though humans and fish may not look the same, we share some similar organs and body parts.

<u>HUMAN</u>	=	<u>FISH</u>
Lungs	=	Gills
Stomach	=	Stomach
Liver	=	Liver
Kidneys	=	Kidneys
Ears	=	Lateral Line, Otoliths
Skin	=	Scales & Slime Layer
Nose	=	Nares
Arms	=	Pectoral Fins
Legs	=	Pelvic Fins

Main Activity

Prior to introduction, fill a cooler and squirt gun with water

Introduction

1. Introduce the activities:
 - a. Fish identification
 - b. Activity/game to learn about five senses

Fish Identification

1. Using fish mounts, models, or pictures help students identify fish that may be found in local waters (freshwater and saltwater).
2. Briefly discuss anatomical features and relationship to fishing.

The Senses

1. Ask students to identify the five senses. Discuss them in short detail. Ask students how many senses a fish has (5 senses).
2. Introduce each sense while introducing a fish species. Use tackle as an aid: spoons, soft plastics, stink bait, etc. (Fish=sense=organ=lure/bait)

Five Senses Game

1. Introduce the game.
 - a. Tell students that the object of the game is to simulate the sense of hearing and feeling.
 - b. Have the students form a circle.
 - c. Select adult to act as the Predator (PR); the students will be schooling baitfish/prey (BF).
2. Have the PR stand in the middle, blindfolded; distribute sponge/koosh balls to BF. As the facilitator points to a BF, that BF tosses his or her sponge ball underhand at the PR (shoulders and down) simulating the movement or vibration in the water. Once the PR feels the “vibration” or “hit” by the BF via their lateral line, he or she will turn towards the direction and spray the water gun, thus “eating” the BF. The BF cannot move feet to escape the water/predator. A BF can only remain in place while ducking, dipping, or bending, etc.
3. Remind students that fish can hear in the water.
4. Play the game for 4-7 minutes; no player is “out” of the game.

Debrief activity

1. At the end of the game, tally the number of fish caught/squirted by water. You may ask “Was it easy for the PR to hear/feel the fish?”
2. If time permits, play the game again.

Wrap Up

Questions for Discussion

Q: What is the purpose of otoliths?

A: Otoliths are small bony structures also sensitive to water vibrations, and can also sense gravity and motion.

Q: What is the purpose of the lateral line?

A: The lateral line is an organ of microscopic pores that are primarily used to sense vibrations and pressure in the surrounding water. Fish utilize this organ also to detect prey and predator movements, currents, and objects in the water.

Q: Name two organs fish have that humans do not.

A: Gills, lateral line, nares, swim bladder (in ray-finned fish)

Conclusion

1. Review the take home messages.
2. Thank students and teacher.
3. Field any questions about the fishing trip or lesson.

Web Resources

Braun, Linda and C.B. Bylander. Minnesota Department of Natural Resources (MN DNR). *Young Naturalist*. "Fish Sense." May-June 1996. 10 October 2008
http://www.dnr.state.mn.us/young_naturalists/fishsense/index.html - easy to understand explanation of fish senses: taste, smell, sight, hearing and sensation.

Maryland Department of Natural Resources (MD DNR). "Fisheries Biology and Management" 10 October 2008
<http://www.dnr.state.md.us/education/envirothon/FISH%20ANATOMY.pdf> – intermediate explanation of external fish anatomy.

Office of Marine Programs. Discovery of Sound in the Sea (DOSITS)
"Animals and Sound in the Sea." 10 October 2008
<http://omp.gso.uri.edu/dosits/animals/produce/2f.htm> - All sounds about the sea, from animals, to science, to people and sounds; all in reference to the sea. Website is part of "Sound of the Sea", University of Rhode Island.