

# Fish Sense

*Fish depend on their senses for survival. Whether they eat a meal or become a meal depends on their ability to see, hear, smell, taste, and detect vibrations.*



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## Chapter 2 • Lesson 1

Please note: Academic Standards are updated regularly and our alignments will be updated on the DNR Academic Standards Website at: [www.mndnr.gov/education/teachers/edstandards\\_intro.html](http://www.mndnr.gov/education/teachers/edstandards_intro.html)

# Fish Sense

## Minnesota Academic Standards

- ☉ Lesson *introduces* this Benchmark.
- ☪ Lesson *partially* addresses this Benchmark.
- ☺ Lesson *fully* addresses this Benchmark.

### Language Arts

Grades 3, 4, 5

#### I. Reading and Literature

##### B. Vocabulary Expansion:

**Benchmark 1**—The student will acquire, understand and use new vocabulary through explicit instruction and independent reading. ☪

#### III. Speaking Listening, and Viewing

##### A. Speaking and Listening:

**Benchmark 1**—The student will participate in and follow agreed-upon rules for conversation and formal discussions in large and small groups. ☪

**Benchmark 2**—The student will demonstrate active listening and comprehension. ☺

### Social Studies

Grades K—3

#### III. World History

##### A. Family Life Today and In the Past:

**Benchmark 3**—Students will compare technologies from earlier times and today, and identify the impact of invention on historical change. ☉ (Lesson provides a specific example of technological change concerning recording fish catches.)

### Science

Grade 3

#### IV. Life Science

##### B. Diversity of Organisms:

**Benchmark 1**—The student will describe the structures that serve different functions in growth, survival and reproduction for plants and animals. ☉

##### C. Interdependence of Life:

**Benchmark 1**—The student will know that organisms interact with one another in various ways besides providing food. ☉

Grade 4

##### G. Human Organism:

**Benchmark 1**—The student will understand that humans have structures that serve functions in growth, survival and reproduction. ☉

## Environmental Literacy Scope and Sequence

### Benchmarks

- Social and natural systems are made of parts. (PreK-2)
- Social and natural systems may not continue to function if some of their parts are missing. (PreK-2)
- When the parts of social and natural systems are put together, they can do things they couldn't do by themselves. (PreK-2)
- In social and natural systems that consist of many parts, the parts usually influence one another. (3-5)
- Social and natural systems may not function as well if parts are missing, damaged, mismatched or misconnected. (3-5)

For the full Environmental Literacy Scope and Sequence, see:

[www.seek.state.mn.us/eemn\\_c.cfm](http://www.seek.state.mn.us/eemn_c.cfm)

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## Chapter 2 • Lesson 1

# Fish Sense

**Grade Level:** 3-5

**Activity Duration:** 45 minutes

**Group Size:** any

**Subject Areas:** Expressive Arts, Language Arts, Social Studies, Science

**Academic Skills:** observing, comparison, painting

**Setting:** indoor or outdoor gathering area with tables

**Vocabulary:** barbel, gyotaku, lateral line, nostrils, senses, school

**Internet Search Words:** AmeriCorps Water Stewards Project, fish prints, fish senses, gyotaku; on the Minnesota DNR website: fish sense

## Instructor's Background Information

### Six Senses Versus Five

**Senses** are mechanisms that help organisms perceive their surroundings and survive in their environments. People experience the world around them using five senses. Fish have six senses. Human senses share some similarities with fish senses, but because people and fish live in different environments—land versus water—there are differences, too. In addition to taste, smell, sight, hearing, and touch, fish have a unique sensory structure, known as a lateral line, which enables them to sense vibrations in the water. The lateral line is referred to as the sixth sense of fish, and is an extension of their sense of hearing.

### Good Taste

Fish have a sense of taste and use it, in conjunction with their other senses, to find food. Some fish, such as catfish and sturgeon, rely primarily on their sense of taste to find food.

Like people, fish have tongues containing thousands of taste buds. Some fish, such as walleye, also have taste buds on their lips and faces. A walleye can taste a fishing lure without ever opening its mouth. Sometimes walleye anglers say they feel a “bump,” without getting a bite. That bump may have been a finicky fish tasting the lure with its face rather than its tongue.

Imagine tasting a chocolate sundae with your whole body! If you were a catfish, you could do just that—catfish and bullheads have taste buds on their bodies from head to tail. They also have whiskers, called **barbels**. These barbels look like stingers, but they're not. They're actually soft, whiskerlike structures above and below the mouth. Barbels are sensory structures containing many nerve endings, some of which are similar to the taste buds of humans. Catfish, carp, and other “whiskered” fish drag their barbels along the lake or river bottom to find food. When the barbels touch a tasty object—perhaps a dough ball, chicken liver, or stinkbait on the end of your line—the fish stops and takes a bite.

## Summary

Students touch and hold a fish (or a rubber replica of a fish) to explore the six senses of fish and gain a better understanding of fish behavior. They compare and contrast their own senses with those of fish. When students have become comfortable with handling fish, they apply paint to a fish and print its image on a sheet of paper using the ancient Japanese art form of gyotaku (gee-oh-tah-koo).

## Student Objectives

The students will:

- 1 Locate sense organs on a fish specimen and name the six senses of fish.
- 2 Describe the functions of the six fish senses.
- 3 Compare and contrast human senses with fish senses.
- 4 Create a fish print.
- 5 Describe how anglers can reduce the chances that fish will detect their presence.

## Materials

- Whole fish with scales (sunfish, perch, or other fish), one per student, if possible (Catch the fish or purchase fresh or frozen fish from a grocery store. Or use rubber fish replicas available from arts and crafts and nature supply catalogs.)
- **Fish Senses Sheets** (you may post or project these if you wish)
- Paper plates, one per fish
- Paintbrushes, one per student (or a few paintbrushes for each paint color)

*continued*



## Materials (continued)

- Washable tempera paint or any opaque washable paint, several colors
- Containers for paint and water
- Large bucket of water for washing paint from fish, or a supply of wet wipes if water isn't available (but the water bucket is better)
- Paper or newsprint for fish prints
- Newspapers, to protect tables
- Paper towels and rags
- **Fish Anatomy Sheet**
- Small aquarium or fishbowl with live goldfish, one for each group of four or five students (optional)
- Fish food (optional)

### T-shirt printing materials (optional)

- T-shirts
- Fabric paint
- Paper to place inside shirts during printing
- Clothesline for hanging and drying printed t-shirts
- Clothespins



If you plan to catch or collect your own fish for this project, you'll need a fishing license or a Minnesota DNR collector's permit to possess fish. Check the Minnesota fishing regulations booklet for current limits. Contact the Minnesota DNR for more information.

### Nosy Fish

Fish use their noses for smelling rather than breathing. With its **nostrils**, usually two openings on either side of the snout, a fish can smell food from great distances. The fish swims to the source of the smell and uses its taste buds to find out if it's edible.

Fish also use taste and smell for navigation. After swimming hundreds of miles to and from the sea, salmon use their senses of taste and smell to find the stream where they were born. They then swim up this stream to their spawning area to lay and fertilize eggs.

Fish use their noses to sense danger, too. In fact, many fish can smell people. They will swim away from any bait that smells like hand lotion, perfume, deodorant, tobacco, gasoline, or insect repellent.

### Fish Eyes

Fish don't see as clearly as people do. Even in clear water, most freshwater fish usually can see no further than fifteen feet. Like people, fish can see brightness and color. Some fish, such as shallow-water fish, can detect most colors seen by humans, although many fish can't see a full range of colors. For example, walleyes see primarily orange and green.

Unlike humans, fish lack eyelids. Their pupils are fixed—they remain the same size regardless of the amount of light. To protect their eyes from bright sunlight, fish usually spend sunny days in deep water or in the shade of lily pads, stumps, or trees. To find and catch fish during the middle of the day, anglers must “cast for cover,” where fish will be spending time in the shade.

A fish can see in every direction except directly behind and below it. This is because its eyes are on the sides of its head, and each eye moves independently. This makes it hard to sneak up on a fish.

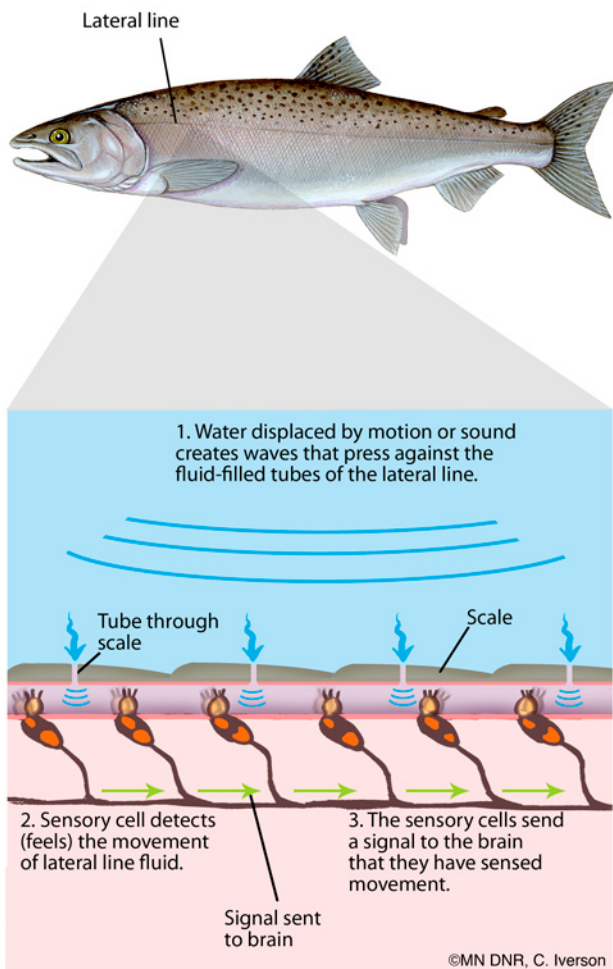
### Hidden Ears

Have you ever *felt* the rumble of thunder? You were sensing sound vibrations. Fish hear sound vibrations moving through the water. Although fish have ears, they don't need ear openings on the outside of their bodies because sound travels so well through water. Fish ears are located under the skin, in the skull near the eyes. The structure of the inner ear is the same as a human's, and contains receptors for balance and hearing.

Fish hearing is so sensitive that they can hear a worm wiggling at the bottom of a lake. Even the faintest sound can spook fish and discourage the biting of bait. That's why it helps to remain quiet while fishing. Talking is fine, but sounds transmitted directly to water, such as the banging of feet on the bottom of a boat or on the dock, can scare fish away.

## Vibration Detectors

Fish have an additional sense related to hearing, called the **lateral line**. This structure is a network of ultra-sensitive nerve endings that run along its sides from the gills to the tail.

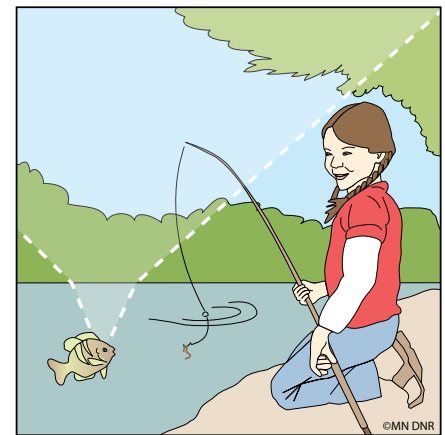


### How a lateral line works.

A fish's lateral line consists of tiny pores containing hairs connected to many nerve endings beneath the skin. The sensitive hairs inside each pore detect the location and direction of vibrations in the water, allowing the fish sense the movement of other fish and aquatic organisms around them in dark or murky water, or at a distance before they might be able to see other organisms.

Fish detect bait by sound and through water movement or vibrations in the water. They hear and feel their way to fishing lures with their ears and lateral lines. When they see the lure, they can tell if it looks like something they usually eat. A fish might then smell or taste the lure before eating it.

A group of the same type of fish swimming together is called a **school**. Have you ever wondered how fish can swim so close together in a school without bumping into each other? Their lateral lines help them



### Light and fish vision.

Light bends at an angle when it passes from air to water. The greater this angle, the more the light bends. A fish sees objects straight overhead in their true locations, but the images of objects near the horizon are shifted. Light from an object very low to the horizon doesn't penetrate the water at all. For this reason, it's possible to stay outside of a fish's field of vision—and avoid being seen—by crouching or sitting at the water's edge.

**Do Fish Feel Pain?**

“Pain and fear in humans results from the stimulation of several regions of the cerebral cortex. The tiny cerebral cortex of fishes’ brains lacks these regions. For this reason, fish do not have the same emotional response to pain. Fish may not experience pain the way humans do, but they do suffer from stress. When handling fishes, fish biologists follow stringent guidelines to reduce stress in fishes.”

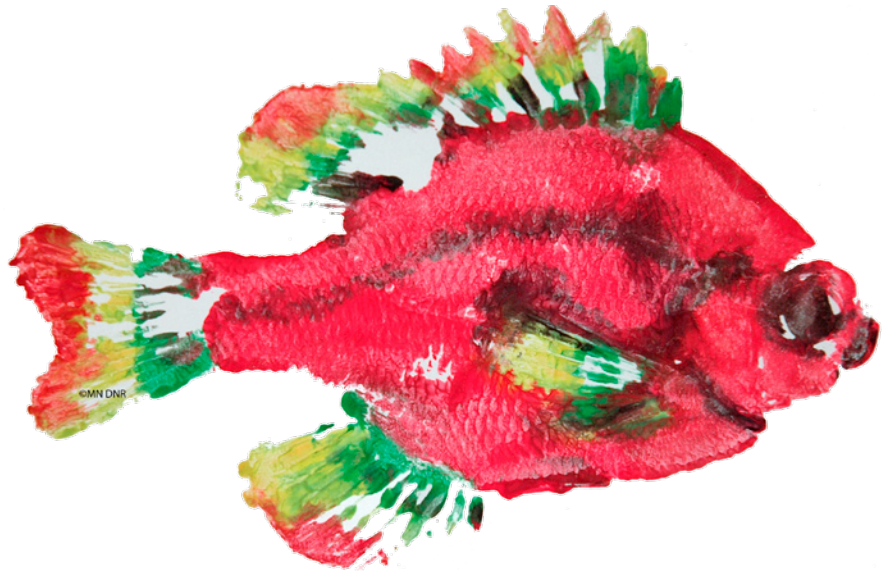
—Professor James D. Rose,  
Department of Zoology  
and Physiology,  
University of Wyoming

sense their proximity to one another by detecting vibrations in the water.

The lateral line helps a fish find a meal by sensing when smaller fish are swimming nearby. The lateral line also helps a fish avoid *becoming* a meal by sensing the presence of lurking predators.

**Touchy, Touchy**

Like people, fish have many sensory structures in the skin that detect touch. Their sense of touch relays information about pressure and temperature. Fish back up or swim away from the slightest contact. Because they can feel touch, it’s important to practice correct methods of catch-and-release to minimize stress to fish.

**This is an example of gyotaku, a Japanese fish printing technique.**

Japanese fisherman developed the art of **gyotaku** (gee-oh-tah-koo; *gyo*, meaning fish, and *taku*, meaning rubbing), or fish printing, in the mid-nineteenth century. Lacking the technology of cameras to help them record their catches, they painted them with a watery black ink and pressed rice paper or cloth onto the painted fish. When the paper was lifted, a detailed image of the fish was revealed. These prints were used for studying biology as well. Fisherman recorded information about the fish, such as the types and sizes of fish, and where and when they were caught. Fish prints also reveal the intricate detail and textures of features such as scales and fins.

Over time, gyotaku has become an art form that helps people understand and appreciate the beauty and variety of aquatic animals.



## Procedure

### Preparation

- 1 To prepare the fish, collect them prior to the lesson and keep them cold (or thaw frozen fish). The fish should be wiped clean of water and slime prior to use. Place the fish in bags of water before you freeze them to prevent freezer burn. Another option is to use a rubber fish replica for printing. Fish replicas molded from castings of fish are available at arts and crafts, science, and nature supply catalogs, and can be used instead of real fish in the fish printing activity. Students will have more difficulty locating the sense organs on replicas, so if you plan to use replicas, try to have at least one real fish available for showing the sense organs.
- 2 Prepare the paints—pre-mixed tempera paints in four to six colors work well.
- 3 To keep work surfaces clean, cover them with old newspapers or butcher paper. Place paper towels or rags at each work area for wiping excess water from the fish.
- 4 Place paper for the prints on the worktables.
- 5 Provide water (or wet wipes) for students to wash the paint from their fish after printing. Place the fish in a large bucket, tub, or a sink filled with water after they've been used for printing. If you plan to reuse the fish, place it in a cooler of ice to keep it fresh during the lesson. Wash and refreeze the fish as soon as possible after the activity.

## Activity

### Warm-up

- 1 If you have several small fish aquariums or bowls with small fish such as goldfish or minnows (one aquarium for each group of four or five students), start the lesson by dividing the students into groups. If small aquariums and fish aren't available, proceed to Step 2. Have the student groups observe the fish in their aquariums or fish bowls. Have the groups feed their fish by dropping in a small amount of fish food. Ask students to observe the fish. Ask students how the fish knew that food was available. How did the fish find the food? List responses on the whiteboard, interactive whiteboard, or overhead. The students will suggest that the fish *saw* the food, *smelled* the food, *heard* the food drop in the water, and so forth. On the whiteboard or overhead, ask students to list the parts of a fish that enable it to perform the functions they noted. (Eyes, nose or nostrils, ears, mouth with tongue or taste buds.) Have students look closely at the fish in the aquariums or fish bowls. Can they find eyes, ears, noses, taste buds, and other features? Some are more easily seen than others—some features are inside the fish and some are extremely small.



Frozen fish can be reused approximately five times if immediately refrozen after each use.



Do not eat fish that have been used for fish printing.



Some people are allergic to the slime on fish. Ask your students if anyone has this allergy prior to distributing and working with fish.

**2** Read this paragraph to the class:

There it is. A big sunfish. Right at the end of the dock. An easy catch! You run and get your rod. You cast a big, juicy worm right in front of its nose. The sunny swims closer. It stares at the wiggling worm. It appears ready to bite. But it doesn't—instead, it slowly swims away. What happened? Why didn't the fish bite?

- Ask the students if they've ever gone fishing without catching any fish. Discuss what may be happening when fish don't bite. Did it see you? Maybe. It might even have felt, heard, and smelled you. Fish can smell, taste, feel, hear, and see—just as people do.
- Review with the students our five senses of sight, touch, smell, taste, and hearing. Have them identify where their major sense organs are located. Ask the students how many senses they think fish have.

**Lesson**

- 1** Place each fish on a paper plate and distribute one to each student. Initially, some students may be reluctant to handle the fish. Encourage them to touch the fish, and work slowly with them until they begin to feel comfortable. Remind students that the fish are real and that they should be handled gently. Explain that you will reuse the fish with others later.
- 2** Discuss fish senses. Compare and contrast fish senses with human senses. Start with the sense the students notice first. Using a prepared fish specimen or the **Fish Senses Sheets**, point out the major organs associated with the sense, and have students follow along by finding the structures on their fish.

**Taste**

- Locate the tongue in the fish's mouth.
- Point out the similarities and differences between fish and human senses of taste. (Similar: fish have tongues with taste buds. Different: fish have taste buds on other parts of their bodies, too.)
- Ask the students, how taste buds help a fish survive in its environment.

**Smell**

- Locate the nostrils: two tiny openings on either side of the snout.
- Point out the similarities and differences between fish and human senses of smell. (Similar: fish have openings used for smelling on each side of their snouts. Different: fish use their noses only for smelling, not for breathing.)
- Ask students how they think nostrils help a fish survive in its environment. (Examples include: finding food, sensing contaminants, and locating spawning areas.)

**Sight**

- Locate the fish's eyes.
- Point out the similarities and differences between fish and human senses of sight. (Similar: most fish have two eyes, which they use to see objects. Fish see colors and their eyes have pupils. Different: Fish eyes operate independently. Fish don't have eyelids, and their pupils are fixed. Most fish can see only short distances.)
- Ask students how they think a fish's eyes help it survive in its environment.

**Hearing**

- Fish ears aren't visible from the outside of its body—they're located underneath the skin near the eyes.
- Point out the similarities and differences between fish and human hearing. (Similar: fish have the same general inner ear structure as people, and they use their ears for balance and to hear vibrations. Different: fish ears have no external openings.)
- Ask the students how hearing helps fish survive in its environment.

**Lateral Line**

- Locate the lateral line along the sides of the body from the gill flaps to the tail. It resembles a line of sewing stitches.
- Point out that the lateral line is something that humans don't have, and that the nerve endings in the lateral line help fish feel vibrations.
- Ask students how the lateral line helps a fish survive in its environment.

**Touch**

- Point out the similarities between fish and human senses of touch. (Similar: both have a sense of touch. A sense of touch helps a fish avoid bumping into things, and to react quickly if they do.)
- Ask students how the sense of touch helps a fish survive in its environment.

- 3 Review the history of gyotaku and explain the process of fish printing.
- 4 Direct the students to take their fish to the tables covered with newspapers. Set out the containers of paint, clean water, paintbrushes, paper, and paper towels.
- 5 Have students gently pat their fish dry with a paper towel. The students might wish to spread out the tail fins and other fins of the fish. Then, using a paintbrush, they should apply a *thin layer* of paint over the fish. *Using less paint produces a better print that will reveal more detail.* Encourage the students to identify and explain the functions of the fish's parts as they paint their fish. You may suggest painting these parts (the eyes, fins, gills, tails, lateral line, and mouths) different colors.

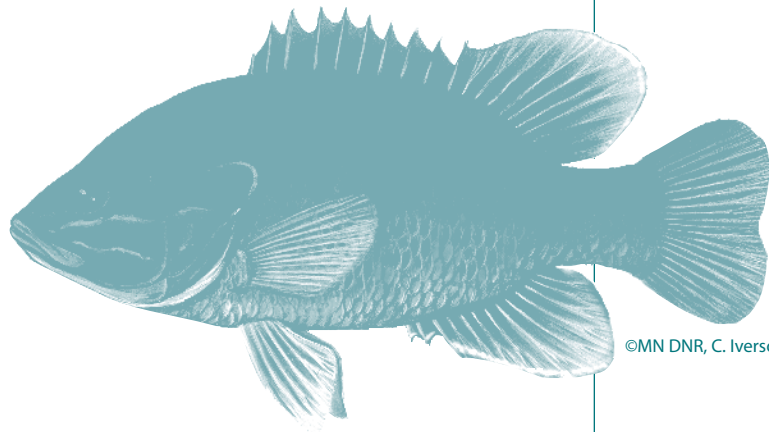
- 6 When students have finished painting their fish, they should gently place a sheet of paper on top of the fish. They should blot or gently pat the paper—do not smooth, push, or rub the paper, or the print will smear. Carefully pat all parts of the fish from the tip of the snout to the tips of each fin without moving the paper. Slowly lift the paper and view the work of art! A second print, done without applying more paint, sometimes shows more detail than the first. Again, less paint works better! Help students notice the details, like the scales and the rays of the fins. What other parts of the fish can they identify from their prints? To do additional prints, wash the fish in the bucket of water and repeat the above steps.
- 7 When the student is satisfied with a print, have them add the basic habitat needs of that fish to the background. (Food, shelter, space, and water containing dissolved oxygen.)
- 8 Ask the students to write their names on their prints. The prints should be moved to a safe place for drying. Using clothespins to clip the prints on a clothesline works well.

### Wrap-up

- 1 Review the six fish senses.
- 2 Ask students to name some parts of the fish and describe the function of each part.
- 3 Ask students to think of other ways, besides senses, in which fish and people are similar or different. For example, both eat food, but different kinds of food; and both need shelter, but different kinds of shelter.
4. Discuss with students the ways to make sure that fish don't "sense" them when they go fishing. Examples include:
  - Stay low when fishing in shallow, clear water. If you stand tall in the boat or at the water's edge, the fish will probably see you and become wary and less likely to bite.
  - Try lures of various colors. Some colors work better than others, depending on water clarity, depth, time of day, and the kind of prey available to the fish in their particular lake or river. Most expert anglers prefer to use dark lures at night because, contrasting against the sky, they show up clearly. (The sky is usually lighter than the surrounding water.)
  - Keep hands clean while handling lures. Bass are especially repelled by DEET, a chemical found in many insect repellents.
  - Match your bobber size to the size of fish you want to catch. With smaller fish, like sunfish, use small, slender bobbers that better indicate slight bites. A sunfish can bite bait, taste it, and spit it out in an instant, and anglers can miss the signal to set the hook. You can miss many light bites if your bobber is too large.
  - Be fairly quiet while fishing to keep from scaring the fish away. Avoid running on the dock, making loud noises in the boat, or unnecessarily disturbing the water.

## Assessment Options

- 1 Have students create two prints. One print can be designated their artistic version. The student should create the second print to demonstrate knowledge of fish senses by labeling the part of the body associated with each sense. Have students include a written description of each sense on the second print.
- 2 Have the students teach fish senses and fish printing to a younger class. They can decide how they might teach younger students about fish senses, but they should include comparing fish senses to human senses.
- 3 Students can write a play about how fish use their senses to help them survive in their aquatic environment. Plays should include all six fish senses.
- 4 Have students create a poster describing what anglers can do to avoid detection by fish and address all six fish senses.
- 5 Reread the paragraph in Step 2 of the Warm-up. Ask students why the fish didn't bite.
- 6 Assessment options include the Checklist and Scoring Rubric on the following pages.



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Checklists are tools for students and instructors. Checklists involve students in managing their own learning. They help students understand and set learning goals before the lesson begins, and help them monitor their progress during the lesson, ensuring that they meet learning goals and objectives by the end of the lesson. Students can also use checklists to discover areas that may need improvement. Checklists help instructors monitor each student's progress throughout the lesson, facilitating appropriate adjustment of instruction to ensure learning by the end of the lesson. The instructor may wish to have students add several of their own learning goals to the checklist to personalize it, and to accommodate varied learning needs and styles.

### Grade

#### 23-25 points = A

Excellent. Work is above expectations.

#### 20-22 points = B

Good. Work meets expectations.

#### 16-19 points = C

Work is generally good. Some areas are better developed than others.

#### 12-15 points = D

Work does not meet expectations; it's not clear that student understands objectives.

#### 0-11 points = F

Work is unacceptable.

## Fish Sense Checklist

Possible Points	Points Earned	Points Earned	
	Student	Instructor	
6	_____	_____	Student can locate all six senses on a fish.
6	_____	_____	Student can describe each of the fish's six senses.
3	_____	_____	Student can make a fish print using paints carefully and without assistance.
2	_____	_____	Student's fish print shows details of fins.
2	_____	_____	Student's fish print shows details of scales.
3	_____	_____	Student cleans up afterward.
3	_____	_____	Student explains how knowing about fish senses can be helpful when you go fishing.
<b>Total Points</b>			
<b>25</b>	_____	_____	<b>Score</b> _____

*Fish Sense Scoring Rubric*

Fish Sense Criteria	4 Excellent	3 Good	2 Fair	1 Poor	0 Unacceptable
<b>Fish senses</b>	Locates all six senses on a fish.	Locates five senses on a fish.	Locates four senses on a fish.	Locates fewer than three or fewer than three senses on a fish.	Unable to locate senses on a fish.
<b>Fish sense description</b>	Describes each of the six fish senses.	Describes five fish senses.	Describes four fish senses.	Describes three or less of six fish senses.	Unable to describe fish senses.
<b>Fish print</b>	Makes a fish print, carefully using paints without assistance. Print represents a real fish and shows details of fins and scales. Cleans up afterward.	Makes a fish print, using paints with minimal assistance. Print represents a real fish and shows detail of fins and scales. Cleans up afterward.	Makes a fish print using paints, but print doesn't show details such as fins and scales. Must be prompted more than twice to clean up afterward.	Makes a fish print using paints, but needs much assistance. Print doesn't show details of the fish. Cleans up reluctantly.	Doesn't complete fish print or clean up afterward.

Score \_\_\_\_\_ (Calculate score by dividing total points by number of criteria.)

## Diving Deeper

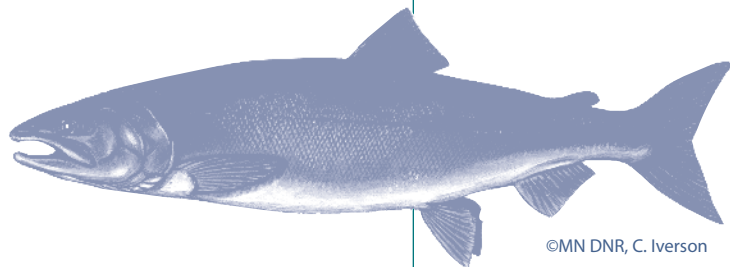
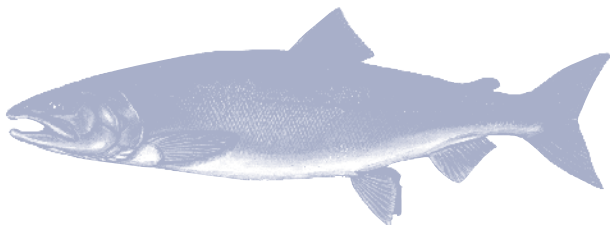
### Extensions

- 1 Make fish prints on T-shirts with fabric paints. To prevent paint from soaking through to the other side of the shirt, place a layer of paper inside the shirt before printing.
- 2 Invite an artist to your class to demonstrate how other media can be used to produce fish art.
- 3 Help your students find elementary student pen pals or chat pals from Japan. Have them ask their pals about fishing in Japan. They can also share information about Minnesota fish and fishing. Ask students to write a report on what they learn about the history of fishing in Japan, the importance of fishing in Japan, or their pen pals' experiences with fish and fishing.
- 4 Visit a museum to look for other examples of fish in art.
- 5 Discuss the structure, function, and names of the various fish fins. For additional information on fish fins, see **Lesson 2:2—Fins: Form and Function**, or conduct an Internet search using the keywords “identifying fish fins.”
- 6 Visit the Minnesota DNR website and read the article “Fish Senses,” from the *Minnesota Conservation Volunteer* magazine, May-June 1996.
- 7 Administer a short quiz, or play a game of Fish Jeopardy, including these questions:
  - A fish can't see in this direction.  
(What is directly behind it.)
  - Fish do this with bones (ears) beneath the skin.  
(What is hear.)
  - Catfish barbels (whiskers) have this sense.  
(What is taste.)
  - Salmon find their way back to spawning streams with this sense.  
(What is smell.)
  - This row of tiny holes runs along each side of a fish to sense vibrations.  
(What is the lateral line.)
  - These abilities can help a fish to better survive in its environment.  
(What are senses.)
  - This is a way to record your catch if you don't have a camera!  
(What is gyotaku, or fish printing.)

## For the Small Fry

### K-2 Option

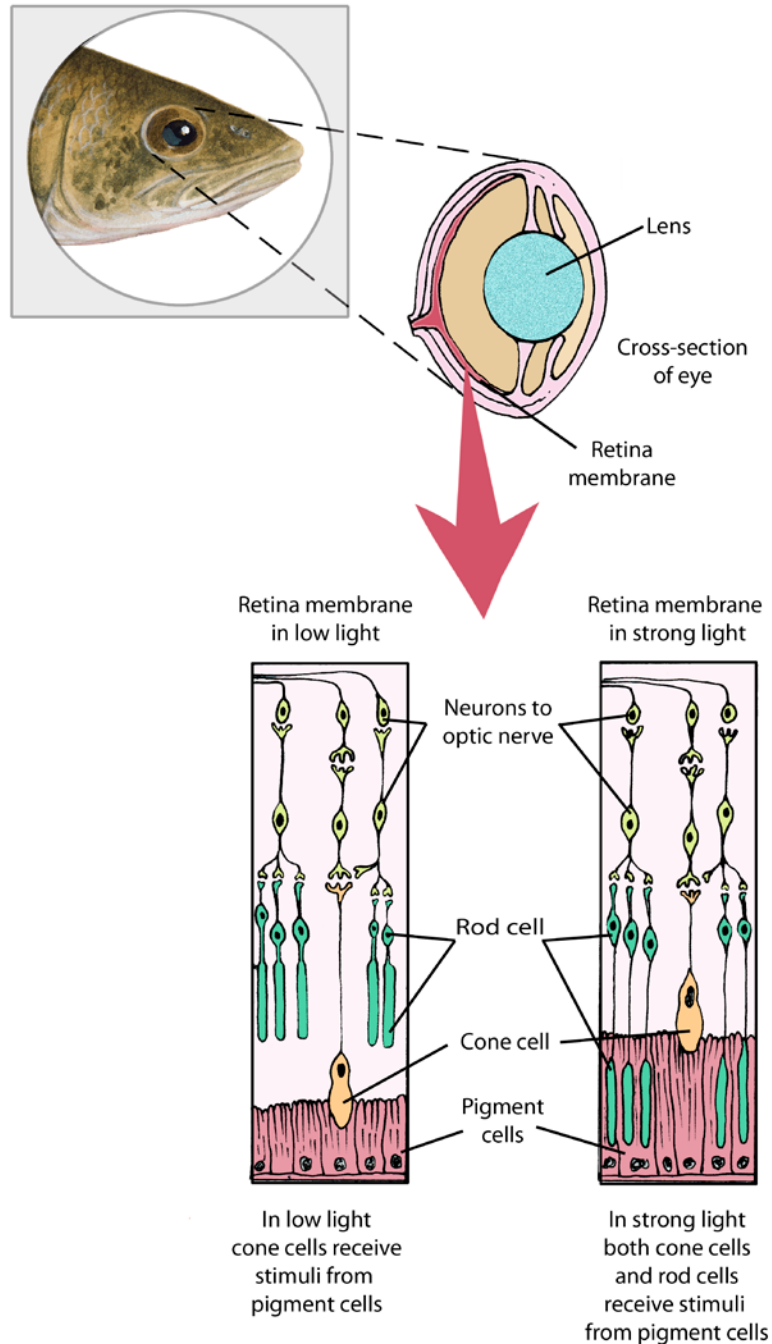
- 1 This lesson works very well with K-2 students as long as you keep the activities simple. You may also want to check out a Fishing Trunk from the Minnesota DNR. The trunk contains the book *Fish Faces*, as well as other materials useful for teaching younger students about fish senses.
- 2 Ask students if they they've ever gone fishing. Be sure to allow enough time for students to share their stories. You may wish to read a storybook about fishing or fish in their habitats aloud.
- 3 Review people's five senses with the students. The book, *My Five Senses*, by Alike is an excellent introduction. Allow time for the students to experience their senses if this is a first time exposure to the topic.
- 4 Work in small groups, having students handle and look at real fish to discover their sensory organs. Have students find the sensory organs that are similar to ours. How are the features similar or different from their own eyes, ears, nose, and mouth?
- 5 To help students understand how a lateral line works, take a vibrating tuning fork and place it on the surface of water in a clear glass or bowl. Observe how the tuning fork vibrates with its sound, and how the vibrating fork makes waves that radiate through the water.
- 6 Do the gyotaku (fish printing) activity. This affords students the opportunity to touch and closely observe actual fish. Rubber fish replicas molded from castings of fish are available at arts and crafts, science, and nature supply catalogs, and can be substituted for real fish in the fish printing activity.



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## Fish Senses Sheets

### Sight

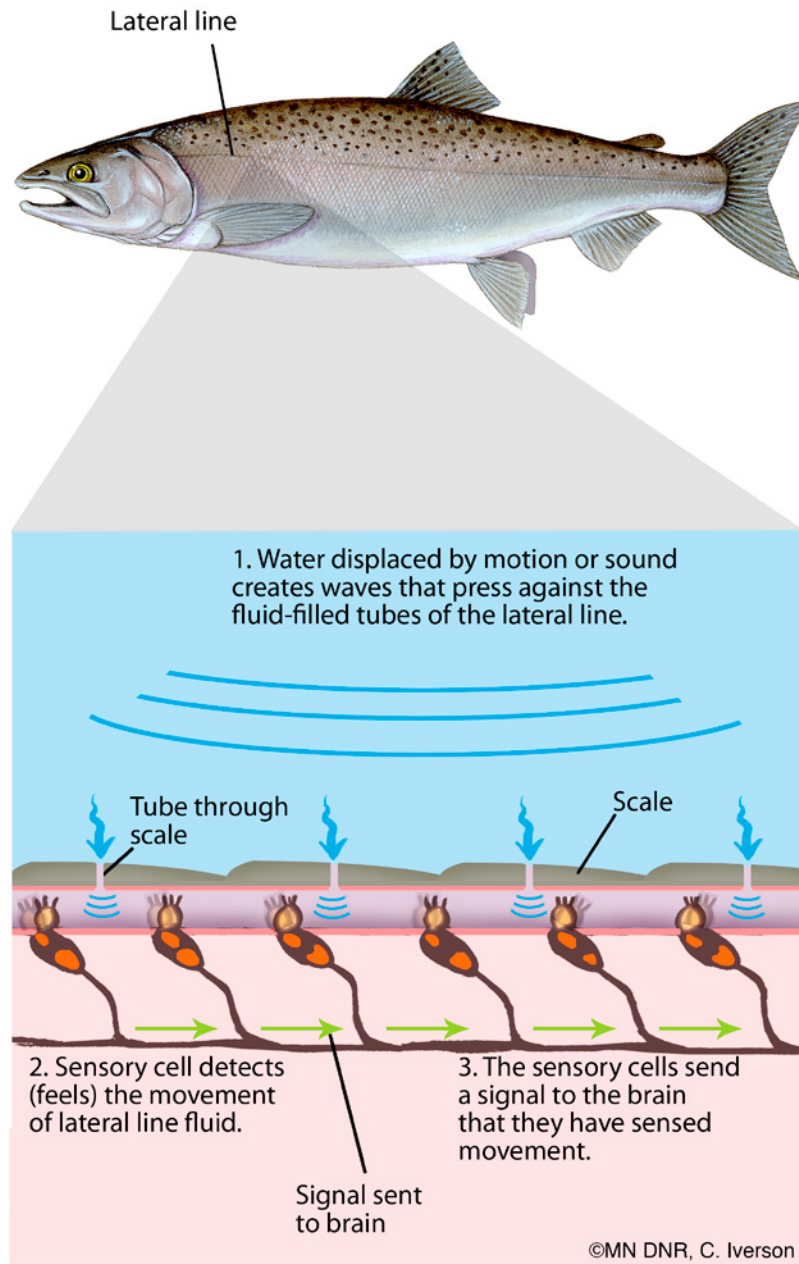


Fish have fixed pupils and no eyelids. They have excellent close-up vision and poor long-distance vision. Most fish species' eyes are located on the side of the head, allowing them to see in every direction except directly behind their tail fins. Scientists believe that fish can see at least 24 shades of color.



## Fish Senses Sheets

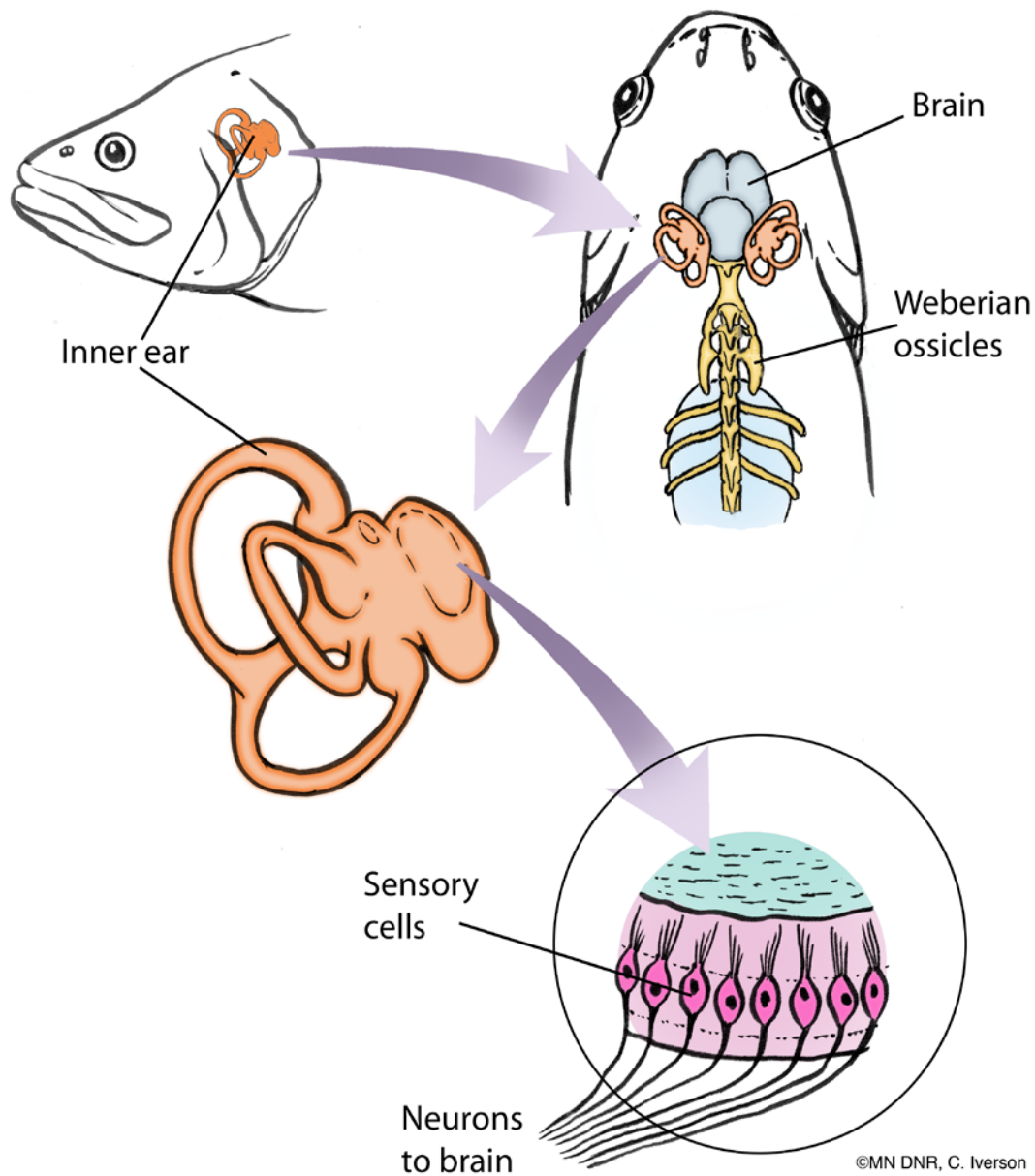
### Lateral Line



Fish “feel” vibrations in the water with their lateral lines, a network of ultra-sensitive nerve endings that run along either side of a fish’s body from the gills to the tail. No other vertebrate (animal with a backbone) has this sensory organ. The lateral line helps fish swim with precision in tight schools, navigate narrow streams, detect approaching predators, and find food.

## Fish Senses Sheets

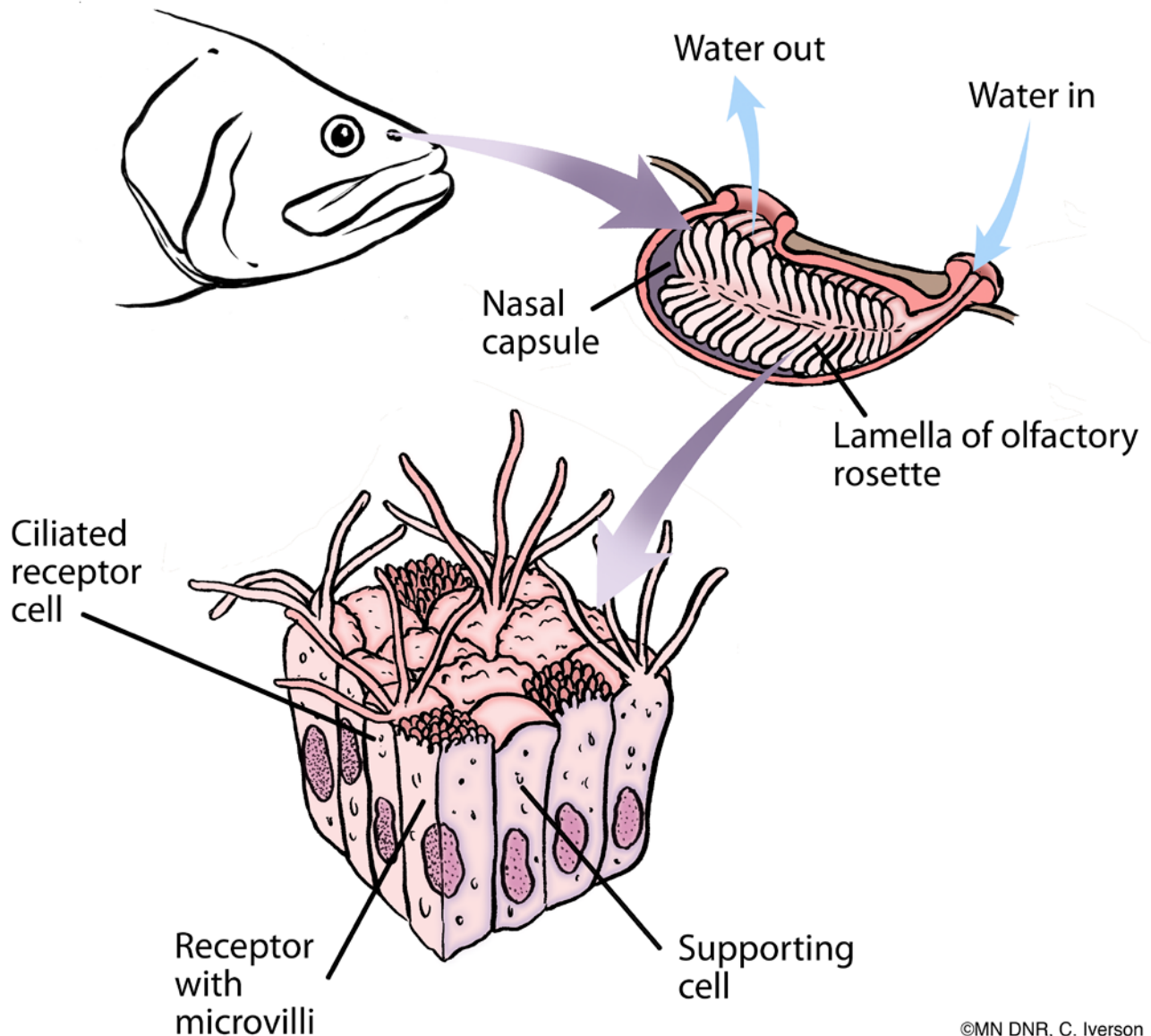
### Hearing



Fish ears don't have external openings. The inner ear provides both hearing and balance. Scientists believe that the lateral line is an extension of the hearing mechanism. Sound travels very well through water, and fish are quite good at detecting and reacting to sound waves that signal food or danger. For instance, they can easily detect a school of bait fish moving in the water, or the noise of a tackle box scraped along the deck of a boat.

## Fish Senses Sheets

### Smell

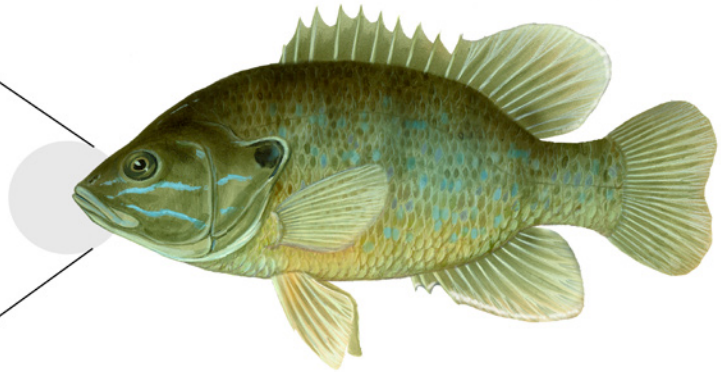
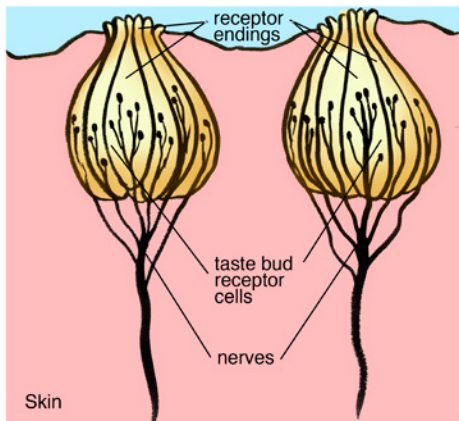


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Fish have four nostrils, or nares—two on either side of their snouts. Each nostril is a simple pouch with a flap. Water enters through the opening of one nostril on each side, passes over the sensory lining of the pouch, and exits through the second nares, which are behind the first nares. The nostrils in Minnesota fish serve only as organs of smell (not for breathing), and have the same olfactory connections to the brain as those of higher animals. Fish use this sense to find food, detect danger, and find their way back to their original spawning areas.

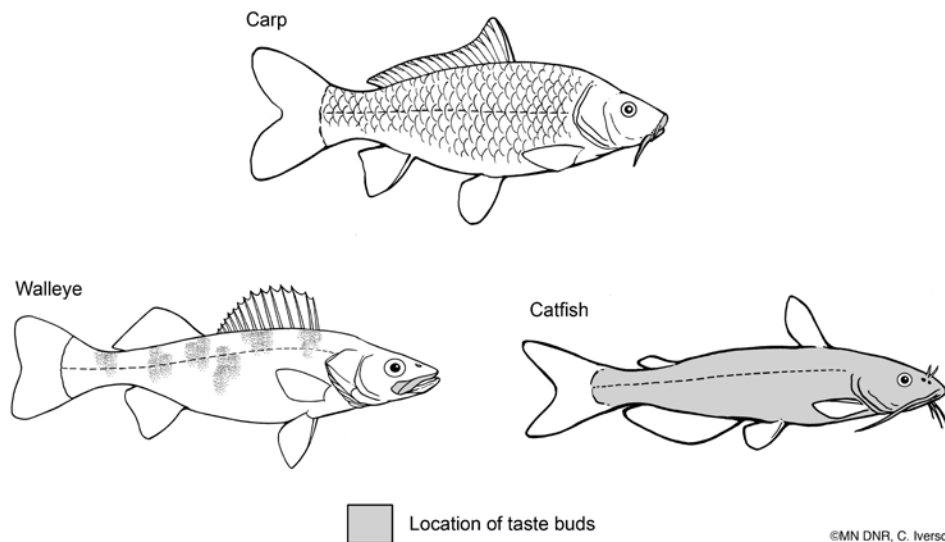
## Fish Senses Sheets

### Taste



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Fish have taste buds on the lips, tongue, and other parts of the mouth. Some fish species have taste buds on body surfaces, fins, and even the eyes!



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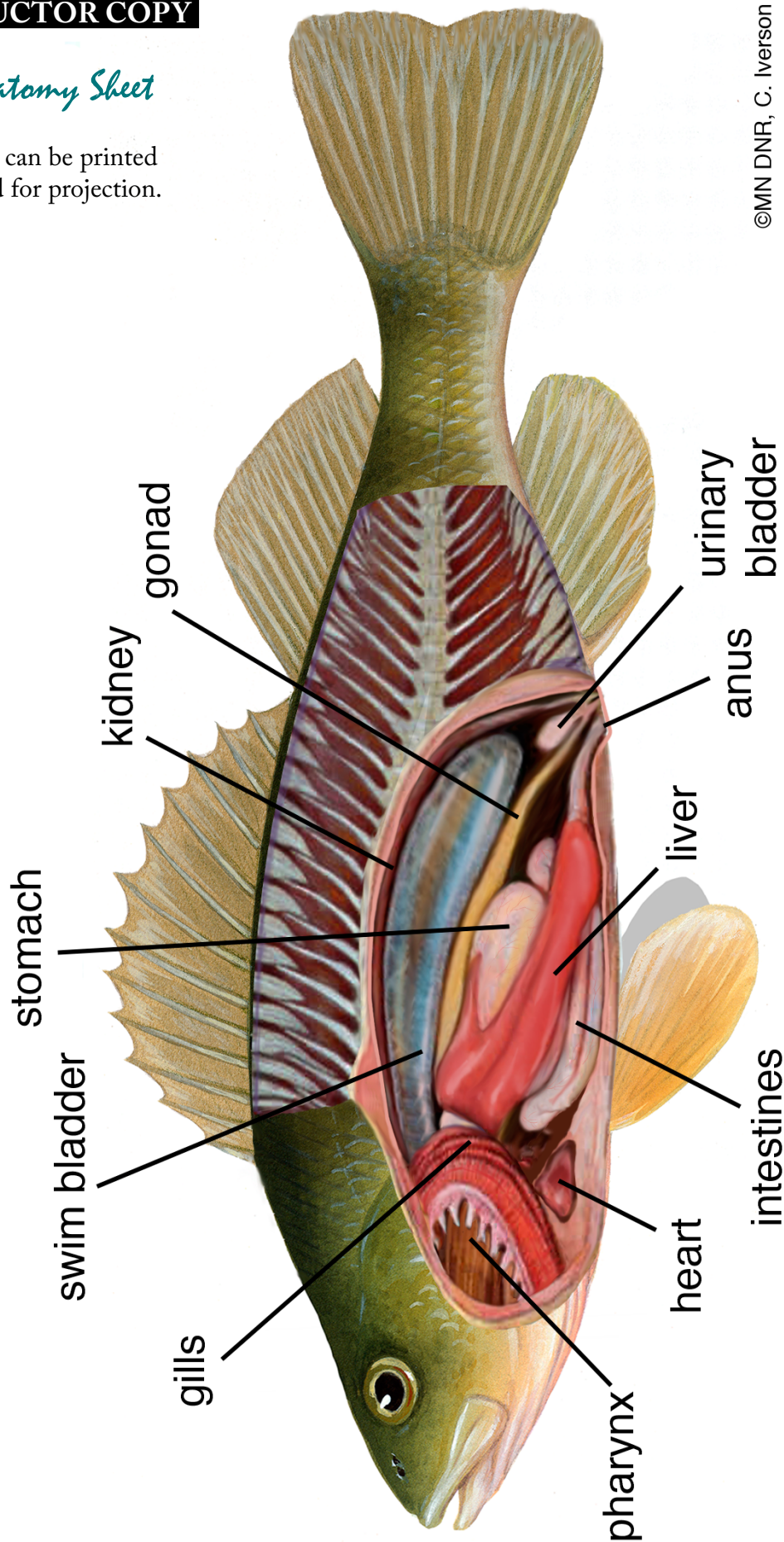
Fish taste by means of structures similar to human taste buds. Fish can distinguish between sweet, sour, salty, and bitter tastes. Some fish have taste buds over their entire bodies as well as on their tongues. Some fish have special features known as barbels, or “whiskers,” that are covered with taste buds. One scientific study measured a 22-centimeter bullhead and found 20,000 buds in the mouth and throat and 175,000 buds over the rest of its body. Fish in the catfish family have more taste buds than other fish species.



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*Fish Anatomy Sheet*

This image can be printed or prepared for projection.



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