

Grade Level
4 - 12

Duration
1 - 1 ½ hours



Subject/Subject Area

Science, language arts;
Analysis, application,
communication,
comparing similarities and
differences, description,
discussion, drawing, small
group work, using time
and space, writing.

Materials

For each pair (or group) of
students:

- Whole body fresh fish
- Dissecting trays or thick pads of newspaper
- Scissors or Scalpel (Most cuts can be made with a pair of classroom scissors)
- Probe (A large partially straightened paper clip works well)
- Forceps (A nice tool but not necessary)
- Paper towels and newspaper
- A photocopy of fish anatomy
- Hands lens
- Student worksheets (optional)
- One sharp knife (for the teacher)

LSSS

4-LS1-1; 4-LS1-2;
4-ESS2-3; 6-MS-LS2-1;
6-MS-LS2-2; 7-MS-LS1-3;
8-MS-LS4-2

EXPLORE A FISH

FISH DISSECTION

FOCUS OVERVIEW

Students will examine the external and internal anatomy of various fish species. They will note similarities and differences. Students will then use their observations to make inferences about the relationships among them.

BACKGROUND INFORMATION

This activity gives students first-hand experience exploring the adaptations which allow fish to function in their environment. Students look at both form and function of different systems to help understand how specific adaptations assist organisms in adapting to their environment. How do fish move through the water and keep their vertical position within the water? Students can make comparisons between their own anatomy and the anatomy of a fish.

It is important for students to understand the purpose of this activity is to study the internal and external anatomy of a fish. It requires concentration, listening skills and being able to follow directions. All students should be given the option of not participating in the activity and be allowed an alternate activity. You may want to do a practice run on your own.

You can either do this activity as a teacher-led class discussion or break the students into cooperative learning groups and give each group: a fish, "Explore a Fish" worksheet, dissection and anatomy sheet, newspaper and something to cut the fish with.

It is helpful to have students read the handouts "What's a Fish," "How Do Fish..." and "Fish Biology" prior to this activity.

TIPS ON BUYING FISH

Whole, uncut (uncleaned) fish are not easy to find. Most markets clean the fish before putting them on display. Asian food stores generally have a tremendous variety of whole bodied fish and are relatively less expensive than most retail fish markets. If you don't know of an Asian market near you, look in the yellow pages under "grocers - retail." You can also look in the yellow pages for "fish - retail," but these will probably be more expensive. Another possibility is to talk with the fish manager at your local store well in advance of needing your fish. We have limited success with this as supermarkets generally only receive a few species of fish and it is hard to obtain them whole body.

Buy several types of fish with a variety of body shapes, scale size, and other interesting features. Or keep some of your catch or ask students to keep some of their catch next time they go fishing.

LEARNING OBJECTIVES

Students will:

- Name characteristics of fish.
- Identify internal & external anatomy.
- Describe form and function of different organ systems.

PROCEDURES

Pre-Activity Discussion

Discuss in groups or use to lead class discussion: (answers are in italics)

- **What is a fish?** (*A fish is a cold-blooded animal with a backbone which lives in water, breathes oxygen through gills, and has fins.*)
- **What do fish need to survive?** (*Food, water, air, shelter.*)
- **Where do they live? Is it the same for all fish?** (*Fresh and salt water.*) (*In the water column; bottom dwellers vs. swimmers.*)
- **What body parts do fish have that people lack?** (*Gills, fins, body slime, scales, lateral line, cold blood.*)
- **What do both fish and people have in common?** (*Backbones, eyes, nose, mouth, teeth, stomach, intestines, heart, liver, bones.*)
- **What specialized adaptations do fish have for their aquatic lifestyle?** (*Streamlined body, fins, gills, cold blood, teeth in rows, slime to keep clean.*)
- **How do people affect fish habitat?** (*Pollutants including soaps and other household products enter creeks, rivers, bays and oceans by way of storm drains: habitat destruction: building along river banks: bank destabilization.*)

ACTIVITY

Student Investigation:

1. Explain the proper use of each tool.
 - a. The scissors are used for cutting into the specimen.
 - b. The probe is used to gently move tissue or organs to gain better access.
 - c. The forceps are used to grasp small pieces like the gill filament.
2. Group students according to age and ability level.
3. Provide each group with scissors, a probe, forceps, a fish, and the student worksheets.
4. Walk the students through both the external and internal procedures of examining the fish using your own fish as an example. This ensures that the students can duplicate your actions. Using a document camera to project your example fish on a large screen would be useful as well.
5. As you progress through the procedure, make sure students are following along with you and their worksheets.



6. Have each group be responsible for the clean-up of their area. (See “Post work/Clean-up” located after internal anatomy procedure)
7. Recycle the fish by cooking them (depending on how long they have been out of refrigeration), burying them in a garden, or they may be used in fish printing.
8. Students will present their findings to the class orally and show their individual drawings to their classmates. (The students can hang up their drawings to compare and contrast with one another.)

NOTE: Warn students that some spines on the fins are sharp.

External Anatomy Procedure:

The following pages are provided as teacher reference and to assist you in leading a teacher guided exploration. Students’ worksheets are included to allow a student guided exploration.

Body Covering

- How does the body feel? (*Slimy*)
- What is the purpose of the slime? (*Protects against disease and reduces friction so they can glide through the water*)
- What else covers the body of the fish? (*Scales or skin for some fish such as catfish*)
- Remove some scales and observe them with a hand lens.

A fish may have a particular coloration pattern that is obviously used for camouflage. Some fish that appear silver may look dark on top and light on the bottom. When viewed from the bottom, the light underbelly blends in with the light from above. When viewed from above, the dark back blends in with the dark of the water depths. This is effective protective coloration.

Fins

- Examine the dorsal fin. The dorsal fins can be splayed out by using the probe and pushing forward on the leading ray or spine of the fin. What does it do for the fish? (*Balance*)
- Examine the skin between the rays, describe its appearance. (*Transparent*)
- Look at the caudal fin. What is its function? What shape is it? (*Propulsion*)
- What is the anal fin used for? (*Balance*)
- Count the rays on the anal fin.
- Examine the pectoral fin. Rotate the pectoral fin. Notice its range of movement. Why do you think it is like this? (*Maneuverability*)
- Ask students why spine-like fins may be an advantage. (*Sharp fins are good for protection against predators.*)

Lateral Line

- Locate the distinctive visible line that divides the fish from top and bottom. The lateral line senses vibrations in the water and can detect pressure changes.
- How does this help the fish? (*It helps them orient to their environment; i.e., navigation and schooling and helps fish detect predators and prey.*)

Mouth

- Open the fish’s mouth. What do you notice?
- Why do you think it opens so wide?
- Feel the tongue of the fish. What do you notice? (*Teeth*)
- How might that help them or why might that be an advantage? (*Helps keep prey from escaping.*)



Operculum

- Using the probes, lift the operculum (gill flap) and look at the gills.
- What might be the function of the operculum? (*Separate the gill filament.*)
- Count the number of gill arches.

Eyes

- Observe the eye, how does it differ from yours? (*It doesn't have an iris.*)
- Touch it gently. What does it feel like?
- The lens of the fish eye is a spherical shape without being attached to muscles in the eye like our own.

Internal Anatomy Procedure:

Opening the Body Cavity:

NOTE: Demonstrate opening the body cavity before having the students try it.

1. Locate the two openings on the ventral side of the fish. One is the vent (anal), the other urogenital.
2. Insert the sharp point of your scissors into the opening that is closest to the pelvic fins (the vent).
3. Make an incision from the vent along the belly of the fish to underneath the gills. Be careful not to cut too deep or you'll damage the internal organs. (Students often have trouble cutting through the bone and cartilage between the pelvic fin especially if the scissors are dull.)
4. Using the ventral fin to lift the rib cage, snip along the incision carefully until you've cut through the ribs and entered the body cavity.

The first obvious organs you'll see are the liver and heart.

Heart

- Locate the fish's heart which is directly below and just behind the gills.
- Why would it be important for the heart to be located close to the gills? (Allows fish to quickly get oxygen to the heart.)
- Notice that there are two main chambers of the heart (some text will list it as four chambers). Blood flows from the heart to the gills and then directly to the body where oxygen is used and carbon dioxide is made. The blood carrying carbon dioxide goes back to the heart.

Liver

- The largest and easiest internal organ to find is the liver. The liver is a chemical factory and a storehouse. It produces bile which is stored and concentrated in the gall bladder and used to break down fats in the digestive system.
- Cut the connective tissue of the liver and fold it back.
- The upper part of the liver is connected to the stomach. It can be carefully snipped away from the stomach and underneath is the gall bladder.

Gall Bladder

- The gall bladder is attached to the liver. It is a pretty hard organ to find. It looks like a little greenish-bubble attached underneath the liver.
- The gall bladder stores bile which is transmitted into the digestive tract. Fold the liver back with the probe and trace the complete digestive tract.



Digestive Tract

- The digestive tract consists of the esophagus, stomach, and intestines.
- The stomach is the larger sac leading from the esophagus.
- Some fish have a pyloric stomach which is an organ that increases the amount of surface area for digestion with little finger-like appendages.
- If you fold the stomach back you will find the spleen; a dark, black-red organ attached to the posterior end of the stomach. It is part of the circulatory system. It stores and forms blood.
- The rest of the digestive tract is the intestines for absorption of nutrients.
- The anal opening is for excretion.
- The stomach can be cut open to examine the contents but it is rather smelly and sometimes hard to identify the contents.

Reproductive Organs

- The reproductive organs are attached to the urogenital opening located directly behind the anus.
- The ovaries, if the fish is female, may be in different stages of development.
- The testes, if the fish is male, are white flaccid organs that produce sperm.
- The digestive system and reproductive organs can be scraped away at this point to reveal the air bladder.

Air Bladder

- How does the air bladder help the fish? (It helps the fish remain suspended without exerting a lot of muscular energy from its fins.)
- How does the air get inside the bladder? (Some fish gulp air into the bladder. However, in most fish, it is a sealed sack, and the gas comes from the fish's blood.)

Kidney

- If you cut away the membrane just below the vertebral column, you will expose the kidneys. They are long and dark in color.
- The kidneys filter waste from the blood and are key organs in balancing the salt in the blood.

Post work/Clean-up:

- When students are finished with the dissection, have them fold all materials into their paper towels/newspaper and set aside a separate trashcan for dissection materials.
- Remind each group to thoroughly rinse and sanitize dissection equipment (water and mild bleach solution, vinegar solution, or other sanitizing agent). Have them dry the equipment and return it to your storage area. Make sure they rinse and dry their tray as well.
- Dispose of dissection material appropriately (ex. Outside dumpster) and immediately.
- Wipe all dissection stations with a sanitizer (mild bleach or vinegar solution).

REVIEW

- What was the most interesting thing you learned about fish?
- What adaptations have fish developed to survive in their environment?
- What anatomical structures do fish have in common with humans?

ASSESSMENT METHOD

- Grade students based on their overall execution of the lesson and their answers to part I of the worksheet.
- You can also use a rubric to score their drawings based on labeling of anatomical features.
- Add a discussion question to a regular weekly test.



EXTENSION

You may want to follow this activity with fish printing.

“Fish Fish Fish” is a modification of this activity that does not involve cutting open real fish.

TEACHER REFERENCES

Websites that contain information on fish species and biology:

- Louisiana Marine Education Resources: www.lamer.lsu.edu
- Barataria-Terrebonne National Estuary Program: btnep.org
- NOAA Education: oceanservice.noaa.gov/education/lessons/welcome.html
- PBS Your Inner Fish: www.pbs.org/your-inner-fish/classroom/
- Aquatic Education Teaching Materials: dnr.wi.gov/topic/fishing/anglereducation/TeachingMaterials.html
- Virginia Tech’s Ichthyology Class page (includes dissection pictures from a variety of species): www.flickr.com/groups/1596382@N24/
- South Carolina DNR’s Educators and Teacher Resources: www.dnr.sc.gov/education/tr.html

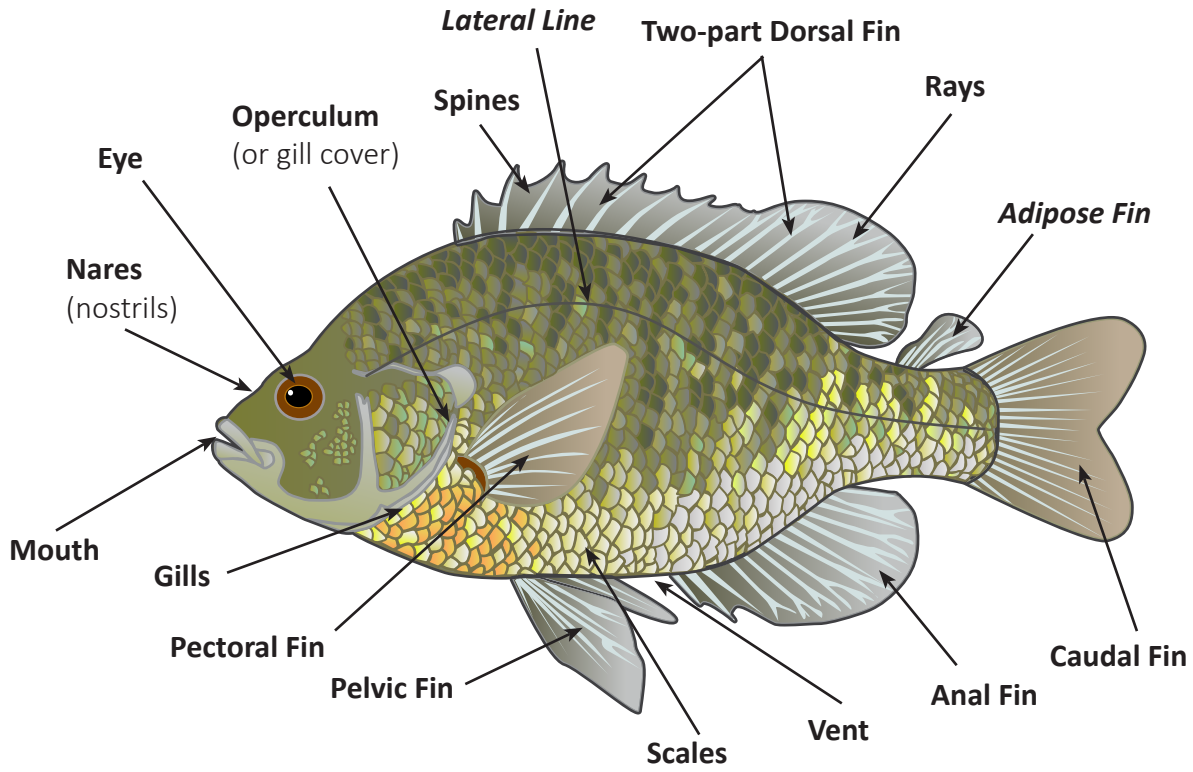
Other lesson plans about fish anatomy and dissection:

- What is a fish?: www.marine.usf.edu/pjocean/packets/f99/f99u2le1.pdf
- Fish Dissection: www.dec.ny.gov/docs/administration_pdf/ifnyfdlp.pdf
- Fish Form & Function – Inside & Out: coseenow.net/mare/files/2012/08/FishFormFunctionInsideOut_ElementaryMiddle.pdf
- Bluegill Anatomy: dnr.maryland.gov/ccs/Documents/education/BluegillAnatomyLessonPlan.pdf
- Fish Dissection: hmsc.oregonstate.edu/sites/hmsc.oregonstate.edu/files/visitor-center/education-programs/docs/previsit_fish_dissection.pdf
- Fish Dissection for 4th grade: oimb.uoregon.edu/Documents/GK12/GK12-Fourth-FishDissection.pdf

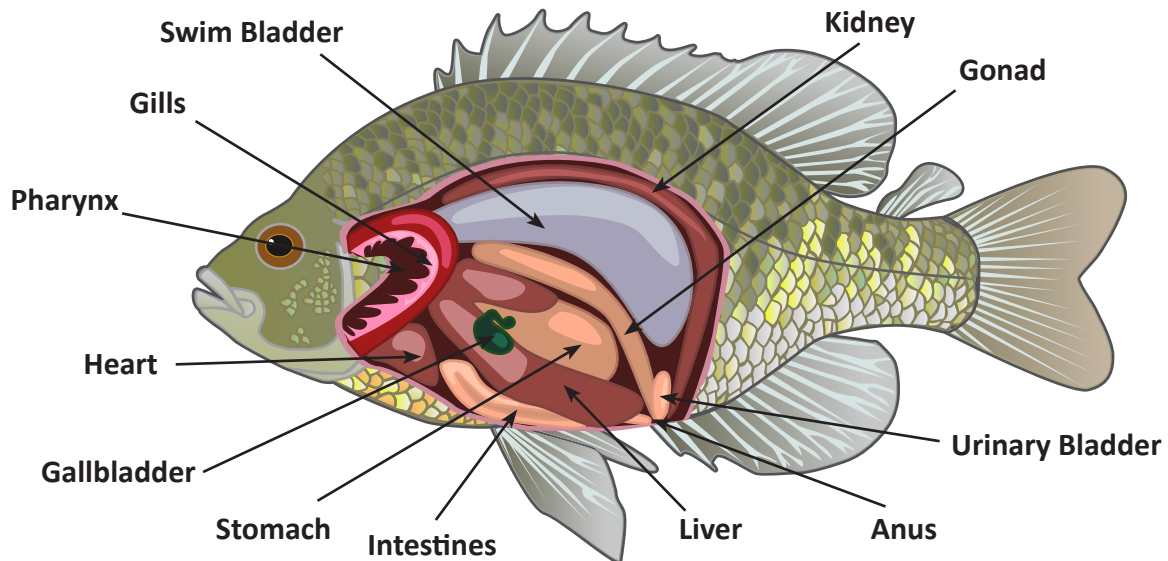


FISH ANATOMY

EXTERNAL FISH ANATOMY



INTERNAL FISH ANATOMY



"EXPLORE A FISH" STUDENT WORKSHEET

1. WHAT IS A FISH?

In a small group, answer the following questions:

- A. What is a fish? (List some characteristics of fish.)

- B. What is their habitat? Is it the same for all fish?

- C. What do fish need to survive?

- D. What body parts do fish have that people lack?

- E. What do both fish and people have in common?

- F. What specialized adaptations do fish have for their aquatic lifestyle?



"EXPLORE A FISH" STUDENT WORKSHEET

As you complete #2 and #3 draw your fish and label the external and internal parts on the separate sheet of paper provided.

2. EXTERNAL ANATOMY

Using the hand lens, carefully examine your fish. Look closely at the scales and the tongue. What do you notice? How does your fish feel?

Identify the following external body parts:

- mouth
- teeth
- adipose fin
- gill cover
- gills
- scales
- dorsal fin
- lateral line
- tongue
- vent
- anal fin

3. INTERNAL ANATOMY

Insert the knife blade in the vent, and carefully cut toward the head, opening the body cavity. Use the fish dissection picture.

Identify the following internal body parts:

- heart
- spleen
- kidney
- stomach
- liver
- gills
- air bladder
- caeca
- reproductive organs
- intestines
- gall bladder



USE THIS SHEET TO DRAW AND LABEL THE PARTS OF YOUR FISH

