



# SCIENTIST IN RESIDENCE PROGRAM™

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**Science Unit:** *Pacific Salmon and their Environment*

**Lesson 14:** *Salmon – Anatomy and Dissection (Primary)*

Summary	Students watch as an adult dissects a salmon. They learn about the <b>internal and external anatomy</b> of a salmon and compare and contrast salmon with humans. Detailed instructions included.
School Year:	2014/2015
Developed for:	Dr. Annie B. Jamieson Elementary School, Vancouver School District
Developed by:	Dominic Tollit (scientist); Beverly Grant and Melanie Dorchester (teachers)
Grade level:	Presented to grade K-2; appropriate for grades K-4
Duration of lesson:	Two classes – 1 hour 10 minutes to review external and internal fish anatomy and 1 hour and 30 minutes for the dissection. Both classes join together in one room for both units.
Notes:	Classes participating in Fisheries and Oceans Canada's <i>Salmonids in the Classroom</i> Program can obtain frozen salmon for dissection by contacting their local DFO Education Coordinator. This lesson is partly based on the activity <i>Dissecting a Salmon</i> created by Beverly Bowler as part of the <i>Salmonids in the Classroom</i> Program. See website with full instructions <a href="http://www.salmonidsintheclassroom.ca/pdf/11-02-18_SIC_Dissection.pdf">http://www.salmonidsintheclassroom.ca/pdf/11-02-18_SIC_Dissection.pdf</a>  An additional salmon dissection lesson which was delivered to older students can be found in the Scientist in Residence Program Unit - "The Journey of a Pacific Salmon" (Lesson 7 – Salmon Anatomy).

## Objectives

- Identify the external parts of the fish and discuss their main function
- Compare and contrast the external and internal anatomy of humans with fish
- Become familiar with the internal anatomy of a fish and the functions of different organs

## Background Information

Fish are vertebrates like humans – both have flexible backbones and internal skeletons. Fish have a number of external features and internal organs that make them ideal for living in an aquatic habitat. Fish also have a number of organs that are identical to humans. The unique features of fish include: fins (for moving in the water), scales, gills (for removing oxygen from the water), swim bladders (for moving up and down in the water current) and a lateral line (for detecting movement). Like humans fish have an esophagus, stomach, intestine, liver, kidney, brains, reproductive organs, skin and a heart. Fish have no lungs, no external ear (but they have an internal ear), no eyelids and a pit for a nostril (used for smelling but not breathing).



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## Vocabulary

Anatomy: study of the parts of an animal

Dissection: To take something apart into smaller pieces in order to better understand it.

Fins: movement (pectoral/pelvic = side to side, dorsal = keeps fish straight, tail = forward)

Scales: protection from abrasions, predators, disease

Slime or mucous: protection from abrasions, predators, disease, easier movement through water

Gills: breathe oxygen from the water

Operculum: gill cover to protect the gills

Lateral line: sensitive to pressure, helps the fish sense movements and objects in the water

Heart: pumps blood around the body (moves oxygen, carbon dioxide, nutrients and wastes)

Stomach: for digestion – to break down food

Intestine: for digestion - to absorb nutrients

Liver: used in metabolism – makes/stores/converts different nutrients and energy

Kidney: used for metabolism/osmoregulation (keeps water and nutrients in balance)

Swim bladder: used for buoyancy (to keep the fish neutral or stable in the water)

Gonads (eggs or testes): for reproduction (males have sperm to fertilize the eggs of females)

## Materials

- 1 salmon (from DFO)
- Newspaper
- Wet wipers
- Screen-linked video camera
- Magnifying glasses
- Venn diagram worksheet
- Knife
- Plates
- Gloves
- Bowl of water
- Tweezers
- Cleaning supplies
- Scissors
- Tray
- Marker pen
- Straw
- Easy access to soap and running water

## In the Classroom

### Introductory Discussion

1. Short description of 'hook' to capture student's attention: How do fish survive in water, do they have special body parts? Has anyone seen inside a fish? What makes a fish a fish? (Brainstorm on board)
  - Cold blooded (always at the same temperature as the water it lives in)
  - Breathes with gills
  - Has fins
  - Flexible backbone



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2. Short description of other items to discuss or review: The fish used in the experiment was provided by DFO, reared specially for science and was killed humanely.
3. Briefly describe science experiment/activity:

Today, you will:

- Learn about the internal and external anatomy of a salmon and how these features work and are adapted for life in water
  - Undertake a full dissection of a salmon to remove and provide hands-on observation of fish anatomy
4. Briefly describe the processes of science that the students will focus on:
    - Students will focus on observation and functions of internal and external fish anatomy. Students will learn what features make fish different from humans and similar to humans.
  5. Briefly describe safety guidelines:
    - Students should wash their hands with soap and plenty of running water immediately after the activity is done.
    - Students will be encouraged to touch and handle fish organs but need to be able not touch their mouth, eyes or nose with dirty hands.
    - Dissection equipment is sharp. No touching of dissection equipment.
    - Windows can be opened to keep smell to a minimum.

## Science Activity #1

### Activity Title: Anatomy of a fish (part 1 – Pre-dissection)

Purpose of Activity: Learn about the internal and external anatomy of a salmon and how these features work and compare with humans.

#### Methods and Instructions:

Set-up prior to experiment: Project on white board a blank diagram of a fish with markings to key externals features.

1. Together identify the external parts of the fish (dorsal fin, pectoral fin, pelvic fin, anal fin, caudal fin or tail, adipose fin, eye, mouth, nostrils, scales, gills, lateral line). Label these parts on the blank fish diagram using the white board app.
2. Discuss the function of main body parts (see dissection text below).
3. Together compare and contrast the external and internal anatomy of humans with fish (e.g. humans = arms/legs, fish = fins; humans = lungs, fish = gills, both have eyes, tongue and mouths, etc).
4. Have students fill out a Venn diagram – What do only fish have? What do only people have? What do both fish and people have? (Use words printed at the bottom of the Venn diagram for student to choose from. Words to include are: fins, legs, arms, eyes, ears, heart, lungs, gills, brain, digestive system, liver, kidneys, stomach, scales, gonads, nostrils, lateral line, mouth, blood, backbone, tongue, teeth, skin.)



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5. Check and help each student on filling out the Venn diagram. Allow them to make predictions of what they think and confirm these predictions in the closure discussion.

## Closure Discussion (part 1)

Go through the Venn diagram and review functions of main body parts that only fish have.

## Science Activity #2

### **Activity Title: Anatomy of a fish (part 2 - Dissection)**

#### Purpose of Activity:

Review external features and to become familiar with the internal anatomy of a fish and to compare fish anatomy with human anatomy

#### Methods and Instructions:

Set-up prior to experiment:

- a. Defrost salmon as necessary. Print out large copy of completed Venn diagram. Put chairs around a central table. Place fish on tray covered in newspaper. Open windows as necessary. Set up video-camera link connection to white board. Label plates for passing around body parts. Label two plates for parts where there are paired parts (like gills, gonads and fins) to be able to pass around table in different directions.
- b. Before starting the dissection discuss animal ethics and the need to treat living (or formerly living) specimens with respect.

Discuss proper behavior:

- Not making a big fuss, yelling or saying “yuck!! gross!!” etc.
- Treating all parts of the animal with respect
- Respecting their classmates, particularly those less comfortable with the activity
- Mention that the fish will smell and that if anyone feels uncomfortable with the smell or what they are seeing that they are welcome to move to the back of the classroom or simply close their eyes and put their head down for awhile.

Do dissection under video-camera following the DFO guidelines: Dissecting a Salmon:

[http://www.salmonidsintheclassroom.ca/pdf/11-02-18\\_SIC\\_Dissection.pdf](http://www.salmonidsintheclassroom.ca/pdf/11-02-18_SIC_Dissection.pdf)

1. Explain that you are going to open up the fish and show them the internal anatomy.
  - Who has ever touched a fish before?
  - What is the first thing you notice when you touch a fish? (it's slimy).
  - What is the slime for? (to help escape predators, slide over rocks, protection from fungus and bacteria, move more easily through the water – aerodynamics).



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2. **Move around the class with the whole fish**, to allow students to touch it and quickly point out anatomy features, including the nostrils, lateral line, tongue and pectoral fins.
  - What covers the fish's body (under the slime)? (scales)
  - What are they for? (protection)
3. **Use the tweezers to remove a few scales** and pass them around with magnifying glasses. Discuss how scales can be used to age a fish. Scrape off some slime to pass around.
4. **Discuss the shape of the salmon.**
  - What shape is a fish? Why? (Streamlined like a bullet – for efficient fast swimming.)
  - What do the fins do? – to help the fish swim, remain stable, balance, steer, propulsion (caudal fin only).
  - A fish swims by flexing its body, which sweeps the caudal fin.
  - Note the adipose fin cut off to mark hatchery fish.
5. **Remove the pelvic fins.** Pass the pelvic fins around and have the students describe them (bone fan with skin stretched between them – so fish do have skin).
6. **Show lateral line.**
  - What is this for? (The lateral line is a specialized sense organ that detects changes in water currents and vibrations in the surrounding water.)
  - Have students blow on their hands and then interrupt the stream of air with a finger. Can they feel the difference?
7. **Ask: How do fish breathe?** (Water passes over the surface of the gills, blood takes up oxygen from the water.)
8. **Show operculum** (gill cover). Remove the operculum and pass them around on plates.
  - What is the purpose of this part of the fish? (A hard cover to protect the gills)
9. **Point to the gills:**
  - What color are the gills? Why? (blood)
  - What do they look like? (branched) Why? (increase surface area).
  - Remove gills, open them up to show gill rakers that prevent food getting into gills and pass around class.
10. **Internal Anatomy:**
  - Now we are going to start looking at the other internal anatomy of the fish.
  - What do you think we are going to see?
  - What organs does a fish have? (Use a copy of the venn diagram on the board – use the list throughout the dissection and check off the parts you find).
11. **Male or female.**
  - How will we know if our fish is male or female?
  - What would we see in each case?
12. **Cut open the fish.** Remove the gonads and pass them around. Discuss both the type of gonads. Present, as well as what would be found in a fish of the opposite sex.



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13. **Liver.** Ask: What is the largest organ inside a fish's body? Hint, it is also the largest organ in our bodies (the liver).
  - Describe the liver makes energy for the body (pass it around).
14. **Heart.** Where would you expect to find the heart? Point out the location and then open the pericardium to remove the heart.
  - Does it look like you expected?
  - What does the heart do? Describe the heart and its functions.
15. **Now let's talk about the digestive system.**
  - When we eat something where does it go?
  - So let's see where a fish's food goes... (insert the straw into the mouth and feed the end down to the stomach. Make sure the students can see that the straw is inside.)
  - Explain the digestive system has many different parts (similar to humans).
  - Show spleen and intestines.
16. **How do fish float?**
  - Does a piece of fish float? (put a chunk of muscle in a cup of water, it will sink)
  - Fish have a special organ called a swim bladder that helps them control their buoyancy in the water. (Show its location internally and then detach the swim bladder and inflate it with a straw.) Twist the ends together so it can be floated in the water container.
17. **The next organ on our list is the kidney.**
  - What does the kidney do? (cleans the blood, produces urine, regulates the salt and water balance of the fish)
  - Remove the kidney with a spoon.
18. **Show flexible backbone and protective ribs.** Cut out a section and pass around.
19. **The last organ on our list is the brain.**
  - We will look at that in a few minutes but first let's talk about the five senses.
  - What are they? (smell, sight, touch, taste, hearing).
  - **How do fish see?** Eyes like us. (Remove and pass around.)
    - They can rotate individually and so fish can see forwards and backwards at the same time (good for escaping predators).
  - **How do fish smell?** – show nostrils. (Explain how the nose is not continuous with the mouth/ears like in humans. Nostrils are simply small dents that contain scent organs.)
    - What would fish use their sense of smell for? (finding food, avoiding predators or pollution, finding their natal stream).
  - **Do fish have external ears?** (no)
    - Can fish hear? How? (Inner ears and also lateral line)
  - **Do fish have taste buds?** (Yes. Used to find natal stream.)
  - **How do fish feel touch?** (They have nerves in their skin just like we do, also the lateral line assists with this function.)



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## 20. Now let's look at the last organ on our list, the brain.

- Have students guess how large the brain will be.
- Carefully remove the brain and pass it around.
- Discuss the difference in relative size when compared with a human brain. Students will likely be surprised with the small size of the brain. Discuss fish are born with instinct to travel back to natal stream – they do not need to learn how.

## Closure Discussion (Part 2)

Review internal anatomy and what is similar and what is different between fish and humans.

- Both have: an esophagus, stomach, intestine, liver, kidney, brains, reproductive organs, heart.
- Fish have a swim bladder and gills.
- Humans have lungs. Allow if time permits the students to review their Venn diagrams.

## References

Fisheries and Oceans Canada. 2009. Salmonids in the Classroom – Primary. Fisheries and Oceans Canada. Also available online at: <http://www.pac.dfo-mpo.gc.ca/education/primary-primaire/index-eng.html>.

## External anatomy image

