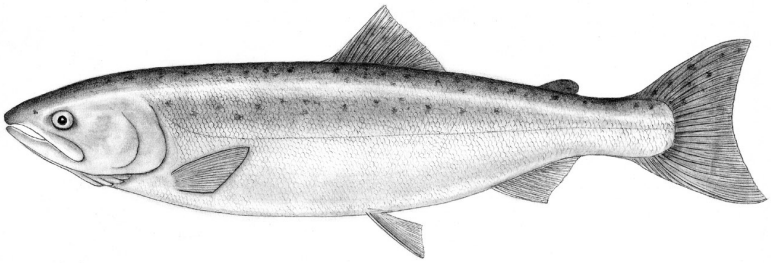
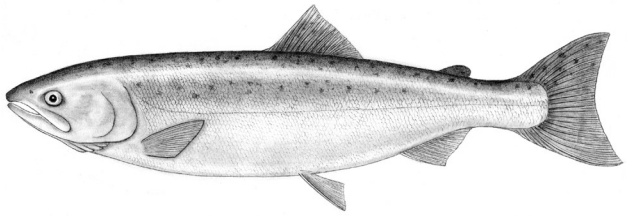
UNIT 3
SALMON ANATOMY



SALMON ANATOMY



OVERVIEW

The class identifies the body parts of a fish and compares them to human body parts. They see how fish shape, skin, scales and gills help salmon live in water.

THE BIG IDEA

Fish, which are physically different from human beings, are suited to their watery environment.

KEY WORDS

For definitions refer to “Appendix 8: Glossary”.
Basic: head, mouth, eyes, nostrils, gills, body, fins, tail, skin, scales
Advanced: pectoral, pelvic, dorsal, anal, adipose, lateral line

BACKGROUND INFORMATION

SALMON ANATOMY

Only some of the animals that live in water are fish. All fish have four things in common:

- a flexible backbone,
- cold blood,
- fins, and
- gills.

Other animals that live in water have only some of these characteristics. For example, whales have flexible backbones, but their blood is warm and they use lungs to breathe. Frogs have flexible backbones and cold blood, but they breathe with lungs.

Fish are usually torpedo-shaped, although they may be long and slender, short and stocky, or even balloon-shaped. The shape allows the fish to move easily through water with the least amount of energy. Whatever their shape, all fish have a head, a body and a tail.

The fish's head contains eyes, ears, mouth, teeth, nostrils and gills. To breathe, fish take water into their mouth, then close their mouth and push the water out through their gills. The gills are full of blood vessels that absorb oxygen dissolved in the water as it passes through the gill openings. Fish can use their nostrils to smell scents in the water and to recognize the scent of their home stream.

Salmon have six bony fins on their body, which they use mainly for balance and steering:

- two pectoral fins near the head,
- two pelvic fins on the belly,
- an anal fin behind the belly, and
- a dorsal fin on the centre of the back.

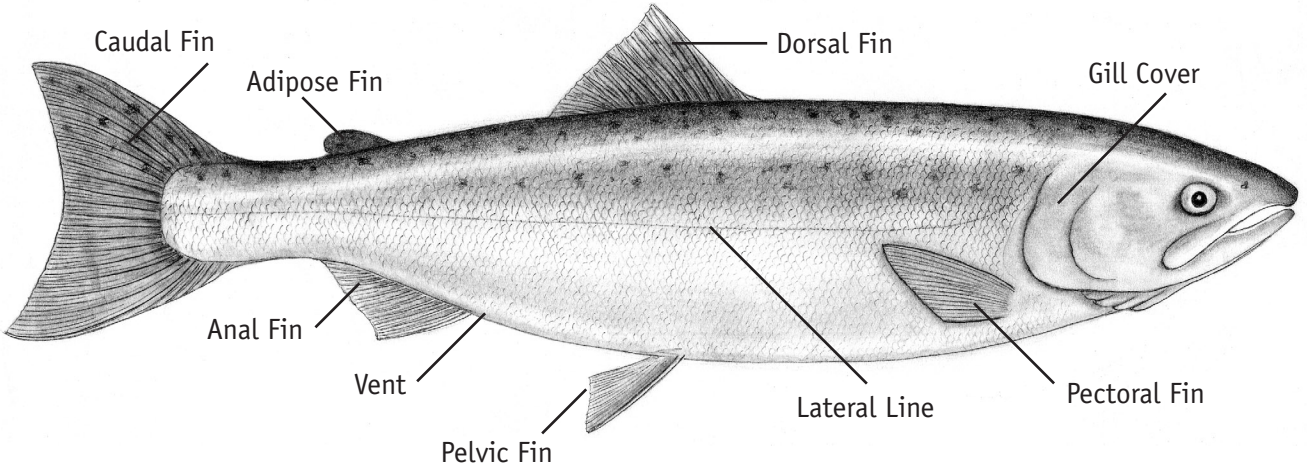
Salmon also have an adipose fin, a small fatty fin on the back just in front of the tail, with no known use.

The tail, also known as the caudal fin, helps the fish keep balance, and pushes the fish forward through the water. Female salmon also use the tail to dig the redd in which they lay their eggs.

Like most fish, salmon have a line of special cells along each side of their bodies. The cells, known as the lateral line, are extremely sensitive to pressure, and help fish sense movements and objects in the water.

Scales and skin cover the body of most fish, including salmon. Scales are small hard plates like fingernails, but they overlap like shingles on a roof and protect the fish from predators, as well as from bruising. Scales begin to grow when the salmon are very young, and show annual growth rings, like trees. If scales are knocked off, salmon can grow new scales. Salmon and many other fish also have a slime layer that makes them slippery and protects them from disease organisms in the water.

EXTERNAL ANATOMY (FEMALE)



INTERNAL ANATOMY (MALE)

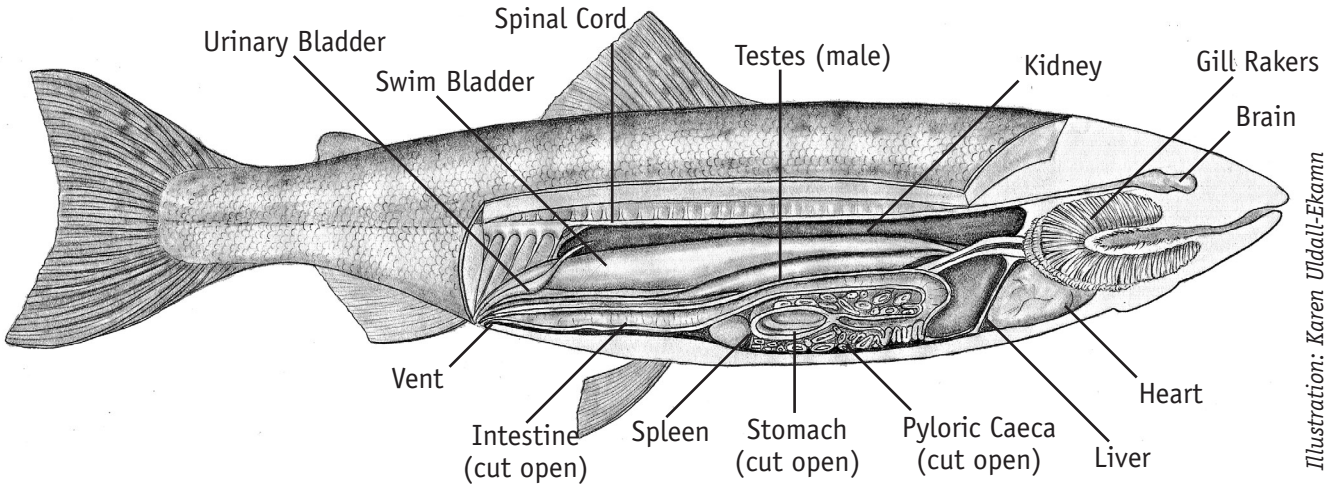


Illustration: Karen Udall-Ekamn

To	Fish Have (a)	People Have (a)
Eat	Mouth	Mouth
See	Eyes	Eyes
Breathe	Gills	Nose
Hear Sounds		Ears
Turn their heads		Neck
Hold the body	Backbone	Backbone
Hold things		Arms and Hands
Walk		Legs and Feet
Swim up and down	Fins	
Swim forward	Tail	
Cover their body	Skin	Skin
Sense pressure and vibration	Scales and slime	Hair

PARTS OF A FISH

Materials:

- *Option:* a classroom plant such as a bean plant
- *Option:* a fresh or frozen salmon
- Writing supplies
- Copies of "Handout 3.1: Parts of a Salmon" for each student
- Poster showing parts of a fish

Time required:
Two lessons

Level of conceptual difficulty:
Simple

Suggestions for assessment:
Monitor student discussion in making the Venn diagram to ensure that they recognize that salmon have features in common with people (e.g., ears, eyes, noses) but that they do not share others, such as fins and tails.

INTRODUCTION

- *Option:* Have students identify the parts of a plant and describe what each part does.
  The stem holds up the plant, the leaves collect sunlight and make food, the roots hold the plant in the ground and collect moisture, etc.
- *Option:* Have students identify the parts of a human and describe what each part does.
  The legs hold people up and let people move, arms let people hold things, the mouth lets people eat, etc.

RESEARCH/DISCUSSION

- Have the class use a poster of a salmon (or a fresh or frozen salmon) to identify the external body parts, i.e., head, mouth, eyes, nostril, gills, body, lateral line, fins (pectoral, pelvic, dorsal, anal, adipose), tail, skin, scales. Have students make and label their own drawing of a fish (or place labels on the outline drawing in "Handout 3.1: Parts of a Salmon").
- *Option:* Some independent education suppliers, education supply stores and science education catalogues carry cloth fish, 3-D models and posters that could help you to introduce the external (and internal) body parts.

  Note: If you wish to teach your students the internal features of a salmon, refer to "Dissecting a Salmon" on page 69 of the activity section of "Unit 4: The Salmon Spawner" in *Salmonids in the Classroom: Intermediate*.

SUMMATION

- Make a list or Venn diagram of overlapping circles with the class to identify features in fish and humans that are similar and different. (See chart in Background Information.)
  Both have ears, eyes and noses, but fish have a lateral line, fins, tails, scales and they use gills to breathe, while people have a neck, arms, legs and hair and breathe air.
- *Option:* Have older students make a chart comparing the functions of the body parts of fish and humans. (See chart in Background Information.)
  To move, people use legs, fish use tails; to breathe, people use noses, fish use mouth and gills; etc.

FISH SHAPE

This experiment demonstrates that a salmon's shape helps it live in its environment.

Materials:
- Modelling clay
- Basin of water
- Long sticks (such as knitting needles or chopsticks)
- Copies of "Appendix 1: Observation Page" for each student

Time required:
One lesson

Level of conceptual difficulty:
Simple

Suggestions for assessment:
Review students' drawings and conclusions from the experiment to ensure that they can identify "fish shape" and recognize that the shape helps fish move easily through water.

INTRODUCTION

- Ask students to describe or draw the shape of a salmon. Ask if all salmon are shaped the same, and if all fish are shaped the same.
  Point out that all salmon have the same shape. Most fish have a narrow nose, a wider body and a narrow tail, but some are long and thin, while others are flat, and a few are rounder.

EXPERIMENT

- Have students use modelling clay to make a fish-shape 10 to 15 cm long, and to make objects of various other shapes, e.g., flat, round, square, human.
- Have students put a stick in the shapes they made, and gently move them through a basin of water.
- Have the class observe how different objects move in the water, and record their observations on a chart or chalkboard. If necessary, prompt them with questions such as:
  - What shape makes the fewest ripples when it moves? What makes the most?
  - What shape takes the least force to move? What takes the most?
  - What shape moves the quickest? What moves the slowest?
  - Do the shapes move the same backwards or sideways as they do forward?

DISCUSSION

- Ask students to suggest the reasons a fish shape is best for a salmon.
  The slender shape that narrows in the front lets the salmon swim forward quickly with little energy, so it does not tire quickly.

SUMMATION

- Have students use "Appendix 1: Observation Page" to draw the fish shape experiment and write the class' conclusions.

SCALES AND SKIN

Materials:

- Poster/illustration showing scales on a salmon
- Copies of "Handout 3.2: Salmon Scales" for each student
- Writing materials

Time required:
Two lessons

Level of conceptual difficulty:
Simple

Suggestions for assessment:
Review students' reports on scales to ensure that they can identify facts about scales, such as their shape, hardness and location.

INTRODUCTION

- Ask students where on their bodies they have hard coverings that protect their skin.
  Fingernails and toenails.
- Have students list words that describe their nails.
  Hard, rounded, small, growing, smooth, multi-coloured, etc.
- Have them list words that describe their skin.
  Soft, covers the whole body, has feeling, different colours, wrinkly, etc.

EXPERIMENT

- Have students use a pencil or similar object to press gently on a fingernail, and then press gently on the skin of a finger. Ask them to compare the two. If necessary, prompt them with questions such as:
  - Which surface is hardest?
    The nail.
  - Through which surface do you feel the most?
    The skin.
  - Which surface is the most flexible?
    The skin.
  - Which surface protects best from cuts and scrapes?
    The nail.
  - What would be good or bad about having a skin covered with fingernail material?
    It would be very strong, but also very stiff and hard to feel through.

DISCUSSION

- Point out the scales on the illustration of the fish and ask students to compare scales with human nails. If necessary, prompt them with questions such as:
  - Where do you see scales on the salmon?
    They cover the whole body except the eyes, fins, head and lips.
  - What pattern do the scales form?
    They overlap in rows or curves.
  - How many scales does a salmon have?
    Hundreds or thousands.
  - What colour are the scales?
    Scales are clear but can look like they are many colours because they allow the colour of the skin below to show through.
  - What shape are the scales?
    They are not perfectly round.
  - Why don't scales make salmon very stiff?
    They have many small scales attached to their skin, so the scales can all move when the salmon's body moves.

SUMMATION

- Give students a copy of "Handout 3.2: Salmon Scales" and have them read it in groups or pairs.
- Have students use the handout and the class discussion to make a simple web or write a report describing three important facts about salmon scales.

GILLS AND LUNGS

This experiment models how fish gills extract substances from water as the water passes across them. It leads to a discussion of how salmon extract oxygen from water, and the need for clean stream or lake water.

Materials:

- A clear jar with a lid
- A basin
- Board or similar object
- Water
- Food colouring
- White paper towels
- Copies of "Appendix 1: Observation Page" for each student

Time required:
One lesson

Level of conceptual difficulty:
Advanced

Suggestions for assessment:
Review students' drawings and conclusions from the fish gills demonstration to ensure that they can explain that fish extract air from water.

INTRODUCTION

- Ask students to describe how they breathe and to explain whether or not they could breathe under water.
- If the class has an aquarium, have them look at the opening of the fish's mouth and gills. Ask how they think fish breathe under water, and explain that the following demonstration will show them how.

EXPERIMENT

- Show the class a jar of water, and explain that most water has some air mixed into it. Shake the jar vigorously and have them look at the bubbles of air as they float to the top. Explain that, although most of the air bubbles disappear, many tiny ones remain in the water.
- Explain that, because it is too hard to see air in the water, you will use some colouring for this experiment. Add several drops of food colouring to the water.
- Line a board with a white paper towel and slowly pour the coloured water across the towel. Ask students to describe what happens to the colouring.
  Some colour passes along with the water, and some stays behind in the towel.
- Ask students to imagine that the colour in the water is air and that the towel is a fish's gills. Have them suggest how fish might get air from water.
  Fish move water through their gills and absorb air from the water as it passes along the gills. They take a mouthful of water, close their mouth, then push the water out through the gills in their throat. The gills are made up of rows of very fine folds of tissue similar to skin. The salmon absorb the air through these special gill cells.

DISCUSSION

- Ask students to describe what would happen to fish in silty or polluted water.
  Their gills could get irritated, making it difficult to breathe.
- *Option:* Have older students create a model of a fish's breathing by drawing an outline of a fish on a strong plastic bag, with the mouth at the open end of the bag. Have them cut a small opening for gills and tape a paper towel to the opening to represent gills. Have them take dyed water into the "mouth" of the model fish, push it out through the "gills" and note what happens to the dye.

SUMMATION

- Have the students use "Appendix 1: Observation Page" to draw the demonstration and write their conclusions.

SALMON SMOLTS
WRAP-UP

REVIEW:

- Materials: chalkboard or chart paper
- Draw a large outline of a salmon on the chalkboard or chart paper. Have the class locate and label, or draw on the outline, each of the following parts: head, mouth, eyes, nostrils, gills, body, lateral line, fins (pectoral, pelvic, dorsal, anal, adipose), tail, skin, scales.
- Explain that some of the salmon's body parts are like human body parts, but salmon have parts that humans do not, and each part helps salmon live in the streams and oceans.

EVIDENCE FOR UNIT ASSESSMENT

- Have students make a painting or drawing of a salmon and label its parts.
- Have students fill in answers to a chart comparing human and fish functions: e.g.,
  People use _____ to move; fish use _____;
  People use _____ to breathe; fish use _____;
  People use _____ to see; fish use _____;
  People use _____ to eat; fish use _____.
- Have students complete a stem sentence, such as, "I used to think… about salmon but now I know that…" or, "One thing I learned about salmon is that…"
- Have students add their materials to their learning log and write a sentence explaining what they learned.

LANGUAGE AND ARTS INTEGRATION

- Dissect an adult salmon, using the dissection guide on page 69 of *Salmonids in the Classroom: Intermediate* to identify the external parts of the fish and their functions.
- Have students form a model salmon using modelling clay, and attach sequins and/or foil to it in overlapping patterns to represent scales.

HOME CONNECTIONS

- Have students show an adult an outline drawing of a fish, name its parts and identify the parts that are like parts of a human.
- Have students fill in "Appendix 4: Classroom Salmon Science News" and read it to an adult.

HANDOUT 3.1

PARTS OF A SALMON

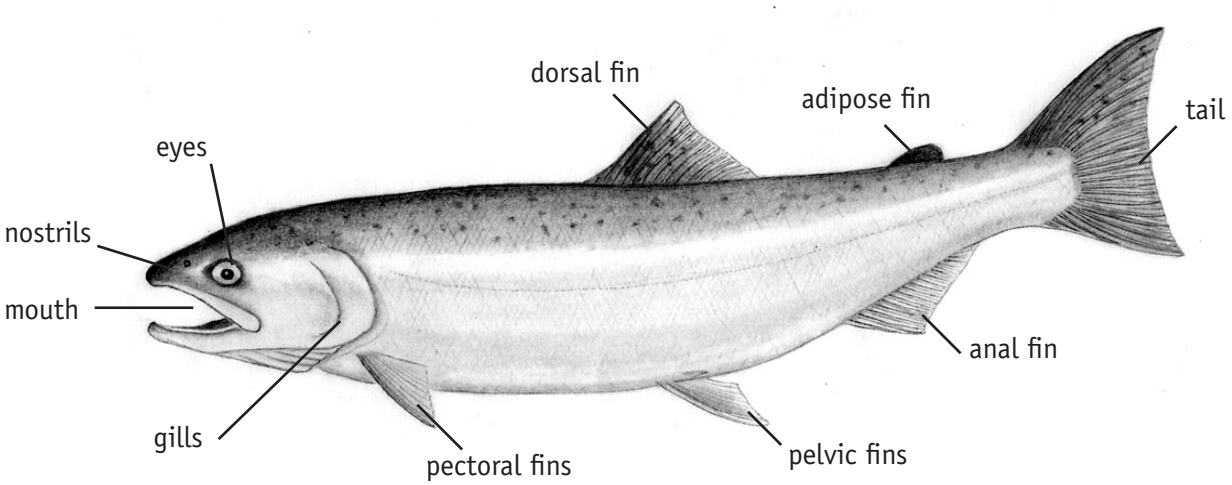


Illustration: Karen Udall-Ekman

Fins	— help salmon turn and balance	Nostrils	— let salmon smell water
Tail	— moves salmon forward	Mouth	— let salmon eat and breathe
Eyes	— let salmon see	Gills	— extract air from water

HANDOUT 3.2

SALMON SCALES

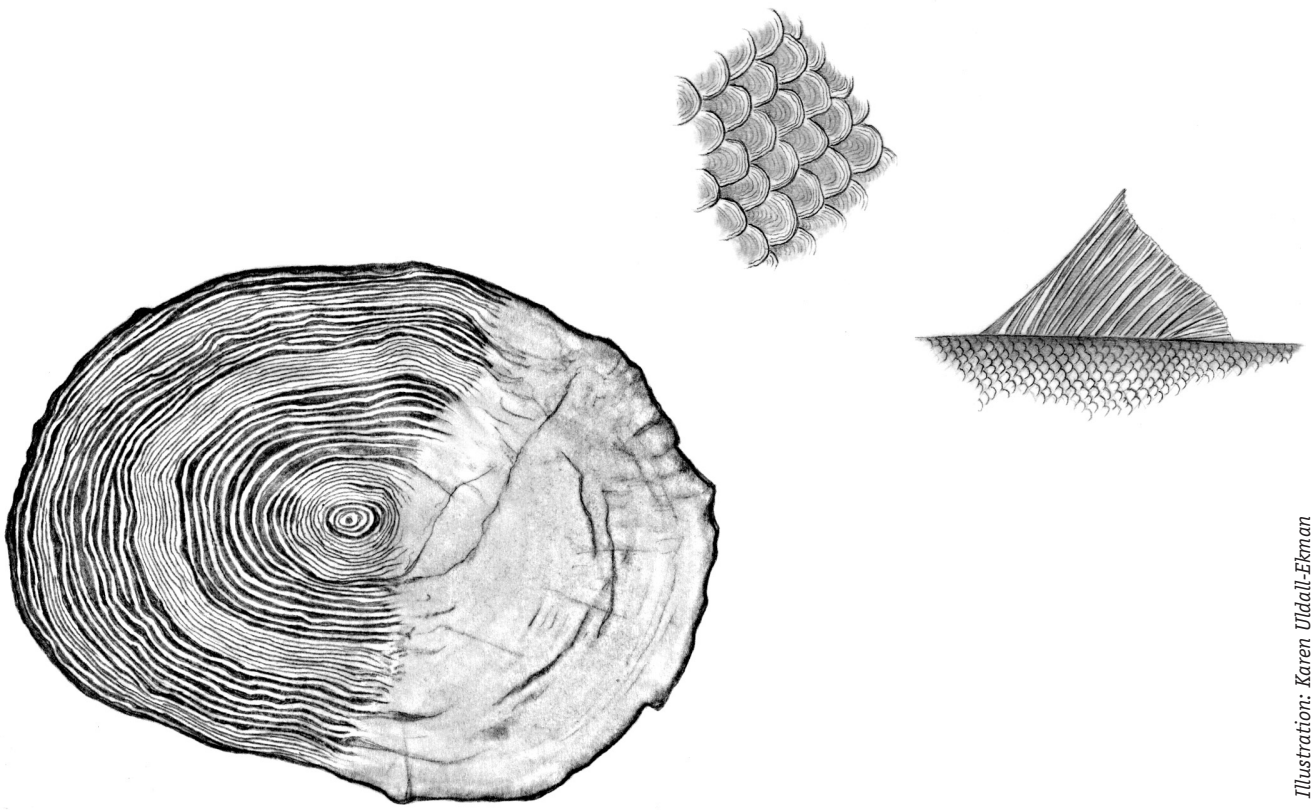


Illustration: Karen Uldall-Ekman

Scales are small plates that cover the body of salmon. The scales are attached to the skin of the salmon in many rows. They are made of hard, stiff material, like your fingernails.

Scales are oval-shaped. They overlap and partly cover each other. The part you see looks like a small fan.

Fish scales can look silver, red, green or any colour. But scales have no colour. The colour of the skin below shows through the scales.

Scales protect the body of the fish. They let salmon slide over rocks or logs without getting hurt. They are hard for birds or animals to grab.

Scales grow a little every year. Each year, a line forms in the scale. With a microscope, you can see the lines. If you count the lines, you can tell how old the salmon is.