



Science Unit: *Pacific Salmon and Mountain Pine Beetle*

Lesson 1: *Fish Anatomy*

School year: 2007/2008

Developed for: Irwin Park Elementary School, West Vancouver School District

Developed by: Erika Eliason (scientist), Jenny Murdie and Wendy Newport (teachers)

Grade level: Presented to grade 2; appropriate for grades 2 – 7 with age appropriate modifications. Note: this is a demonstration only lesson for primary students. The teacher should be well versed on the parts of the fish anatomy before beginning this lesson.

Duration of lesson: 1 hour and 20 minutes (if the handouts are filled in as a follow-up at another time)

Notes: This lesson is made up of 4 distinct activities. Teachers should use their discretion and choose whether to perform all 4 activities in one single lesson, break it up over a couple lessons or leave out a few activities.

Objectives

1. To compare fish anatomy with human anatomy (internal and external)
2. To explore the different body shapes of fish
3. To observe a live hagfish and examine its unique slime properties

Background Information

Fish have many specialized parts that allow them to live and swim in the water. Some of these parts are similar to humans, while some are very different. This lesson will compare and contrast fish parts with human parts. In addition, fish have different shapes depending what they do and where they live. Some fish swim fast, some barely swim at all. Some live at the bottom of the ocean, others live in shallow little streams. We can compare different fish shapes and predict where they might live and how they may behave.

Vocabulary

<u>anatomy:</u>	study of the parts of an animal
<u>fins:</u>	movement (pectoral/pelvic = side to side, dorsal = keeps fish straight, tail = forward)
<u>scales:</u>	protection from abrasions, predators, disease
<u>slime or mucous:</u>	protection from abrasions, predators, disease
<u>gills:</u>	breathe oxygen from the water
<u>operculum:</u>	gill cover to protect the gills
<u>eyes:</u>	sight
<u>nostrils:</u>	smell
<u>lateral line:</u>	sensitive to pressure, helps the fish sense movements and objects in the water
<u>various “shape words”:</u>	e.g. slender, compressed, flat – whatever is age appropriate
<u>camouflage:</u>	blending in to the background



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<u>heart:</u>	pumps blood around the body (moves oxygen, carbon dioxide, nutrients and wastes)
<u>esophagus:</u>	digestion – to direct food from mouth to stomach
<u>stomach:</u>	digestion – to break down food
<u>pyloric caeca:</u>	digestion - to absorb nutrients
<u>intestine:</u>	digestion - to absorb nutrients
<u>spleen:</u>	stores red blood cells and immune function
<u>liver:</u>	metabolism – makes/stores/converts different nutrients
<u>kidney:</u>	metabolism/osmoregulation (keeps water, nutrients and ions in balance)
<u>swim bladder:</u>	for buoyancy (to keep the fish neutral or stable in the water)
<u>gonads (eggs or testes):</u>	for reproduction (males have sperm to fertilize the eggs of females)

Materials

- various preserved fishes from the UBC Fish Museum (or pictures of fish)
- freshly euthanized rainbow trout or salmon (or any fish)
- lots of paper towels
- live hagfish
- gloves, dissecting tray, scissors, scalpel, forceps, straw
- human body model (torso)
- beaker for hagfish slime
- plastic trays for the internal fish parts
- 3 handouts

In the Classroom

Introductory Discussion

1. Short description of 'hook' to capture student's attention.
 - How many of you have ever been fishing? What kinds of fish did you catch?
 - What do fish look like, feel like, smell like, taste like, sound like?
 - Where do fish live?
 - Can anyone tell me what the word "anatomy" means? (write it on the board and define it)
2. Briefly describe science experiment/activity.
 - We're going to do 4 activities to look at the parts and shapes of fish
3. Briefly describe safety guidelines.
 - Wash your hands after you touch the hagfish slime
 - Don't touch the dead fish
 - NOTE: some students may start to feel faint or ill when they see/smell the dead fish. Be sure to have adequate ventilation (open windows) and adult helpers on hand to help if a student starts to feel ill.



Fish Anatomy Activity #1

Activity Title: External Fish Anatomy

Purpose of Activity:

- To become familiar with the external anatomy of fish and to compare fish anatomy with human anatomy

Methods and Instructions:

Set-up prior to experiment:

- Before class, draw a cartoon of a fish on the board (the students will be given a fish picture in a handout, so try and make your cartoon fish look similar to the handout).
1. Have the students identify the external parts of the fish (dorsal fin, pectoral fin, pelvic fin, anal fin, caudal fin or tail, adipose fin (if it's a salmon) eye, mouth, nostrils, scales, gills, lateral line). Label these parts on the cartoon fish on the board.
 2. Discuss the function of each part.
 3. Compare and contrast the external anatomy of humans with fish (e.g. humans = arms/legs, fish = fins; humans = lungs, fish = gills, both have eyes and mouths etc).
 4. Have the students fill in their worksheets. (NOTE: teachers may choose to have the students fill in the worksheet after class as a review, depending on age and time limitations).

Fish Anatomy Activity #2

Activity Title: Fish shapes and sizes

Purpose of Activity:

- To become familiar with all the different shapes and sizes of fish

Methods and Instructions:

Set-up prior to experiment:

- Borrow some preserved fish specimens of different shapes and sizes (e.g. flounder, stickleback, salmonid). We borrowed our specimens from the University of British Columbia Department of Zoology Fish Museum (<http://www.zoology.ubc.ca/research-facilities/fish>). Please note that the new Beaty Biodiversity Museum at UBC will open in the spring of 2010 and will house all the different biological collections (<http://www.beatymuseum.ubc.ca/>). Alternatively, prepare a PowerPoint presentation with a bunch of different pictures of fish or bring in some pictures/posters of different fish.
1. Pass around the preserved jars of fish, 1 species at a time. Have the students make observations about the shapes (e.g. flat, squished, round, skinny, long, narrow, spikes, big eyes etc).
 2. Have the students guess the name of each species. Then have them guess where it lives and what it spends most of its time doing (e.g. flounders live on the bottom of the ocean buried in the sand and don't move very much. Salmonids are very good swimmers and spend their lives in lakes, rivers and the ocean).
 3. Discuss how the shapes can help you predict where fish may live and how they might behave.
 4. You can also discuss how fish have many colours. For example, some fish are coloured very similarly to their background (called "camouflage") so that they can blend in to either avoid predators or



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surprise their prey (e.g. flounders and rockfish are camouflaged). Other fish are brightly coloured and they are often also poisonous. Their bright colours are like advertisements for “danger” and warn potential predators to stay away (e.g. lionfish)!

5. Have the students fill in their worksheets. (NOTE: teachers may choose to have the students fill in the worksheet after class as a review, depending on age and time limitations).

Fish Anatomy Activity #3

Activity Title: Hagfish

Purpose of Activity:

- To become familiar with a unique and ancient fish

Methods and Instructions:

Set-up prior to experiment:

- Bring in 2 live hagfish into the classroom. Keep them covered and in a corner so the students don't get distracted before you are ready to begin the activity.
1. Have the students gather around the fish tank with the hagfish, ensure that everyone can see the demonstration.
 2. Have the students guess what type of fish you brought in. Ask them to make observations about what it looks like (long, skinny, like a snake, holes in its side, tail is flat, all curled up like a snail shell etc).
 3. Discuss where hagfish live and what they do (they live on the bottom of the ocean and feed off dead things on the bottom. They are not very good swimmers).
 4. Discuss how animals have different ways of defending themselves. Have the students guess different ways that a fish could protect itself (with spikes, poison, sharp teeth, it could swim away etc). Pick the fish up and have the students make observations. The hagfish will slime **everywhere**. Discuss what this is (slime), where it comes from (slime glands on the side of the fish) and what it does (coats the hagfish and makes it less tasty to eat!). Pick the slime up with your hands and put some in a beaker so all the students can touch it (it is not toxic – in fact, you can make muffins with it – but the students should wash their hands afterwards to get all the slime off).

Fish Anatomy Activity #4

Activity Title: Internal fish anatomy

Purpose of Activity:

- 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:

- Bring in a freshly dead (or partially frozen) fish. Be sure it is big enough so that most of the major internal structures are clear (at least 500 g). Be sure to wear gloves, have the proper dissecting tools (scissors, scalpel, forceps, dissecting tray, plastic dishes for parts) and lots of paper towels.



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1. Have the students gather around the table so everyone can see the demonstration. Have the students use the phrase “that’s interesting” rather than “ewwwwwwwwww” or “that smells” or “gross”.
2. Explain that you are going to open up the fish and show them the internal anatomy. Briefly review the external anatomy. Then slice open the intestinal cavity by making a cut along the ventral line from the anus to the pectoral fins.
3. Identify each part as it is in the fish and then pull them out and put them in plastic dishes so the students can observe them (gonads (eggs or testes), intestine, pyloric caeca, stomach, esophagus, liver, spleen, swim bladder, kidney). NOTE: Grade 2 students won’t know the function of many of these parts (e.g. kidney, liver, spleen), but they can re-visit the functions later (see below).
4. Pop the swim bladder and then use a straw to re-inflate it.
5. Open up the pericardium to expose the heart (continue the same cut from the pectoral fins, extending it anteriorly towards the gills). Remove the heart and some gills (don’t bother to take out the brain, there’s lots of bone to cut through and the brain is pretty small!). Warning: if the fish is freshly dead, the heart may still be beating! This may be *very* cool to some students and *very* disturbing to others, so you may want to avoid showing this depending on the age of the students.
6. Have the students fill in their worksheets. (NOTE: teachers may choose to have the students fill in the worksheet after class as a review, depending on age and time limitations).

Closure Discussion

- Show the students the model of the human body torso. Identify what is similar and what is different between fish and humans. Both have an esophagus, stomach, intestine, gallbladder, spleen, liver, reproductive organs, heart. Fish have pyloric caeca, a swim bladder and gills. Humans have lungs.

References

1. Salmonids in the Classroom: Primary. Fisheries and Oceans Canada. Also available online: <http://www.salmonidsintheclassroom.ca/index.html>

Extension of Lesson Plan

1. Assign each student (or groups of students) a fish (that you didn’t discuss in class). Have the student act like a “reporter” to learn about the fish. For example: overall shape of fish, fin shape, size and length of fish, mouth location and appearance, colouration, where it lives, what it eats. Have the student (or group) do a presentation on their findings to the rest of the class.
2. Ask the students to go home and research with their parents or guardian the function of some of the different parts. For example, they could choose to learn about the liver or spleen or kidney.
3. This lesson could be good preparation before going on a class field trip to the Vancouver Aquarium.



Handouts

1. Fish Anatomy Activity #1 - External Fish Anatomy **and** Fish Anatomy Activity #4 – Internal Fish Anatomy
 - There are many handouts readily available on the internet. Google “salmon anatomy” or “fish anatomy” and you will hit some great links. Some suggestions:
 - Salmonids in the Classroom (http://www-heb.pac.dfo-mpo.gc.ca/community/education/lessonplans/sicprimary/downloads/english/sic_primary_unit_3.pdf)
 - <http://www.sf.adfg.state.ak.us/region2/ie/sicc/pdfs/anatomy.pdf>
 - <http://www.enchantedlearning.com/Home.html>
2. Fish Anatomy Activity #2 – Fish shapes and sizes
 - There are many handouts readily available on the internet. Google “fish shapes”
 - <http://www.enchantedlearning.com/Home.html>
 - <http://www.marine.usf.edu/pjocean/packets/f99/f99u2le2.pdf>
 - Alternatively, copy different images of fish from the internet (e.g. flatfish, tuna, seahorse, eel, lionfish, salmon, angelfish, rockfish etc) onto a handout and leave space for the students to:
 - a. Describe the fish (compressed, fusiform, globular etc)
 - b. Predict how they might swim, where they might live