



Science Unit: *Pacific Salmon and Mountain Pine Beetle*

Lesson 2: *Fish Hazards*

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 1 – 7 with age appropriate modifications.

Duration of lesson: 2 hours

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. If the teacher chooses to do all 4 activities as stations, several classroom helpers/parents will be needed.

Objectives

1. To explore some of the different challenges or hazards that Pacific salmon may face
2. To learn about how humans affect the environment and how this may affect Pacific salmon
3. To think about how we can change our behaviour to help the salmon.

Background Information

Pacific salmon are faced with numerous challenges and hazards in their environment. Some of these are natural (predators, parasites, disease, some environmental changes) and some of them can be human-induced (pollution, global warming, oil spills). Students will examine four different challenges facing Pacific salmon and think about what they can do to help Pacific salmon.

Vocabulary

oil: A substance that is liquid at room temperature and doesn't combine with water. Some oils can be used for cooking, other are burned for heat or to fuel cars

parasite: An organism that benefits from another organism (the host). The host is harmed by the parasite.

sea lice: A parasite that affects Pacific salmon

endotherm: An animal that maintains its body temperature the same regardless of the environmental temperature (e.g. if a human is in a room at 21°C, the human is still 37°C)

ectotherm: An animal whose body temperature is the same as the environmental temperature (e.g. if a fish is in 10°C water, the fish is 10°C)

Materials

Oil Spills

- feathers
- rocks

Plastics

- household plastics:
- yogurt containers

Sea Lice

- sea lice
- small petri dishes

Global Warming

- digital thermometers
- glass thermometer



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- plastic fish & insects
- shallow pans/dishes
- water
- vegetable oil
- spoons/wisks
- eye droppers
- cotton balls
- coffee filters
- newspaper
- bags for waste
- liquid dish soap
- toothbrushes
- plastic containers (for soap/water cleaning)
- bottles
- pop bottles
- Safeway bags
- pop bottle rings
- brown paper bags
- lunch containers
- cloth bags (Safeway/IGA etc)
- re-usable water bottle
- magnifying glasses
- tack board
- flat, round thumbtacks
- small salmon cut-out
- med. salmon cut-out
- large salmon cut-out
- 6+ cloth bags (Safeway/IGA etc)
- MANY books
- microscopes (optional)
- 2 large glass beakers
- kettle
- ice cream
- cups and spoons
- small ziplock bags
- ice-cream fish
- fish-shaped cookie cutter

In the Classroom

Introductory Discussion

1. Short description of 'hook' to capture student's attention.
 - Class brainstorm on the board: What are some of the challenges that Pacific salmon face?
 - Divide up the brainstorm into "man-made", "natural" and "unknown" causes of these challenges.
2. Briefly describe science experiment/activity.
 - The class will be divided into 4 groups and rotate through 4 stations.
 - An adult (or 2!) will need to run each station, so classroom helpers (parents?) will be needed

Fish Hazards Station #1:

Activity Title: Oil Spills

Purpose of Activity:

- To observe how oil interacts with water
- To explore how difficult it is to clean up an oil spill
- To examine how soap helps clean up the spill
- To think about how oil spills can affect the ocean ecosystem

Methods and Instructions:

Set-up prior to experiment:

- Cover the table with newspapers
- Fill each student's plastic tray half full of water. Place 3 rocks and 1 insect in each student's tray

1. Discuss what oil is for, how it is transported in big boats in the ocean and how spills can occur



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2. Make predictions about what will happen when you add oil to the water (e.g. it will float, sink, mix with the water etc)
3. Pour 1 spoonful of oil into each student's tray
4. Make observations (e.g. the oil floats on the surface)
5. Simulate a "storm" by mixing the oil with the water using a spoon
6. Make observations (e.g. the oil doesn't mix with the water)
7. Give each student 1 dropper, 10 cotton balls (more if needed) and 1 (or more) coffee filter. Instruct the students to try and clean up the oil spill. Give each student a "waste" container to dispose of soiled cotton balls, coffee filters and oil
8. Make observations (e.g. it's hard to clean up, can't get all the oil, hard to see but can tell the oil is still there etc)
9. Have the students try and clean off the rocks, insect and fish.
10. Make observations (e.g. the oil feels slippery on the rocks and insect, water can't seem to get all the oil off)
11. Fill 1 plastic container with water and add some soap. Fill another plastic container just with water (for rinsing). Distribute the toothbrushes and allow them to use the soapy water to clean the insect and rocks
12. Make observations (e.g. soap works well to clean the oil)
13. Do demonstration with feather showing how the oil coats the feather and it is hard to clean even with soap (or if you have enough feathers, have each student try it themselves).
14. Clean up (observing how water alone won't clean the dishes up, you need soap!)

Closure Discussion:

1. Discuss how hard it was to clean up the oil spill.
2. Discuss how an oil spill might affect the ecosystem. Why are oil spills bad?

Fish Hazards Station #2:

Activity Title: Plastics

Purpose of Activity:

- To examine some of the sources of plastic pollution
- To learn about how plastic can harm the environment
- To think about ways to reduce plastic pollution

Methods and Instructions:

1. Discuss what plastic is and where it comes from.
 - a. Man-made from chemicals (scary names like benzene, ethylene oxide and vinyl chloride)
 - b. Cheap and easy to make, convenient
2. Show the students a variety of different plastics (pop bottles, plastic Safeway bags, various containers, packaging etc).



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3. Examine each one and discuss what it is and its uses.
4. Discuss how the different objects might get into the ocean (e.g. littering, blowing away in wind from garbage dumps, dumped into streams which carry it out to sea).
5. Discuss how the different plastics might harm the environment
 - a. Birds and fish get caught in the 6-pack pop bottle loops
 - b. Seals, turtles, whales, fish and other animals eat pieces of plastic and get sick or die
 - c. Turtles mistake plastic bags for jellyfish and eat the plastic bags which get caught in their stomachs or throats, causing the turtle to choke or die from starvation because it can't eat
 - d. Dead birds have been found to have hundreds of pieces of plastic in their stomachs
 - e. Marine mammals (whales and seals) become tangled in large pieces of plastic fish nets or other garbage and can no longer hunt for food, so they die of starvation
 - f. We estimate that over 1 million sea creatures die each year from plastics
 - g. Over 90% of the garbage found on our beaches is plastic
6. Discuss how plastic cannot biodegrade – that is, every piece of plastic that has ever been made is still around (with the exception of the small amount of plastic that has been incinerated, a process that releases harmful chemicals into the air). Even when it is ground up into tiny pieces and put in a landfill, it is still there and cannot biodegrade.
7. Discuss how people can change their behaviour to reduce plastic pollution (show the cloth bags, reusable drinking containers, reusable lunch dishes)
 - a. Buy less plastic
 - b. Use re-usable shopping bags and containers instead of plastic
 - c. Reuse plastic
 - d. Recycle plastics and dispose of them in the correct manner
 - e. Never put plastics in the sewer system
 - f. Always take your litter with you
8. If there is time remaining, give each student a handout and have them draw a clean, plastic-free beach scene and a plastic pollution-filled beach scene (see handout at end).

Fish Hazards Station #3:

Activity Title: Sea Lice

Purpose of Activity:

- To examine a particular parasite that affects Pacific salmon – sea lice
- To learn about how sea lice can harm salmon

Methods and Instructions:

Set-up prior to experiment:

- Obtain some preserved sea lice. I work in a fish lab at UBC, so I got mine from some colleagues. Fish processing plants should have some sea lice, you can also check with various fish labs, parasitology labs or even Fisheries and Oceans Canada.
- Put 1 or 2 sea lice in each small Petri dish, make sure you have enough for each student.



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1. Discuss parasites. Have the students ever heard the word before? What is a parasite? What does it do? A parasite is an organism that benefits from another organism (the host). The host is harmed by the parasite. Parasites are typically much smaller than the host and can be found inside (endoparasite) or outside the animal (ectoparasite). See if the students can come up with examples (e.g. tapeworms, mites, lice, bedbugs etc).
2. Sea lice are parasites that affect Pacific salmon. They are a natural part of the ecosystem but there is recent concern that fish farms are causing sea lice to increase in numbers. Sea lice are a current hot area of research. Scientists are trying to figure out more about the life history of sea lice and whether fish farms are causing sea lice to increase in numbers. They are also trying to figure out how sea lice affect Pacific salmon. For example, scientists are looking at whether Pacific salmon swim slower, have impaired metabolic rates or feed less when infected with sea lice. They are also trying to figure out how many fish are infected with sea lice, how and where they are getting infected and how many fish are dying because of this. Currently there are many more questions than answers!
3. Sea lice attach themselves to the outside of a fish. Have each student examine their sea lice without and then with a magnifying glass (or microscope if available). Have the students make observations (the sea louse is small, round, has hooks underneath, 2 little sticks sticking out 1 end etc). If desired, have the student draw their sea lice.
4. Hold up tack board with large (~60cm), medium (~10cm) and small (~3-4cm) Pacific salmon (I just printed off a picture of a coho salmon blown up to different sizes). Use small, round flat silver thumbtacks to simulate "sea lice". Put 4 tacks on the large, adult-sized fish. Ask the students what they think those 4 sea lice might do to the large salmon (likely, not much damage). Put 4 tacks on the juvenile, medium sized fish and ask the same question (a little more damage). Put the 4 tacks on the smallest fish. The 4 tacks should almost completely cover the body of the fish. Discuss how the smallest fish are most susceptible to damage from sea lice. In British Columbia, pink salmon spend very little time in freshwater after they hatch from eggs and head straight out to sea. Therefore, they are very small when they first arrive in the ocean. This makes pink salmon very susceptible to sea lice.
5. Explain that you are going to do an activity with the group to show how sea lice could affect fish. Each student is going to pretend they are a Pacific salmon. Give each student an empty cloth shopping bag (i.e. from Safeway or IGA) to put over their shoulder. This shopping bag is equivalent to one sea louse. Pick one student to be the leader and then have the other students follow the leader around and around in a circle (I had the students circle around 4 desks) for 1-2 minutes. Have the students discuss how it felt to walk/run with the shopping bag (likely not a problem). Put some books in each student's bag (keep the bag on the same shoulder) to simulate 2 sea lice. Pick another leader and have them circle for 1-2 minutes. Report in. Repeat with more and more books (a.k.a. sea lice). The students will likely start complaining that their shoulders hurt or they are tired (or they may act tough and say it's no problem at all!). Pick one student to carry ALL the student's shopping bags and try and circle the desks. The student will likely barely make it once around! Discuss with the students that sea lice don't come off the fish very easily, so wherever the fish goes, the sea lice goes with it. Have the students imagine carrying their shopping bags to school, to the library, to the grocery store, to the park, everywhere they go! Now imagine being only 2 or 3 years-old and having to carry that entire load. That might be what it's like for a really small pink salmon infected with sea lice.

Fish Hazards Station #4:

Activity Title: Global Warming

Purpose of Activity:



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- To discover that fish are ectotherms, so their body temperature is closely affected by their environment
- To explore how global warming could harm fish

Methods and Instructions:

Set-up prior to experiment:

- Use a fish-shaped cookie cutter (available at specialty cooking stores) to mold ice cream into fish shapes. Place the frozen ice cream fish in ziplock bags and store in a freezer.
1. Discuss ectothermy and endothermy. Fish are ectotherms. This means that their body temperature is the same as the environment around them. If they are in cold water, they are cold. If they are in hot water, they are hot. Humans (and all birds and mammals) are endotherms. This means that humans maintain a constant body temperature regardless of the environmental temperature.
 2. Fish prefer to live at certain temperatures. If it gets hot, fish become unhappy. They can't swim as well or reproduce as well and if it gets too hot, the fish could even die. This is a problem with Pacific salmon that are trying to swim up the Fraser river during their spawning migrations. Many fish aren't making it to their spawning grounds because the river temperature is too warm.
 3. Fill one of the large beakers (~2 L) with cold water (use ice if available) and the other with warm water from the kettle.
 4. Bring out 2 ice cream fishes. These fish prefer to live at cold temperatures. Put 1 fish in the cold beaker and the other fish in the warm beaker. Have the students make observations (the warm fish will melt, the cold fish will stay solid/melt slowly). Use the regular glass (ethanol) thermometers to measure the temperature of the water and fish.
 5. Take the temperature of a couple students using the digital thermometer (under the armpit). Give each student a bowl of ice cream. After the students eat their ice cream, take their temperature again. It will be the same as before. Humans stay the same temperature regardless of the environment or what they eat. When humans get sick, they sometimes have a fever or a high temperature.
 6. Discuss global warming and climate change. How are humans affecting global warming? How can this affect the ecosystem? Why are fish particularly susceptible to changes in environmental temperatures? What can we do about it?

References

1. Salmonids in the Classroom: Primary. Fisheries and Oceans Canada. Also available online: <http://www.salmonidsintheclassroom.ca/index.html>
2. http://www.dfo-mpo.gc.ca/media/infocus/2005/20051011b/info_e.htm# Biology of Sea Lice Fisheries and Ocean Canada. Accessed May 31, 2008.
3. <http://www.ec.gc.ca/climate/home-e.html> Climate Change. Environment Canada. Accessed May 31, 2008.
4. <http://www.epa.gov/climatechange/> Climate Change. United States Environmental Protection Agency. Accessed May 31, 2008.

Extension of Lesson Plan

1. Go on a class field trip to a beach or stream and clean-up all the garbage.

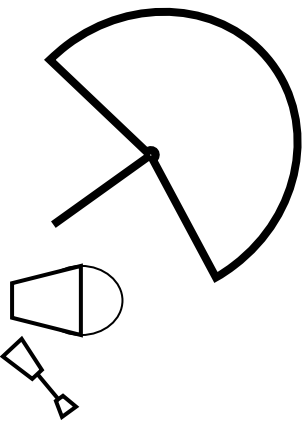
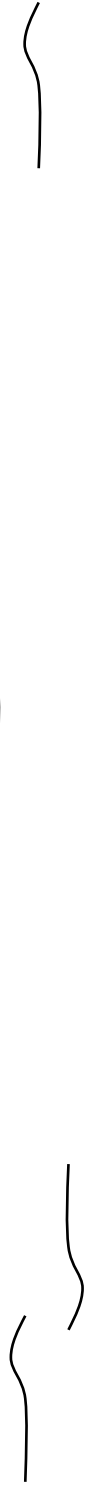
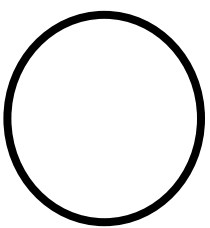


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2. Make brochures or posters to place around the school/neighborhood to encourage other people to look after the environment, to reduce, reuse and recycle and to use re-usable containers.
3. Paint fish on storm drains in your neighborhood (contact local groups to arrange this, most communities have people in place to coordinate these activities).

Scientist Name: _____

POLLUTED BEACH



Scientist Name: _____

CLEAN BEACH

