



Science Unit: *The Journey of the Pacific Salmon*
Lesson 4: *Salmon in the Open Ocean and Fishing*

School year: 2008/2009
Developed for: Grenfell Elementary School, Vancouver School District
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Grade level: Presented to grade 3; appropriate for grades 2 – 5 with age appropriate modifications.
Duration of lesson: 1 hour and 30 minutes

Objectives

1. Review the Pacific Salmon open ocean life cycle stage: adults.
2. Explore characteristics and behaviors of adult salmon at sea.
3. Discover that people are the biggest predator of adult salmon via commercial fishing, and understand how fishing effort and gear impact catch.

Background Information

Adult salmon spend 1-7 years in the open ocean, depending on the species. Salmon in the ocean are notoriously difficult to observe and study, so scientists know very little about this life cycle stage. We know that Pacific salmon migrate to the North Pacific Ocean and can travel 20-50 km in one day. Chinook Salmon are estimated to travel about 16,000 km while at sea. While in the ocean salmon travel in schools to protect themselves from predators. They also develop silver bellies and dark backs; this counter-shading is a common adaptation of oceanic swimmers against predation. While in the ocean Pacific salmon also eat a variety of prey and grow into mature adults (that are eventually ready to return to their natal stream to spawn). Salmon prey include smaller fish, such as herring, and pelagic crustaceans such as amphipods and krill.

The main predator of adult salmon is people. People love to eat Pacific Salmon and the commercial fishing industry aims to meet this demand. Three fishing methods are common for catching wild Pacific Salmon: seining, gill netting and trolling. Seining is the setting of nets to encircle schools of fish. Once a catch is made, the net is drawn up and brought aboard. Gill netting involves dropping a large net in the ocean like a mesh wall. The net is kept buoyant with floats and fish get caught by their gills when they swim into the net. Trolling involves dragging a series of lines and baited hooks that are attached to long poles that extend from the boat.

The amount of salmon caught is determined in part by the fishing method (gear type) and the amount of boats and fishers fishing (fishing effort). Scientists must work closely with the fishing industry to ensure that the fishing methods are not detrimental to salmon habitat or indiscriminately kill fish (e.g., the now banned open ocean drift nets) and that the fishing effort is kept at a level that allows wild salmon to maintain healthy population numbers. Overfishing has been a major factor in the decline of populations of many pelagic fish species, including Pacific salmon. There are many organizations that monitor fish stocks and publish statistics on which fish populations/species are well-managed and which are not. One way consumers can help wild Pacific salmon and other fish is to read these reports and carry around a seafood wallet card (e.g., Sea Choice lists sustainable seafood for Canada: <http://www.seachoice.org/>) and choose to eat fish that come from healthy, well-managed fisheries.



Vocabulary

<u>Word:</u>	Brief definition.
Commercial fishing	The activity of capturing fish and other seafood for commercial profit, mostly from wild fisheries.
Fishing gear	The equipment used for fishing, e.g., rod-and-reel.
Seining	Setting of nets to encircle schools of fish.
Gill netting	Setting of a large mesh net like a wall which catches fish by the gills.
Trolling	One or more fishing lines, baited with lures or bait fish, are drawn through the water behind a moving boat (typically multiple lines with multiple hooks).

Materials

Fishing Experiment

- 8 fishing rods (string, magnets, dowel and tape)
- 2 troller fishing rods (string, magnets, dowel and tape)
- 40 cut out salmon, each with a paper clip
- Worksheet 1

Journey of the Pacific Salmon Board Game

- game board (see lesson 2)
- open ocean question cards (Worksheet 2)
- 4 magnets
- dice

In the Classroom

Introductory Discussion

1. Review the adult stage of the salmon life cycle and explore why scientists know so little about this stage.
 - Where do adult salmon live?
 - How would you describe the ocean?
 - How do scientists study salmon, or any fish, living in the ocean?
 - What do we know about adult salmon behavior? Where do they travel and for how far?
 - What do Pacific salmon eat while in the ocean?
2. Review how Pacific salmon avoid predation (schooling, counter-shading) and brainstorm on who are the major predators of Pacific salmon.
 - Who eats salmon?
 - Do people eat salmon?
 - What is recreational fishing? What is commercial fishing?
 - How are wild salmon different from farmed salmon?
3. Brief description of the activities:
 - Activity 1: Salmon fishing experiment
 - Activity 2: The Journey of the Pacific Salmon board game



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- Processes of science that the students will focus on:
 - Activity 1 requires students to make predictions and test their predictions with an experiment.

Science Activity

Activity #1: Salmon fishing experiment.

Purpose of Activity: To explore how the number of fish caught is influenced by effort (number of people fishing) and gear type.

Methods and Instructions:

Set-up prior to activity:

Assemble all materials (see Fishing Experiment Materials above) and photocopy Worksheet1, one per student. Build 8 'normal' fishing rods: attach a magnet (the hook) to one end of a piece of string (the fishing line), and attach the string to a meter stick or dowel (the fishing rod). Build 2 'trolling' fishing rods by attaching five lines (as described above) to each rod lengthwise. Each salmon cutout must have a paper clip attached to it. Divide the class into two groups. Note this lesson is modified from Salmonids in the Classroom: Primary (see references).

In class activity:

- Explain that each group will conduct 3 fishing experiments. Each group has 20 salmon that they are fishing for (place the salmon non-overlapping on the ground). In the first experiment, each student in the group takes one turn fishing for 30 seconds. In the second experiment, 4 students in each group fish together for 30 seconds. In the third experiment, three volunteers from each group will take one turn fishing for 30 seconds with the modified "troller" fishing rod. Before starting the experiments, students predict how many salmon will be caught in 30 sec under the 3 different scenarios (Worksheet 1).
- During the experiments, both groups can fish simultaneously. Have a time keeper who starts and stops the fishing intervals, and record the number of salmon caught interval (i.e. per student for Ex #1 and per 4 students for Ex #2) on a flip chart easily seen by the whole class. After each experiment, calculate the mean and the range for each group.
- At the end of the experiments (do them in order), students finish filling out Worksheet #1 with the results.
- End with a discussion about catch per unit effort; particularly how gear type and the number of people fishing affects the number of fish caught. Talk about the conservation implications of fishing.

Activity #2: The Journey of the Pacific Salmon board game (Ocean).

Purpose of Activity: To review the day's lesson in a fun and engaging way.

Methods and Instructions:

Set-up prior to activity:

Print and cut out the ocean questions (Worksheet 2) and place them in an envelope.

In class activity:

- Start the game with the team whose turn it is (from last lesson).



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2. Explain that today we will play the OCEAN section. The game questions reflect what we have explored and learnt in today's lesson. The rules of the game are as follows:
 - a. The first team rolls the die and moves forward X squares by the number rolled. A volunteer from the team then picks a estuary question from the envelope and reads the question to the class. The team has 1 minute to decide how they will answer the question. If their answer is correct, they roll again. If incorrect, the scientist asks the rest of the class if they know the answer. Either a student or the scientist explains the correct answer to the class, and then the next team goes. Each team stops playing when they reach the end of the estuary section.
 - b. For the next 2 lessons we will end each day with playing this game. Next week the class will play the STREAM IN section and finish the game (note that an Estuary In section is present on the game board, but this section can be skipped by asking the students one question and if they answer it correctly they progress to the start of the STREAM IN section).

Closure Discussion

The board game is an effective way to review the lesson. After the board game, explain briefly the intent of next week's lesson: to review spawners, the life cycle stage that returns to natal streams to reproduce. We will explore how non-native species can impact wild salmon populations.

References

1. Salmonids in the Classroom: Primary. A Teachers Resource for Studying the Biology, Habitat and Stewardship of Pacific Salmon. To download the entire package, see: http://www-heb.pac.dfo-mpo.gc.ca/community/education/lessonplans/sicprimary/downloads/english/sic_primary_all.pdf
2. Fisheries and Oceans Canada. Salmon Fisheries in the Pacific Region. <http://www.pac.dfo-mpo.gc.ca/fm-gp/species-especies/salmon-saumon/fisheries-peches/index-eng.htm>
3. Commercial Salmon Fishing in British Columbia. <http://www.kenbryski.com/commercial.html>

Name: _____

Salmon Fishing Experiment

There are 20 adult salmon in the ocean and we are going fishing to catch them!

a) Explain what will happen when 1 person fishes for 30 seconds (your prediction):

Explain what did happen (your observation or result):

b) Explain what will happen when 4 people fish for 30 seconds (your prediction):

Explain what did happen (your observation or result):

c) Explain what will happen when 1 person fishes with a "troller" fishing rod for 30 seconds (your prediction):

Explain what did happen (your observation or result):

How long do Pacific Salmon spend in the ocean?	What is gill netting? Explain this fishing method.
How far do Pacific Salmon travel while in the ocean?	What is trolling? Explain this fishing method.
What is the scientific word for salmon travelling to the North Pacific and then returning to their home stream?	Name one type of predator that eats adult salmon.
Name one type of animal that adult salmon eat.	What is recreational fishing?
Name one type of animal that adult salmon eat.	Why do scientists know so little about adult salmon?
How do adult salmon protect themselves from predation? Explain one way.	What stage in the salmon life cycle comes before adult salmon?
How do adult salmon protect themselves from predation? Explain one way.	What stage in the salmon life cycle comes after adult salmon?
What is seining? Explain this fishing method.	Name one type of predator that eats adult salmon.

