

LESSON PLAN: PACIFIC SALMON CASE STUDY

GRADES: 4-6

SUGGESTED TIME: TBD

OVERVIEW:

Aquatic species in Canada are faced with many factors that impact their ability to survive and reproduce. This lesson focuses on the impacts of bycatch gillnet fishing on Pacific salmon. (Bycatch means that some species are caught unintentionally, and then released.)

In this investigation, students will compare two samples of fish - one group that has been stressed by being trapped in a gillnet, and a control group. Students will look at real telemetry data, and compare the success of these two groups of fish.

Students will then get to participate in a game that demonstrates the challenges pacific salmon face when completing their migration from the ocean to the river.

OBJECTIVE:

Students will:

- Learn about a data collection method called biotelemetry
- Organize secondary data into stem and leaf and scatter plots
- Compare two sets of data using median and mean
- Draw conclusions from a sample, and apply their findings to the greater population
- Learn about how human activities impact salmon
- Identify environmental issues associated with commercial fishing

PRIOR KNOWLEDGE:

Students would benefit from having a basic understanding of:

- Stem and leaf plots
- Scatter plots
- Median and mean

MATERIALS:

Part 1: Data Organization

- ❑ Biotelemetry introduction video
- ❑ Handout - Pacific Salmon - Part 1 - Data Organization Package (6 pages)
 - Print a copy of the package for each student
- ❑ Handout - Fish Spawning Map
- ❑ String
- ❑ Fish Data Cards (3 from each set, 6 cards total)
 - Print and cut the cards

Optional: Part 2: Salmon 'Battleships' Game

- ❑ Handouts
 - Battleships Game Package
 - Game Instructions
 - Game follows the same rules as traditional battleships but uses obstacle tokens representing some of the stakeholders and natural predators to illustrate the real challenges salmon face during their migration. Instructions are provided with the game package.

INSTRUCTIONS TO PARENTS/TEACHER/EDUCATOR

INTRODUCTION:

1. Begin by showing student(s) the Biotelemetry Introduction video.
2. Show the Pacific Salmon video.
3. Inform students that they will be exploring a case study about a species of Pacific salmon called coho salmon. They will be analyzing real telemetry data and learning about the effects of bycatch and commercial gillnet fishing.

PART 1: DATA ORGANIZATION

MINDS ON

1. Ask your student(s): How do you perform differently when you are feeling sick and/or tired?

ACTION

2. Distribute the Data Organization package. Have your student(s) read the Case Study Notes on page 1. Give each student 6 fish cards - 3 stressed, and 3 not stressed.
3. Give student(s) six fish cards - 3 stressed, and 3 not stressed.
Note: Explain to student(s) that when a fish is stressed, it means that it is tired and possibly injured.
4. Discuss with your student: Which fish are most likely to make it to the spawning area and why?
5. Provide students with a copy of the map.
 - Teach the student how to use a string and the scale (at the bottom of the map) to calculate the distance that each fish travelled. Have them lay the string carefully along the river from one location to the next. Then, have them stretch out the string and measure it using the scale at the bottom.
 - Ask student to measure the distance from the Release point, to each of the locations along the river. Have them jot these distances down on scrap paper. Challenge them to be as accurate as possible.
 - Then, share the actual distances that it takes to get to each location. Have them compare the accuracy of their measurements:
 - Mission - 40 km
 - Confluence - 60 km
 - Vedder - 75 km
 - Tahimi - 95 km
 - Lower Hatchery - 110 km
 - Once you have given students the accurate distances, have them fill in the distance column on their fish cards.
 - Use data collected to add to Table 1: How Far Did the Fish Travel? (Note: To do this, you only need information about the final location where each fish was detected. See the Answer Key for reference.)
 - Have students complete the Part 1 - Data Organization handouts. These include:
 - Organizing distance travelled into stem and leaf plots.
 - Creating a scatter plot comparing the time and distance travelled by stressed and not stressed salmon.
 - Calculating the median and mean distance travelled for stressed and not stressed salmon.

CONSOLIDATION

Use the following questions to facilitate a discussion about the implications of these results

A. What trends do we notice in our scatter plot when we compare stressed to not stressed salmon?

Possible responses:

More of the not stressed salmon seemed to make it farther distances.

It seems difficult for both groups of salmon to make it to the spawning grounds. This surprised me. I wonder what other factors affected the success of the salmon.

B. How can we use the mode, median and mean of each set to make conclusions about the data?

Possible responses:

The mean and median scores allow us to compare the data using one score. For example, the data set with a higher mean distance, would have generally made it farther than the other set.

The median shows us the center of the data. It means that half of the fish in that group made it further than the median, and half didn't make it as far.

We can use both the mean and median to compare this data. If there were any extreme outliers, the mean wouldn't be as useful.

C. What inferences can we make about the effects of gillnet fishing?

Possible responses:

Stressed fish are slower after release, and take longer to get to the spawning grounds than not stressed fish.

If we compare this sample to the greater population, we can conclude that more stressed fish fail to make it to the spawning grounds.

If fewer stressed fish make it to spawn, then that species of fish is going to decline in numbers.

D. The overall goal of this management strategy is to conserve the coho salmon population, by throwing them back, after being caught in nets meant for other types of salmon. Do you think this strategy is effective in conserving coho salmon?

Possible responses:

The majority of coho salmon are not making it to spawn, which means that they won't produce offspring. If most coho salmon don't get to reproduce, then this is not a very effective management strategy. Maybe they could consider other management strategies?

E. What other management strategies could they use to protect the coho salmon?

Possible responses:

Ex. Ban all fishing during coho migration

Ex. Reduce the amount of overall captures

Ex. Protect certain areas from fishing Ex. Use other fishing techniques

8. Provide students with the 'exit card' to assess their overall understanding.

PART 2: SALMON BATTLESHIPS GAME | OPTIONAL EXTENSION

MINDS ON

1. Ask your student(s): What obstacles might salmon face during their migration from the open ocean to the river?

ACTION

2. The following activity is designed for two participants. Have students set up the Salmon Battleships Game. Ask students how the current obstacles included in the game might impact a salmon's ability to migrate and spawn.
3. Play a round (or two!) of the salmon migration game. Allow the student to read the pacific salmon fact sheet and re-watch the salmon video.
4. Discuss with the student how removing or limiting the action of some of the obstacles in the game might impact the salmon population, and the consequences a smaller salmon population might have on that obstacle.