Narrator's Script

Wild salmon, the staple food source for resident orca communities along the Pacific coast, are under threat from a variety of factors: overharvesting, the building of dams that interrupt migration, habitat destruction, the accumulation of chemical pollutants in ocean water and climate change. **Aquaculture**, or fish farming, the raising of fish in holding tanks at sea, is a way to reduce at least *some* of the pressures on wild salmon stock. Fish farming is a growing industry, providing jobs and revenue for thousands of people and food for countless others. Fish farming helps meet the food demands of our growing population and seems to many a viable solution to the problems facing wild salmon.

Biologists wonder if the story is so simple. Fish farms raise salmon in open-net cages in which fish are in close contact with one another. As in any place where organisms are packed together, diseases and parasites spread quickly in fish farms. But unlike the fish, these problems do not stay contained. As the water in the high-density cages mixes with the surrounding seawater, so do the organisms that prey on salmon.

A sea louse is one such organism. It is a tiny creature that **parasitizes** salmon, living off the skin, mucus and blood of the salmon, causing young fish harm or death. Sea lice larvae float in the water until they attach to the skin of a salmon. The sea lice create sores that invite infection or gravely injure the young salmon. Even one sea louse can be a deadly **load** for a juvenile salmon! In the natural life cycle of salmon, juvenile salmon emerge from the rivers without coming into contact with many adult fish. Adult salmon are either at sea or dead in the river. Fish farms have the ability to keep adult salmon, which may be infected with lice, in inland waters all year, including when juvenile fish emerge from the rivers.

Biologists asked the question: Are fish farms endangering wild salmon by spreading sea lice?
• Invite students to make a hypothesis.
Scientists monitor wild salmon stocks in the Broughton Archipelago, British Columbia. In 2002, the pink salmon stock collapsed - out of the 3.6 million salmon expected to return that year to the Broughton Archipelago, only 147,000 fish returned! (A map of the study site can be found at: http://www.livingoceans.org/files/Maps_PDF/ff_brough_tenures1_june04_2008.pdf.

Research scientists conducted a survey of three wild salmon runs in the Broughton Archipelago. The study compared three sites: one next to fish farms, one near but not right next to fish farms and one quite a distance away from any fish farms. What were their findings? In this game, you will each represent 1,000 juvenile pink salmon migrating down your birth rivers to the Pacific Ocean.

Congratulations! You faced many dangers along the way but you have made it to the mouth of the river. Now in the ocean, a new danger faces you, a small horseshoe-shaped parasite called a sea louse. **How many of you will make it? How many will perish?**

Parasite Perils Data Analysis Game
Teacher Sheet

Round 1: How many salmon are infested and die from sea lice in areas where there are *no* fish farms?
In an adjacent cove, salmon are farmed in large holding tanks. Even though you won't be swimming directly by these installations, you will be sharing the same water. Surface and tidal currents in the near-shore waters mingle with the waters in the connected coves.

- Choose one number card out of the envelope. Announce the number and the sad news. *"All 1,000 of your salmon are infested with sea lice. You didn't make it to sea!"* Direct this student to move to the sea lice side of the room.
- Ask students to record the mortality numbers for the sample on their worksheet.

Round 2: How many salmon are infested and die of sea lice in areas *closer to, but not right next to* fish farms?
Fish farms are cropping up everywhere in the protected coves along the coast. Your river is near a fish farm. The tides and surface currents mix the first waters you enter on your journey to the sea with the waters around the fish farm.

- Choose five number cards out of the envelope. Announce the numbers and the sad news. *"All 1,000 of your salmon are infested with sea lice. You didn't make it to sea!"* Direct students to move to the sea lice side of the room.
- Ask students to again determine and record the mortality numbers for the sample on their worksheet.

Round 3: How many salmon are infested and die of sea lice in areas *right next to* fish farms?
The mouth of your river opens on a protected cove. A fish farm operation is capitalizing on the location and raising throngs of captive salmon. Your journey takes you directly by the fish farm on your way to the open sea!

- Choose nine number cards out of the envelope. Announce the numbers and the news. Tell eight of the students, *"All 1,000 of your salmon are infested with sea lice. You didn't make it to sea!"* Tell the ninth student, *"800 salmon from your population are infested with sea lice; a lucky 200 salmon made it through without contracting any sea lice."* Direct all nine students to move to the sea lice side of the room and ask the ninth to add the appropriate number of surviving salmon to a sheet of paper and pass it to the other side.
- Ask students to again determine and record the mortality numbers for the sample on their worksheet.

Round 4: How many fish return to spawn? Scientists measured how many adult salmon returned to spawn compared with the number of adults (their parents) returning when they were conceived.

- Pass out the mortality cards to each student. Have the students read the cards and move to the appropriate side of the room. If part of a student's population survived and the other part died, ask them to move to the sea lice side and pass a sheet of paper with the number of surviving salmon to someone in the other group.
- Ask students to determine the mortality numbers for the sample and record it on their worksheet.
- Ask students to return to their seats and use the data collected from rounds 1 through 4 to complete their worksheets. Students can work collaboratively in groups.