Smelling Like Fish

Written by Brianna Patterson; based on a combination of activities with unidentified sources

Time requirement: 100 minutes (including prep and clean-up time; the activity alone should take 30-60 minutes)

Summary of Activity: Students will learn about the stages of a salmon life cycle and simulate the migration of a salmon and understand a salmon's ability to locate their home stream through scent.

Concepts to Teach: Adaptations and Survival; Freshwater and Saltwater habitats

Standards Addressed:

3.1L.1, 3.2L.1, 4.2L.1, 5.2L.1

Instructional Strategy: Experiential learning

Goal(s): Students will learn about the unique life cycle and migration habits of salmon and how they find their way back to their freshwater breeding grounds.

Specific Objectives:

- Construct a mnemonic device as a way to remember the stages of the salmon life cycle.
- Become salmon and experience the challenges of migration.
- Use sense of smell to locate a home stream.
- Discuss migration experiences.

Vocabulary:

Adaptation, alevin, anadromous, fry, habitat, migration, parr, predator, smolt, species

Required Materials:

- Paper and pencil
- Colored pencils or crayons
- 4-6 distinct smells
- Airtight containers/baggies
- Post-it notes
- Marker
- Open space (indoors or outdoors)

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Background

Salmon Life Stages

(information adapted from: http://library.thinkquest.org/05aug/00548/species--life%20cycle.html)

Egg: Most eggs are reddish-orange in color. Adult salmon hide them under gravel to protect them from predators. Incubation periods vary among species. When the egg hatches, an alevin emerges.

Alevin: After emerging from the egg, alevin are very vulnerable to predators. They cannot swim very well on their own, so they need to stay hidden to avoid being eaten. Alevin are equipped with a yolk sac that provides them with nutrients so that they do not need to find their own food. The yolk will last until they grow strong enough to swim and eat on their own.
Fry: After the alevin has absorbed all of the nutrients from the yolk sac, it is considered a fry. Fry are about one inch long, can swim on their own, and need to forage for food to stay alive. Some species head directly to the sea while others spend more time in the relative safety of the freshwater river or stream.
Parr: Parr are very similar to fry except that they are double in size. They still need to be very careful of predators. During this stage, the little salmon must eat constantly to bring up their strength and get ready to take on the journey of traveling to the ocean.
Smolt: During this stage, the fish have migrated into brackish estuary waters where they being the physiological change needed to survive the saltwater environment.
Adult: Salmon in this stage instinctually head toward their hereditary feeding ground in the ocean. Depending on the species, salmon will spend anywhere from 1-5 years at sea. As they prepare to return to their spawning habitat, they stop eating and live on their fat reserves as they use their tremendous memories and sniffers to make their way back to the stream in which they were born.
Spawners: Male spawning salmon will guard their female counterparts while they dig nests (called "redds") where they will bury their eggs. Nests are often located in cold, fast-flowing water. Females lay thousands of eggs, but only 1 in 10 will actually survive to maturity. Males will then fertilize the eggs and then the females will cover the nest with gravel. In most species, after spawning, the salmon will die. Some will go on to breed once or twice more.

Migration

Migration is a seasonal or long-term movement from one area to another. Many animals migrate to find food, to breed, or to find better habitat conditions. Salmon migration is unique in that they are changing habitats completely. Young salmon migrate from the freshwater environment where they were born into a saltwater environment where they will live until it is time to breed. Special chemical changes happen in the salmon as they migrate so that they are able to live in both types of environments. To breed, salmon return to the freshwater stream where they were born. Animals that are born in freshwater but travel to saltwater are considered anadromous. As they return to the freshwater, chemical changes occur again so that they can live in the freshwater again. Scientists believe that salmon use their sense of smell to know which freshwater stream to return to when it's time to breed.

Prerequisites

None

Preparation

- Choose 4-6 distinct scents. Essential oils work well, but you could also use flavored tea, spices or scented markers. Be creative! It is also fun to use scents that students

can't really put a name to so that they have to think more about what they smell over what they know the name of.

- Put each scent into its own container. These containers can be closed or have a lid with holes. Film containers or yogurt cups with lids work well. Number the containers on the bottom so that they can be identified later. If you are using oils or other liquids, a cotton ball can be used. If you are using a spice or powder, a cotton ball is also useful to keep things from spilling.
- Mark Post-it notes with the numbers of the scents so that you can pass them out to students when you assign them a "home scent." That way, at the end, they can double-check their smelling abilities.

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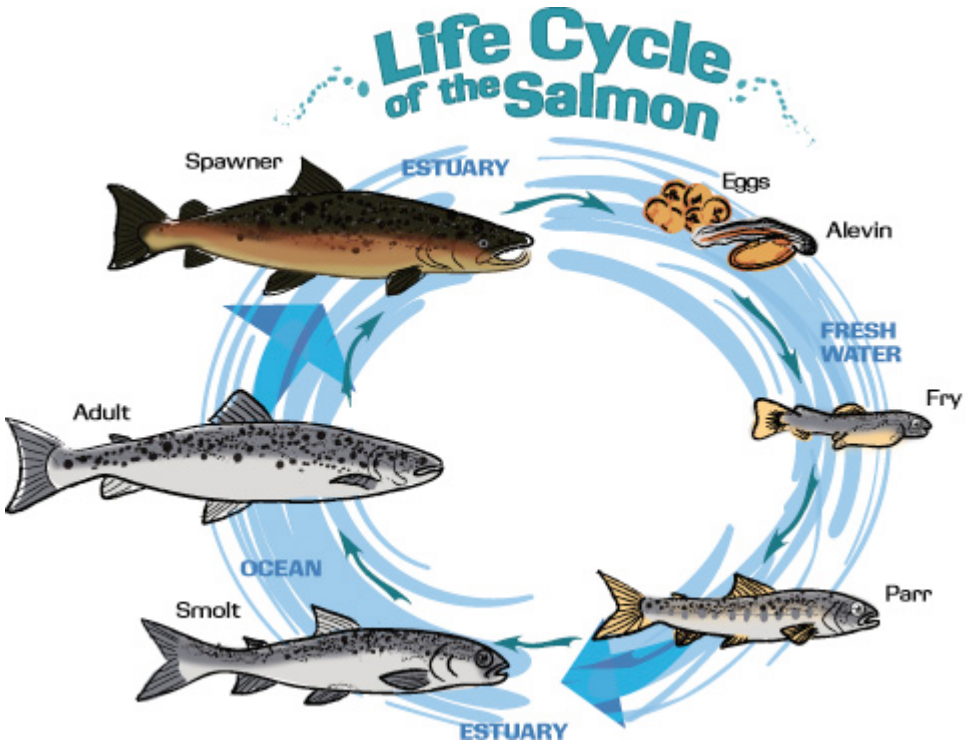
Lesson Procedure/Activity Description

Introduction:

Introduce students to the concept of migration, anadromy, and the powerful sense of smell that salmon use to find their home stream. This discussion should be an overview of migration but it should also explain that salmon are unique in that they adapt to an entirely different environment when they migrate.

Main Activity:



1. Introduce the salmon life cycle. You can use the picture above or any other version.

2. Explain distinct characteristics of each stage to give students a way to identify each (see the background section for more information on this). Then explain that they can make a mnemonic device to help them remember the stages.
3. Students can work individually or in groups to create their device. Here is an example:
   Edgar's
   Aunt
   Florence
   Plays
   Saxophone
   Above
   Saturn
   Some students will just want to use the one you present, so you might want to give an example that is a different saying. If that will be an issue, you can use the familiar musical mnemonic:
   Every
   Good
   Boy
   Does
   Fine
   Give students 10-15 minutes to come up with their mnemonic, and then choose a couple of students to explain theirs to the class.
4. Explain to students that they will now become migrating salmon. They have completed the egg, alevin, parr, and smolt stages and need to head into the ocean to feed.
5. Have each student smell one of the scents and give them a Post-it with the number that corresponds to the scent they smelled. They can put this number at their desks so that it doesn't get lost during migration.
6. Take the students outside/to the indoor area to play the Migration game:
   While the class is outside of the classroom, have someone set-up the scents in different locations in the room.
   a. Use existing landmarks to draw out a course. For example, the students need to get from one end of the blacktop to the other to complete migration. Or, they might run in between basketball hoops.
   b. Have the students run the course once. They are migrating from their freshwater home to their ocean feeding grounds. Talk about how easy or hard it was for them to get across. This should be pretty easy considering there were no obstacles. Distinct and important habitats can be added to the course highlighting the diversity of these areas and importance for salmon survival and growth (i.e., log jams, deep pools, salt marshes, bay area, ocean)
   c. Add obstacles: Have some students act as predators of salmon: seals, sea lions, eagles, osprey, and orcas (especially in the open ocean where there is little habitat protection). Try to avoid these predators. If the "salmon" are tagged by a predator, then they should sit on the sidelines.

   d. Add more obstacles: In addition to predators, have some chairs or other students represent dams that are blocking the salmon's path. (You can also add the element of fisherman, but be prepared to explain a little about human interactions with salmon populations.)
   e. You can also choose to add in other ways of migrating. The students have migrated alone. Now, have them link arms to form "schools" and run the migration course.
   f. Run through a few times with predators and other obstacles and then have all the students sit down and discuss how easy or hard it was to "migrate" to the ocean and then back again.
   g. This activity can be completed many times as time allows. Or, if students come up with more and more ways to add obstacles or want to run the course lots of times.
7. Allow the students back into the classroom in small groups (3-5 students). When they enter the classroom, they should take a minute to sniff out their home scent and stand by it. Instruct them not to pick up the container or to look at the number.
8. Once everyone is where they think they should be, have a student at each station reveal the number that is on the bottom of the container. Is everyone at the correct number? Have them refer back to their Post-it note to make sure. A nose can be deceiving!

Conclusion:
Have a discussion about the results. If everyone made it back to the right place, they have salmon-worthy sniffers! If not, why was it hard to find the same scent again? Discuss the adaptation of salmon sensory systems to finding their home stream again to spawn.

Assessment

- The mnemonic device can be graded based on creativity or effort.
- Have the students investigate salmon adaptations further. Split the class into groups and have each group research a type of salmon found in the Pacific Northwest. Do all salmon have the same abilities? What are the differences between species? Compile the results into a reference book for students to use.

Adaptations & Extensions

- Have the students investigate migration further. What other animals migrate? Does their migration differ from what salmon do?
- Hexaflexagon Activity: This requires some dexterity and patience. It is a good idea to try this yourself before attempting to give it to your students to do. Determine if your students are likely to be able to construct this. Another option is to put together 4-6 hexaflexagons and have students use them in groups to learn more about the salmon life cycle.

Additional Resources

Vocabulary

Adaptation- a characteristic, such as a body part, color pattern, or behavior, that helps an organism survive in their habitat
Alevin- a life stage in which small salmon rely on a yolk-sac for nutrients
Anadromous- migrating from saltwater to spawn in freshwater
Fry- a life stage in which a salmon has to begin foraging for food on its own
Habitat- the place where an organism lives and finds food
Migration- a seasonal or long-term movement from one area to another
Parr- a life stage in which a salmon has to eat voraciously in order to gain the strength needed for their long journey to the sea
Predator- an animal that kills and eats other animals to gain energy
Smolt- a life stage in which salmon begin to take on a silvery coloring and starts its journey to a saltwater environment
Species- a group of organisms that have common physical structures and can interbreed

Standards Addressed

3.1L.1- Compare and contrast the characteristics of offspring and parents.
3.2L.1- Compare and contrast the life cycles of plants and animals.
4.2L.1- Describe the interactions of organisms and the environment where they live.
5.2L.1- Explain the interdependence of plants, animals, and environment, and how adaptation influences survival.