"Finding Their Way" Through the Watershed: An Anadromous Fish Activity Packet

Station 1) **Let's Learn about Fish Anatomy!**

The *internal* "inside" anatomy of Atlantic salmon:

- Using Internet Explorer, go to the following webpage: http://idahoptv.org/sciencetrek/topics/salmon/games.cfm
- Under "Salmon Knowledge" select "Fun Games."
- Select and play the "Dissection" game.
- Follow the instructions to dissect the salmon. Make sure to find all of the following internal organs: eggs, liver, stomach, intestines, heart, swim bladder, and kidney.

Using the terms below, can you list the internal and external features of Atlantic salmon that are present and absent in humans?

Jaw	Eye	Fins	Liver	Stomach	Heart	Kidney
Swim bladder	Eggs	Intestines	Gills			

PRESENT in Humans	**ABSENT** in Humans
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Station 2) **Atlantic salmon in Freshwater: What Makes a Good Habitat?**

Sand?	**Toxins?**	**Temperature?**	**Large woody debris?**
Dissolved oxygen?		**Current speed?**	**Stream depth?**
Bacteria?	**Vegetation?**	**Turbidity?**	**Gravel?**

Activity A) What Makes a Good Stream Habitat for Salmon?

- Using Internet Explorer, go to the following webpage: http://idahoptv.org/sciencetrek/topics/salmon/games.cfm
- Under "Salmon Knowledge" select "Fun Games."
- Select and play the "Pick the Good Stream" game.
- Click on the stream you think would be best for salmon eggs to hatch in.
- Move your mouse over the buttons to see why.

Activity B) Build your own Salmon Stream

- Using Internet Explorer, go to the following webpage: http://idahoptv.org/sciencetrek/topics/salmon/games.cfm
- Under "Salmon Knowledge" select "Fun Games."
- Select and play the "Stream Builder" game.
- Follow the instructions to design a stream that will allow as many eggs as possible out of 4,000 to survive the hatch.

How many salmon eggs survived in your salmon stream? _____

Which settings did you do well on? _____

Which settings could you improve on? _____

Which settings needed a lot of improvement? _____

Reset your salmon stream settings and repeat this activity.

How many salmon eggs now survived in your salmon stream? _____

Station 3) **The Anadromous Life-Cycle: Using the Entire Watershed!**

The life-cycle of Atlantic salmon begins in late autumn when the female lays her ***eggs*** in a gravel pit (a redd) in the streambed. Once the male fertilizes the eggs with his sperm (or milt), the female covers the eggs with gravel for protection. The following spring, newly hatched salmon, called ***alevins***, live in the gravel substrate and get nutrients from their yolk sacs. After a few weeks, the yolk sac disappears, and the small fish, now known as ***fry***, emerge from the gravel and move into deeper water to find food. ***Parr*** remain in freshwater streams feeding and growing for many months or even years before migrating downstream to the ocean. Before parr can enter the ocean, their bodies must change in preparation for life in saltwater. This process of change is called smoltification, and after it is complete, the salmon are now called ***smolts***. Smolts migrate from the river to the Atlantic Ocean where they grow to become ***adults*** by feeding on shrimp, crustaceans, and other fish. After two to five years in the ocean, salmon begin the migration back to freshwater. As young fish, salmon have memorized the unique odors of their home stream, and they use their sense of smell to guide them upstream to the exact location where they were hatched. Once in their home stream, adult salmon spawn and often die.

Activity: Construct the anadromous life-cycle of Atlantic salmon by placing the correct name, picture, and description of each life-stage in the correct location on the poster board.

Below are several factors that can lead to the decline of anadromous fishes. List the life-stage(s) you think are most affected by these factors?

1. Dams = _____

2. Pollution = _____

3. Overfishing = _____

4. Predation = _____

5. Habitat Destruction = _____

Station 4) **Adapting to Life in Different Environmental Salinities**

Anadromous fish must adapt to life in saltwater when they migrate to the ocean, and then to freshwater when they return to their natal rivers to spawn as adults. In this activity you will learn about the challenges that anadromous fish face when moving from freshwater to saltwater and vice versa, and predict how they overcome this challenge.

Activity: Turn on the scale using the ON/OFF button. Make sure the units on the scale are in grams (g). Before beginning, press the TARE button to zero the balance. Using the spoon, carefully remove one gummy bear from each of the three beakers and gently place them on a paper towel to blot dry. Next, using the spoon, place the control gummy bear (from the empty beaker) on the scale. Record its weight in grams. Repeat this step for the gummy bears in freshwater and saltwater. Once you have finished measuring the weight of gummy bears from all three beakers, throw away your gummy bears and paper towel, and wipe the scale clean.

Gummy Bear	Weight (g)	Weight (g)	Weight (g)	Mean
Control (empty)				
Freshwater				
Saltwater				

Compare the weight of the control gummy bear to the weights of the freshwater and saltwater gummy bears.

What happened to the weight of the gummy bear after soaking in freshwater?

_____

What happened to the weight of the gummy bear after soaking in saltwater?

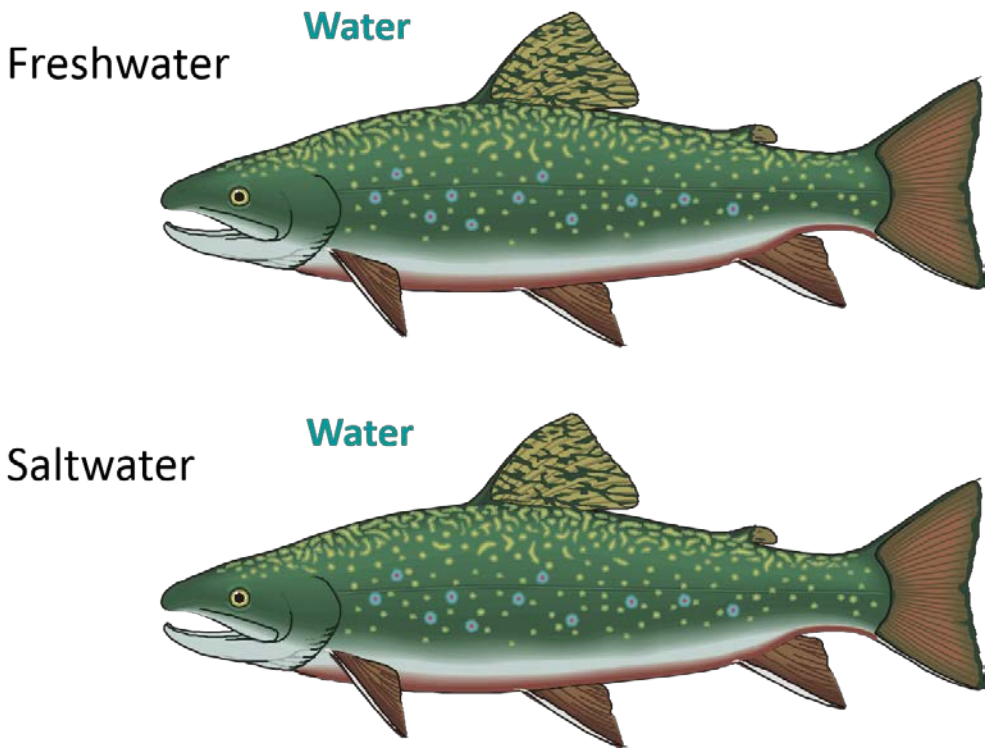
_____

Give an explanation for the observed results.

_____

_____

The gummy bear experiment demonstrates the physiological challenges that anadromous fish face when migrating to freshwater and saltwater. In the picture below, draw arrows to show the direction of water movement for an anadromous fish that has just migrated into freshwater and saltwater.



Anadromous fish are specially adapted to deal with the challenge of life in different environmental salinities. Can you think of how an anadrmous fish may overcome the physiological challenges you have outlined above? Think about what happens to your body when you are dehydrated or when you have had a lot to drink.

What can an anadromous fish do to adapt to freshwater?

_____

_____

What can an anadromous fish do to adapt to saltwater?

_____

_____

Station 5) **Finding The Way Back Home: Effects of Chemical Pollution**

Anadromous fish return to spawn or reproduce in the same river or stream where they were hatched as eggs. Scientists do not know for certain how they find their way back to the same river or stream, but one idea is that they can smell or taste the water chemistry of their natal river or stream.

Activity: Choose one of the six jars labeled A-F, open the jar, smell inside, and memorize your scent. Now, one by one, open and smell the jars labeled with the names of salmon rivers to find your natal river.

What's the name of your natal river? _____

Find the picture of your watershed. Which States are part of your watershed?

_____

Flip your map over to calculate how many salmon returned to spawn in your river?

_____

How did the presence of chemical pollution affect your ability to find your natal river?

_____

_____

_____