DRAFT

CLASSROOM HATCHERY PROGRAM

GRADE 1 LESSON GUIDE

Made possible through funding from:

An agency of the Government of Ontario
Un organisme du gouvernement de l'Ontario

Lesson Summaries

Lesson 1: **Build an Atlantic Salmon**	Students will be introduced to basic fish biology and identification to assist them in identifying an adult Atlantic Salmon. They will then build an Atlantic Salmon from diagrams of parts of the fish and add dots to reflect the key characteristics of the fish.	50-60 Minutes
Lesson 2: **Life Cycle Bracelet**	Students will learn about the Atlantic Salmon's life cycle and then illustrate the life cycle by creating a bracelet.	2 Hours
Lesson 3: **Aquarium Add Up**	Students will apply grade 1 math skills in the context of their classroom hatchery unit on a math worksheet. This lesson is best done just before egg delivery so the students will be able to assist with monitoring water temperatures.	50-60 Minutes
Lesson 4: **Salmon Song**	Students will hear the story of the Lake Ontario Atlantic Salmon including its history, habitats, and life cycle. They will then dissect the story for the important pieces and create a song from the information.	60-120 Minutes
Lesson 5: **Water Temperature Experiment**	In this simple experiment, students will practice temperature measurement skills by placing containers of water in different environments and observing how the temperature changes. They will then apply this knowledge to a stream system where salmon need cold water to survive.	60-120 Minutes
Lesson 6: **Predator Tag**	A dynamic tag game teaches the students about predators and prey that are involved in the life of Lake Ontario Atlantic Salmon.	60-120 Minutes

Curriculum Connections

Curriculum	Lesson 1	Lesson 2	Lesson 3	Lesson 4	Lesson 5	Lesson 6
Science & Technology						
UNDERSTANDING LIFE SYSTEMS NEEDS AND CHARACTERISTICS OF LIVING THINGS						
Expectations						
1. assess the role of humans in maintaining a healthy environment				X	X	X
1.2 describe changes or problems that could result from the loss of some kinds of living things that are part of everyday life taking different points of view into consideration					X	X
2. investigate needs and characteristics of plants and animals, including humans	X	X	X	X	X	
2.3 investigate and compare the physical characteristics of a variety of plants and animals	X	X	X	X		
3. demonstrate an understanding of the basic needs and characteristics of plants and animals, including humans				X	X	X
3.4 describe the characteristics of a healthy environment, including clean air and water and nutritious food, and explain why it is important for all living things to have a healthy environment					X	
3.6 identify what living things provide for other living things					X	X
UNDERSTANDING MATTER AND ENERGY IN OUR LIVES						
Expectations						
2.1 follow established safety procedures during science and technology investigations					X	
2.5 use scientific inquiry/experimentation skills and knowledge acquired from previous investigations, to explore the effects of light and heat from the sun					X	
2.7 use appropriate science and technology vocabulary, including explore, investigate, design, energy, and survival, in oral and written communication					X	
3.2 demonstrate an understanding that the sun, as the earth's principal source of energy, warms the air, land, and water; is a source of light for the earth; and makes it possible to grow food					X	

Mathematics

NUMBER SENSE AND NUMERATION

Expectations

solve problems involving the addition and subtraction of single-digit whole numbers, using a variety of strategies			X			
count forward by 1's, 2's, 5's, and 10's to 100, using a variety of tools and strategies			X			
solve a variety of problems involving the addition and subtraction of whole numbers to 20, using concrete materials and drawings			X			

MEASUREMENT

Expectations

relate temperature to experiences of the seasons					X	
compare two or three objects using measurable attributes and describe the objects using relative terms			X		X	
estimate, measure, and describe length, area, mass, capacity, time, and temperature, using non-standard units of the same size					X	
compare, describe, and order objects, using attributes measured in non-standard units					X	
compare two or three objects using measurable attributes			X		X	

The Arts

VISUAL ARTS

Expectations

D1 creating and presenting: apply the creative process to produce a variety of two-and three- dimensional art works, using elements, principles, and techniques of visual arts to communicate feelings, ideas and understandings	X	X				
D1.2 demonstrate an understanding of composition, using principles of design to create narrative art works or art works on a theme or topic	X	X				

MUSIC

Expectations

C1 creating and Performing: apply the creative process to create and perform music for a variety of purposes, using the elements and techniques of music				X		
C1.1 sing songs in unison and play simple accompaniments				X		

C1.3 create compositions for a specific purpose and a familiar audience				X		
C1.4 use the tools and techniques of musicianship in musical performances				X		

Language

ORAL COMMUNICATION

Expectations

1. listen in order to understand and respond appropriately in a variety of situations for a variety of purposes	X	X	X	X		
Active listening 1.2 demonstrate an understanding of appropriate listening behaviour by using active listening strategies in a few different situations	X	X	X	X		

Expectations

2. use speaking skills and strategies appropriately to communicate with different audiences for a variety of purposes	X	X		X		
Interactive Strategies 2.2 demonstrate an understanding of appropriate speaking behaviour in a few different situations, including paired sharing and small- and large group discussions	X	X		X		

READING

Expectations

3. use knowledge of words and cueing systems to read fluently		X	X			
Reading Familiar Words 3.1 automatically read and understand some high-frequency words and words of personal interest or significance, in a variety of reading contexts		X	X			
Reading Unfamiliar Words 3.2 predict the meaning of and solve unfamiliar words using different types of cues			X			

Health and Physical Education

LIVING SKILLS

Expectations

1. demonstrate personal and interpersonal skills and the use of critical and creative thinking processes as they acquire knowledge and skills in connection						X

Personal Skills 1.1 use self-awareness and self-monitoring skills to help them understand their strengths and needs, take responsibility for their actions, recognize sources of stress, and monitor their own progress, as they participate in physical activities, develop movement competence, and acquire knowledge and skills related to healthy living						**X**
1.2 use adaptive, management, and coping skills to help them respond to the various challenges they encounter as they participate in physical activities, develop movement competence, and acquire knowledge and skills related to healthy living						**X**
Interpersonal Skills 1.3 communicate effectively, using verbal or non-verbal means, as appropriate, and interpret information accurately as they participate in physical activities, develop movement competence, and acquire knowledge and skills related to healthy living						**X**
1.4 apply relationship and social skills as they participate in physical activities, develop movement competence, and acquire knowledge and skills related to healthy living to help them interact positively with others, build healthy relationships, and become effective group or team members						**X**
Critical and Creative Thinking 1.5 use a range of critical and creative thinking skills and processes to assist them in making connections, planning and setting goals, analysing and solving problems, making decisions, and evaluating their choices in connection with learning in health and physical education						**X**

ACTIVE LIVING

Expectations

A1. participate actively and regularly in a wide variety of physical activities and identify how regular physical activity can be incorporated into their daily lives						**X**
A1.1 actively participate in a wide variety of program activities						**X**
Safety A3.1 demonstrate behaviours and apply procedures that maximize their safety and that of others during physical activity						**X**
A3.2 identify environmental factors that pose safety risks during their participation in physical activity						**X**

Class size:	Unlimited
Setting:	Classroom
Time:	50-60 Minutes

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Grade 1 Classroom Hatchery Activities

Lesson 1: Build an Atlantic Salmon

Lesson Objectives:

- Familiarize students with the identification of Atlantic Salmon
- Familiarize students with basic fish biology, identification, and terminology
- Assist students with recognizing the value of proper species identification

Materials:

- Projector connected to computer or printed presentation (found below)
- Handout containing Atlantic Salmon pieces (found below - print enough for 1 student each)
- Scissors
- Craft glue
- Construction paper of various colours
- Pencil crayons, markers, or crayons

Background

Ontario is home to nearly 150 fish species; 129 of which are native. Proper identification of individual species is useful for monitoring (species presence and location, population size, fish health, etc), and for managing and complying with fishing regulations. Identification can also help build a deeper connection with a species by enabling the observation of patterns and life stories. It can also be a lot of fun!

Fish just like all other living things have unique physical characteristics that distinguish one species from another. Size, colouration, shape, and presence or absence of particular features are some of these characteristics. Atlantic Salmon like all salmon have an adipose fin (the small fin on the back of fish just in front of the tail) and a soft dorsal fin. Atlantic Salmon have dark spots (sometimes x shaped) on a lighter coloured body, generally only 2-3 large spots on the gill cover, a mouth that stops at the eye, and a long narrow caudal peduncle (the part of the fish that joins the body to the tail). These characteristics are shown in the presentation below.

It is important that scientists and anglers can properly identify Atlantic Salmon to give these fish the best level of care and so that anglers can follow fishing regulations. Anglers with proper identification skills can be valuable citizen scientists who can greatly contribute to monitoring efforts.

Teaching and Learning Sequence

Part A. Share this Cool Atlantic Salmon **Fact:** *Atlantic Salmon are known as the "leaper". They can jump out of the water 3 metres high! That is as high as a basketball net!!*

Part B. Ask these Guiding Questions:

1. Has anyone ever seen an Atlantic Salmon?
2. How might you tell the difference between an Atlantic Salmon and another fish?

Part C. Present **"Basic Fish ID"** (on a projector screen or print/display to class):

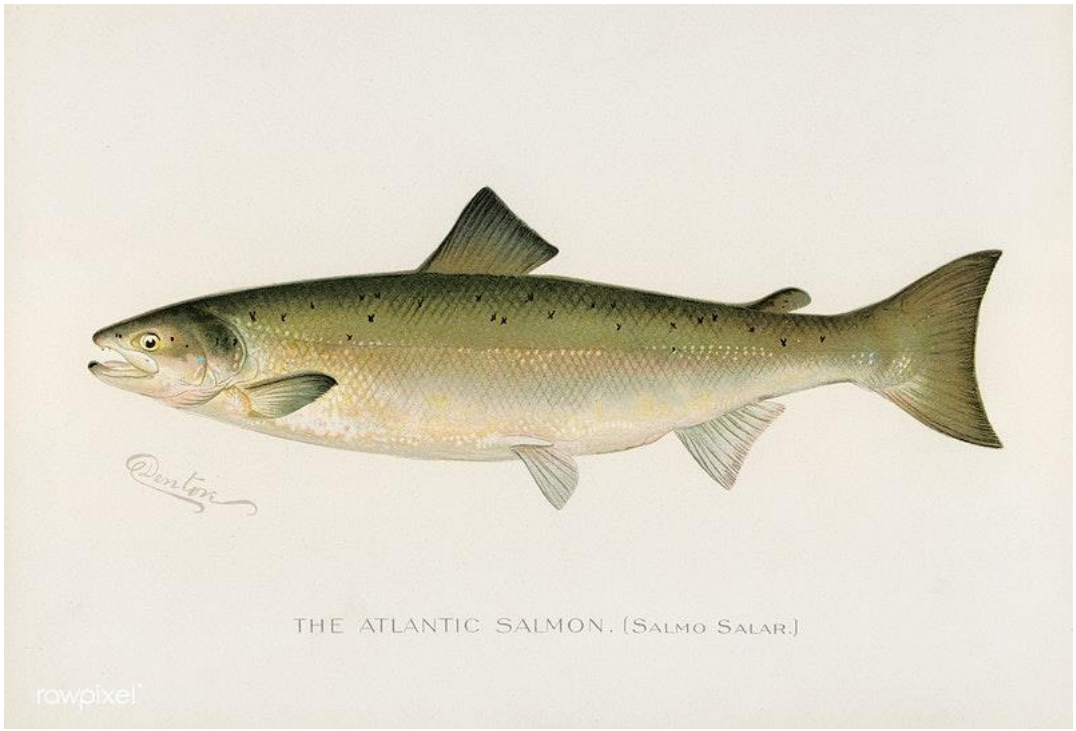
1. Page 1 of Presentation: Allow time for the students to talk about what they see. You are not looking for specific answers; rather, engaging their observation skills.
2. Ask the students how a fish breathes. Point out and define the ***gills*** = *the breathing organ of fish and some other animals used to extract oxygen from water.*
3. Page 2- 4: Show the 1 or 2 characteristics identified on each fish. This can be done quickly and is intended to show the students some of the main physical differences between fish. Atlantic Salmon, being our focal fish, has more characteristics identified.
4. Page 5 shows the fins of the Atlantic Salmon. The presence of these fins is characteristic of all salmon species. Point out and define the ***adipose fin =*** *a small fleshy fin just in front of the tail. Found on only a small number of fish species including salmon*.
5. Supply students with "**Build an Atlantic Salmon (handout)**", construction paper, scissors, glue, crayons/markers/paint supplies/pencil crayons.
6. Have the students create a background for their fish. This can be just blue water or water with the sky above. Make sure that they leave enough water for their Atlantic Salmon cut out.
7. While displaying "**Build an Atlantic Salmon"**, have the students cut out the pieces of the Atlantic Salmon and glue them in numbered sequence as close to the completed fish diagram as possible, i.e. the mouth does not extend past the eye (a key characteristic of Atlantic Salmon).
   The names of the parts are: 1. Body; 2. Head; 3. Tail; 4. Dorsal Fin; 5. Anal Fin; 6. Pelvic Fin; 7. Pectoral Fin; 8. Eye; 9. Adipose Fin.
8. The students can now colour the fish and add the black spots. Instruct them that another key characteristic is 2-3 dots on the gill cover (the crescent shape on the head), few or no dots on the tail and few dots on the lower part of the body. The distribution of the dots on the rest of the body is distinctive of individuals. For an Atlantic Salmon in a lake the colour of the back can be brown, blue, or green; the sides are silvery and the belly is white. When the fish leaves the lake to enter streams to spawn they lose their silvery colour, become darker and may develop red spots. Students can also name their fish and use this name for the fish they release in the spring!

Part D. Ask these Reflection Questions (can be done as a Think, Pair, Share):

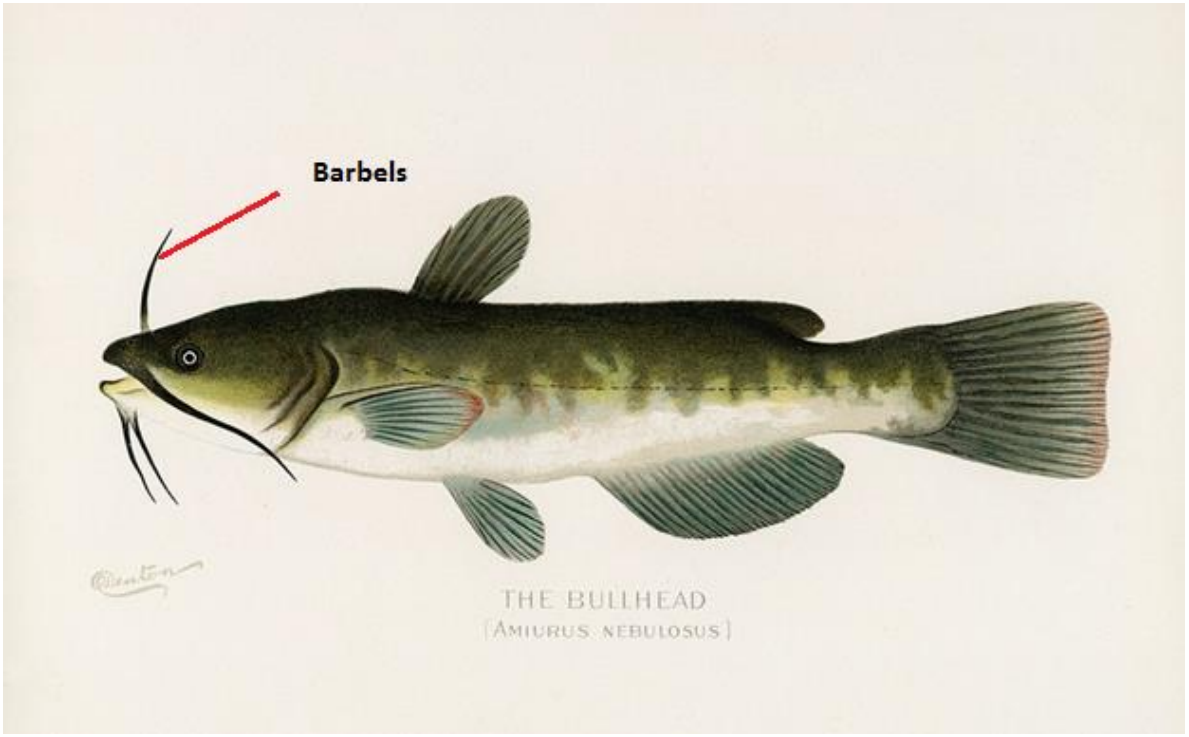
1. Why is the proper identification of fish important?
2. Name some identifying characteristics of an adult Atlantic Salmon.

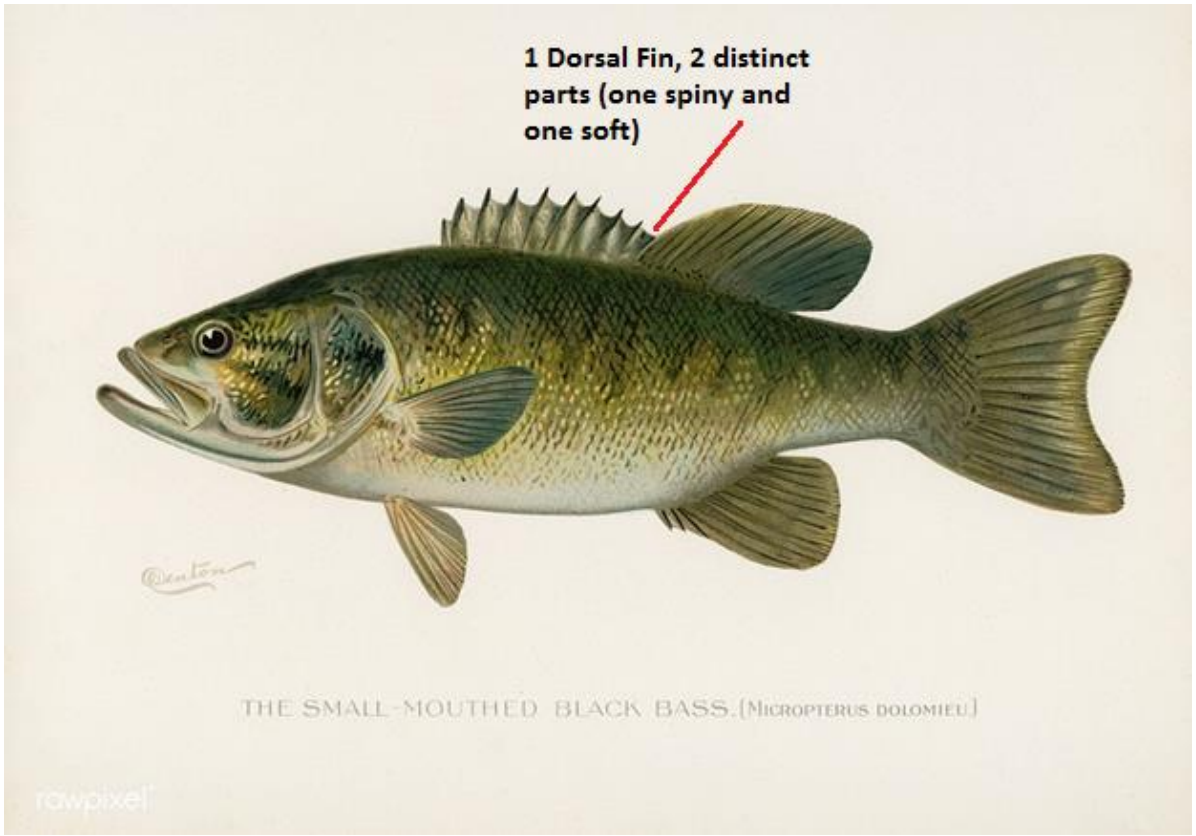
Presentation: Basic Fish Identification

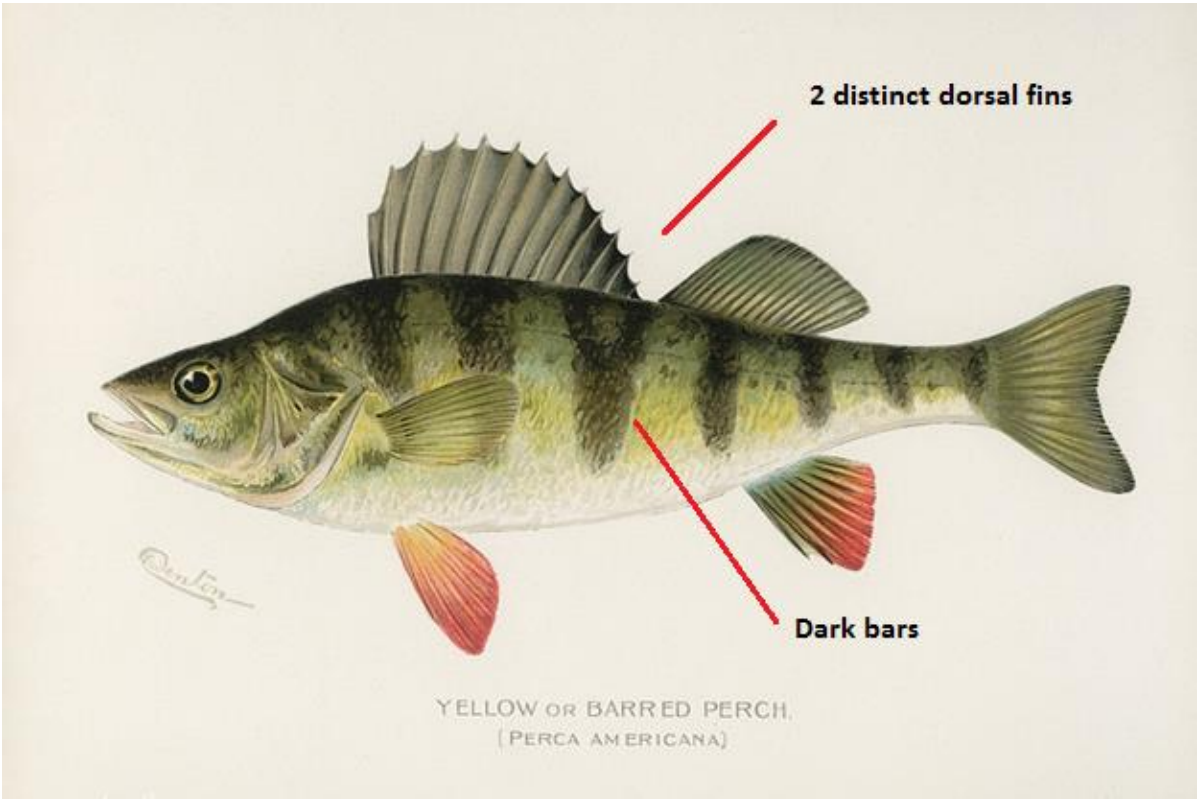
What differences do you see?

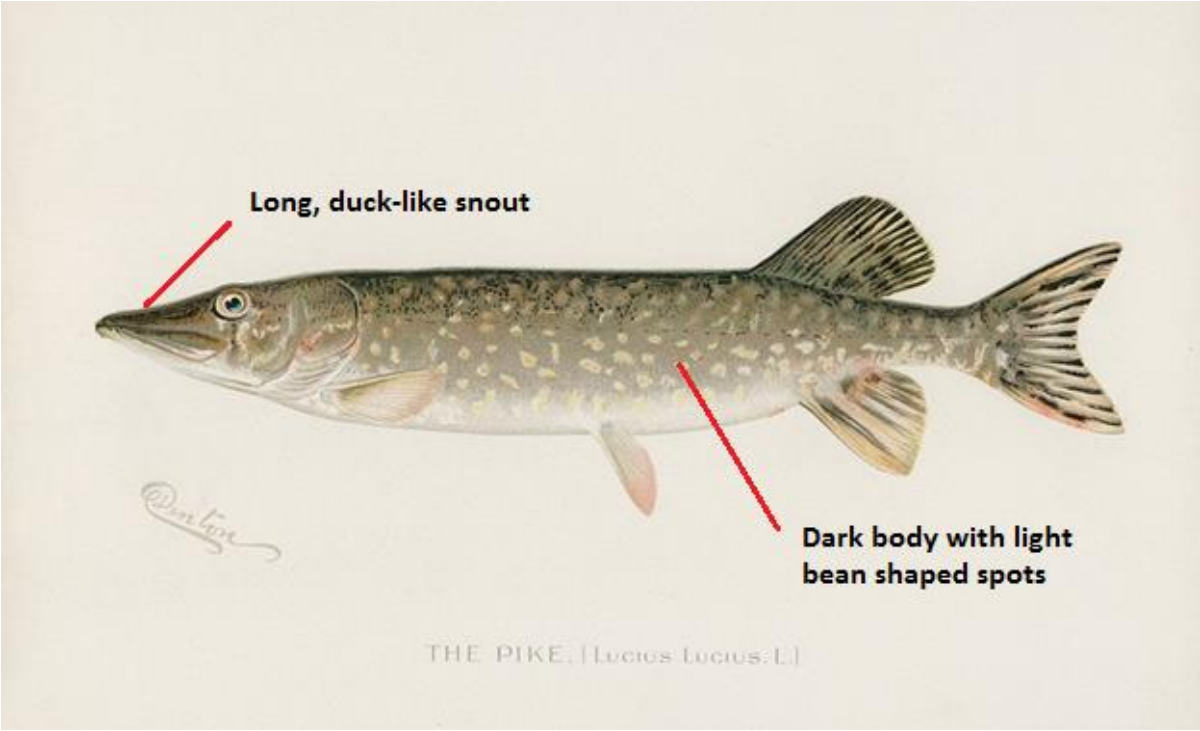


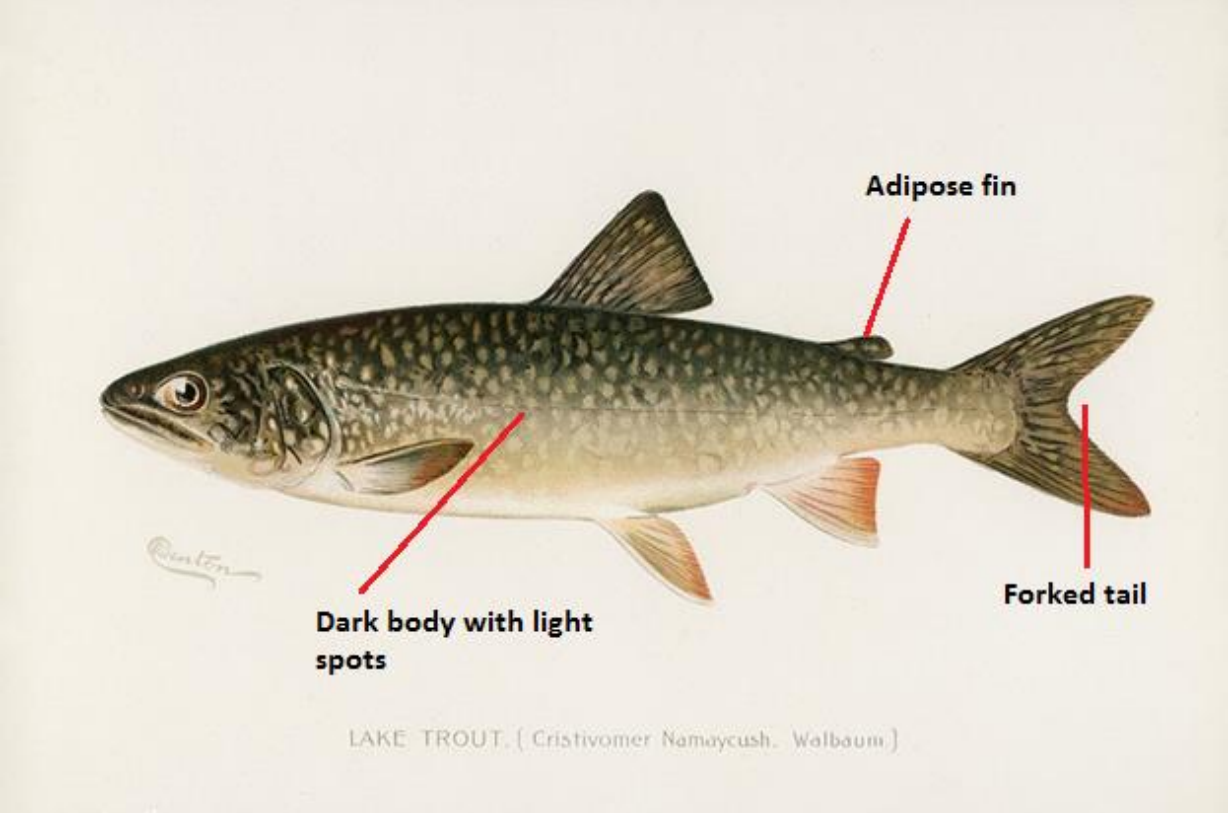
Some Differences in Physical Characteristics

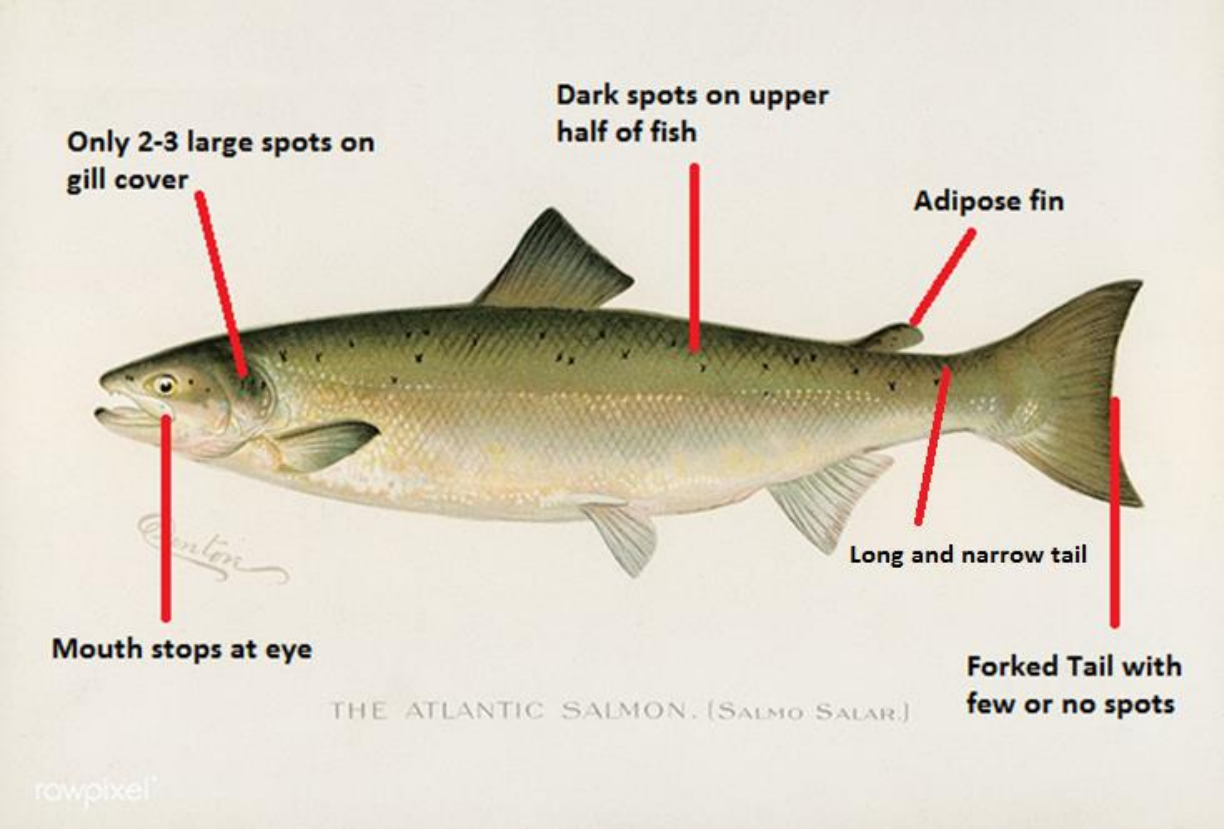




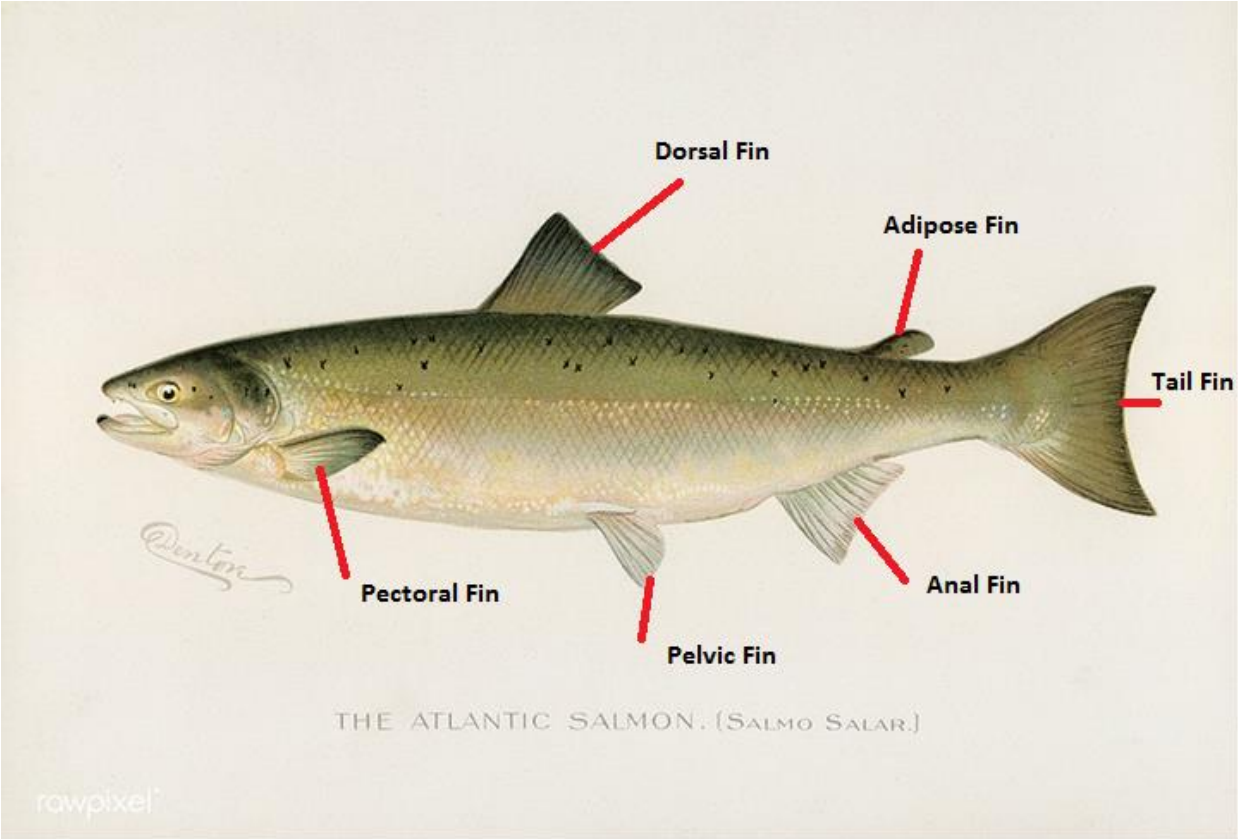

2 distinct dorsal fins
Dark bars
YELLOW OR BARRED PERCH.
(PERCA AMERICANA)


Long, duck-like snout
Dark body with light bean shaped spots
THE PIKE. (Lucios Lucius. L.)


Adipose fin
Forked tail
Dark body with light spots
LAKE TROUT. [Cristivomer Namaycush. Walbaum.]

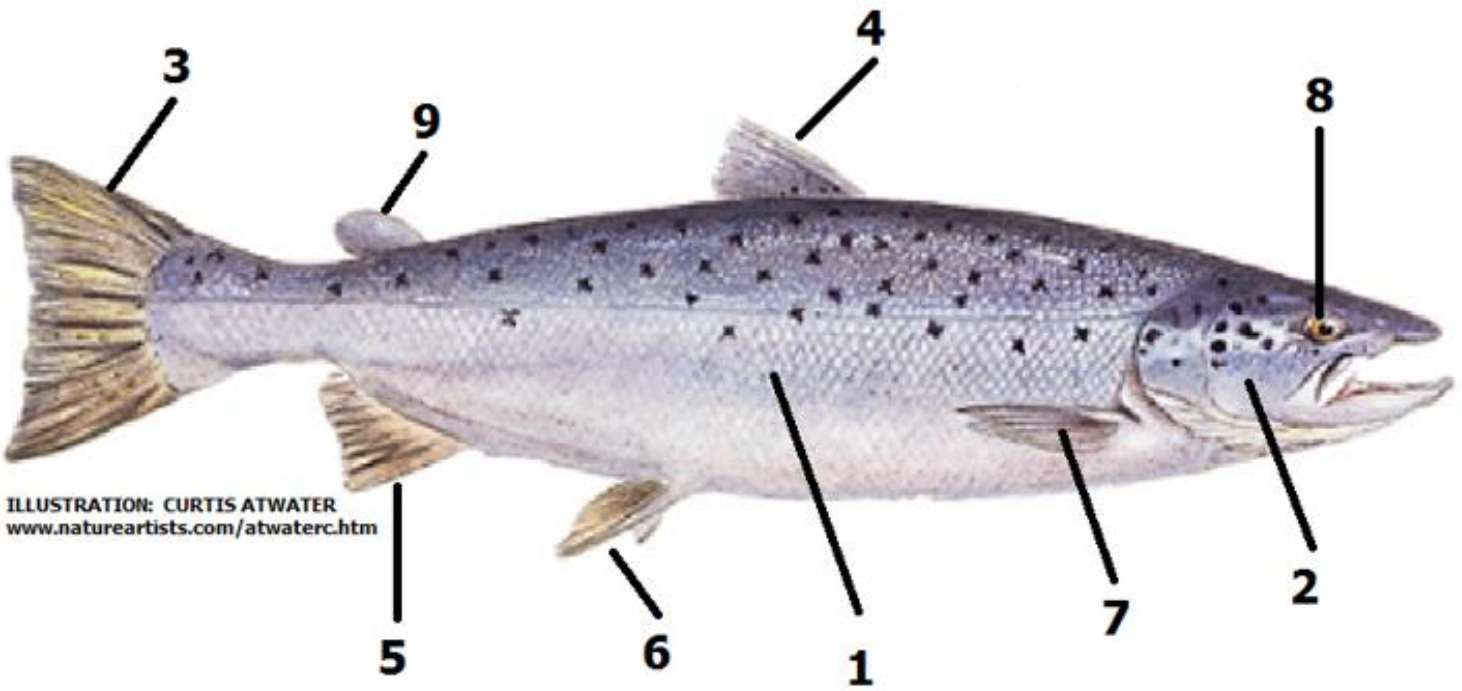

Dark spots on upper half of fish
Only 2-3 large spots on gill cover
Adipose fin
Long and narrow tail
Mouth stops at eye
Forked Tail with few or no spots
THE ATLANTIC SALMON. [Salmo Salar.]
rawpixel

Fins of a salmon

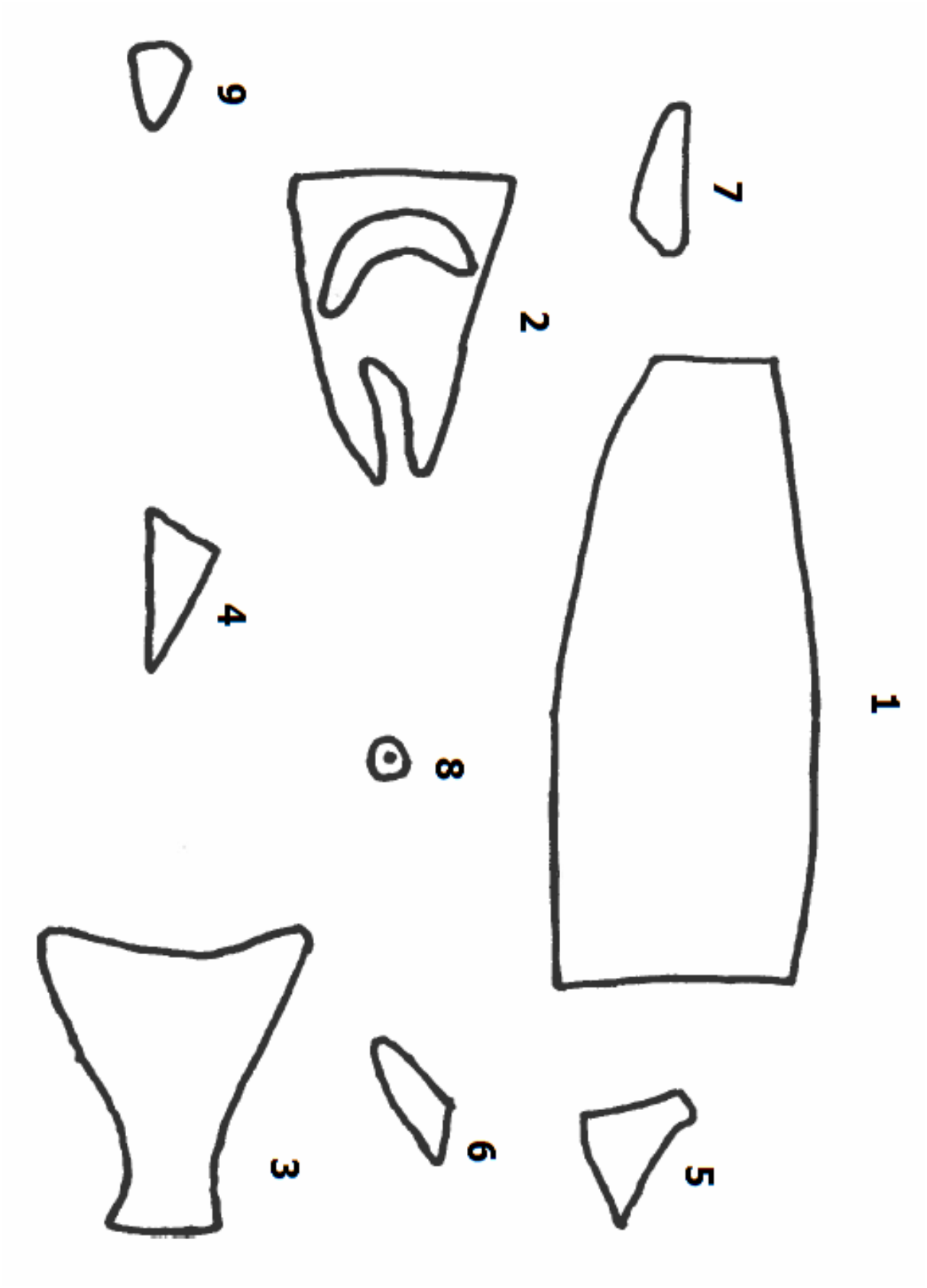


Fish Illustrations from Game Birds and Fishes of North America; illustrated by Sherman F. Denton (1856–1937)

BUILD AN ATLANTIC SALMON



BUILD AN ATLANTIC SALMON (Handout)



Class size:	Unlimited
Setting:	Classroom
Time:	2 Hours

Grade 1 Classroom Hatchery Activities

Lesson 2: Life Cycle Bracelet

Lesson Objectives:

- Familiarize students with the life cycle of the Atlantic Salmon
- Assist students with recognizing and spelling words associated with the Atlantic Salmon life cycle

Materials:

- Scissors
- Small box or hat
- Alphabet and coloured beads (either plastic or wood with at least 6 colours) (can be purchased at a craft or dollar store)
- Bracelet string* (can be elastic cord, and purchased at a craft or dollar store) cut into 12", one for each student sections with a knot on one end
- Markers of the same colour as the beads
- Printed Copy of "Wild Atlantic Salmon: a wondrous life cycle" (found below)
- Printed and cut apart "Life Cycle Stages" list (found below)

Background

What came first: the Atlantic Salmon adult or the egg? Like all living creatures, Atlantic Salmon go through a ***life cycle***. The life cycle of a Lake Ontario Atlantic Salmon begins in a coldwater stream connected to Lake Ontario. In October or November, the female deposits between 2,000 and 8,000 ***eggs*** in a shallow gravel depression known as a 'redd' and the male fertilizes the eggs. The eggs start to develop. Most notably, when the eyes become visible, it is referred to as the ***eyed egg*** stage. In January to February the eyed eggs hatch and the tiny fish hide in the gravel and survive by absorbing proteins from their yolk sac; this is the ***alevin*** stage. In May, as a result of warming temperatures (which increases the abundance of tiny invertebrates - the Atlantic Salmon's prey), the yolk sacs are used up and the small fish, now called ***fry***, emerge from the gravel and move into deeper water to hunt for food. The fry grow throughout the summer, developing dark vertical marks on their sides, and by the fall are called ***parr***. Parr will live in the stream for 1-3 years before going through the process of smoltification, where they lose the parr marks and become the silvery colour of the adult. At this stage they are known as a ***smolt***. The smolts head down stream and enter the lake where they hunt for fish and grow into ***adults.*** After two to three years in the lake, the adults begin the journey that guides them back to their hatching site. As juveniles the salmon imprinted on the unique odours of their home stream. The returning adults use their sense of smell to guide them upstream to where they hatched, and this is where they will spawn and the life cycle repeats. Adult Atlantic Salmon will return to the lake after spawning and will often live to spawn for several years - which is different than many other species of salmon that die after spawning.

Teaching and Learning Sequence

Part A. Share this **Cool Atlantic Salmon Fact:** *The largest Atlantic Salmon ever caught was 174 cm long. How tall is your teacher? How tall are you?*

Part B. Define **Life Cycle** = *the series of changes that an organism goes through as it grows, reproduces and eventually dies.*

Ask these **Guiding Questions** for the students to discuss as a group:

1. What is the life cycle of a tree? (seed, seedling, sapling, mature tree, flowering/seed producing tree...)
2. What is the life cycle of a human? (egg, fetus, baby, toddler, child, teen, adult, parent…)

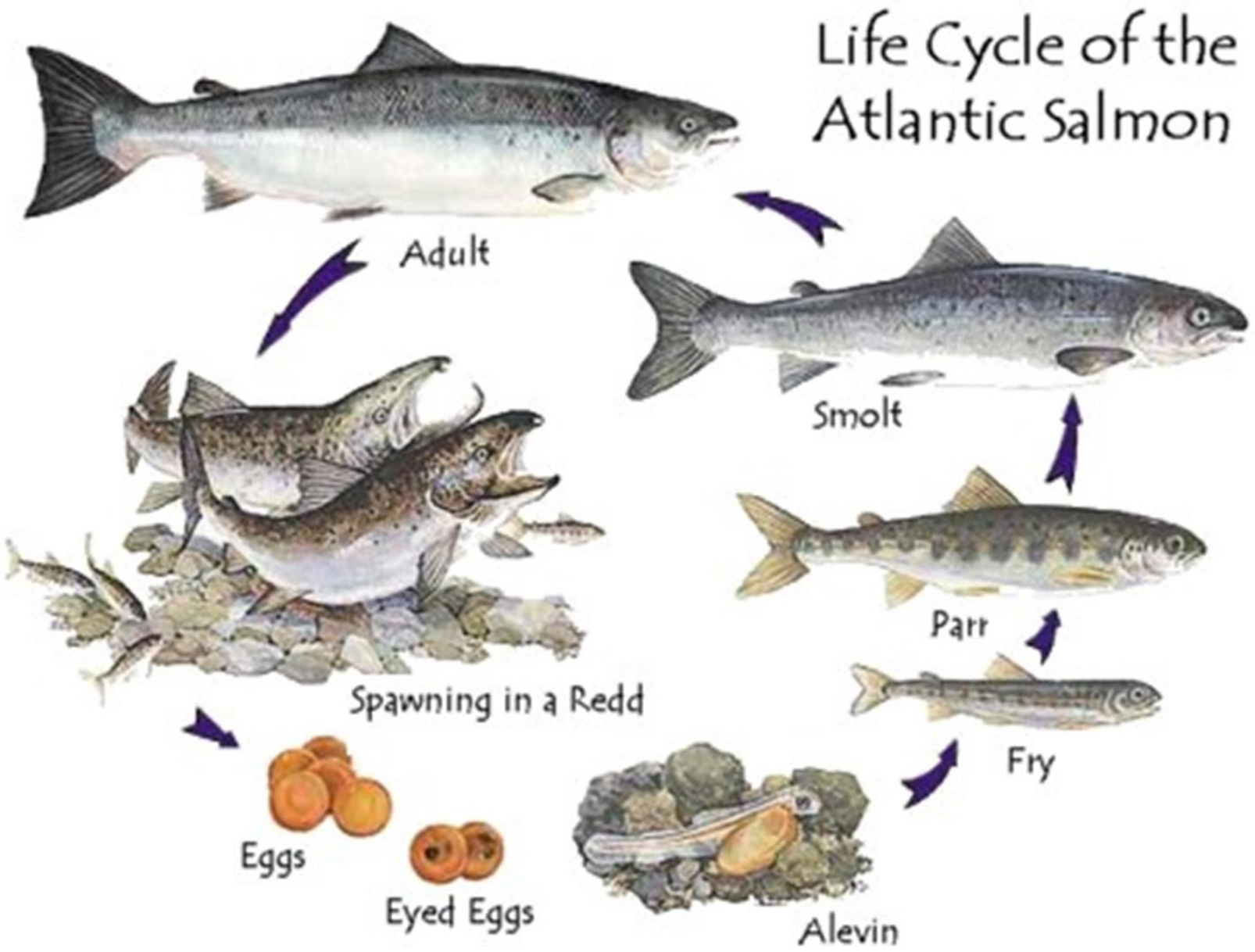
Part C.

1. Show **"Wild Atlantic Salmon: a wondrous life cycle"** found below. This can be digitally displayed for the purpose of illustration but should also be printed out and displayed near the aquarium set up.
2. Explain each stage of the life cycle as per the background above.
3. Cut apart the **"Life Cycle Stages"** list, place in a box or hat, and have students select one word each.
4. As a group choose which coloured bead will correspond to each life cycle stage. If you have more than 6 colours you can also include the eyed egg and spawning stages.
5. Give each student a length of string and have them start to put the coloured beads on the string in the order of the life cycle. Have them spell out their word in the middle of the bracelet replacing the corresponding colour.
6. Assist the students with getting to the correct length and tying the bracelet. This can also be done by making a loop on one end and pulling it through a larger bead.

Part D. Have the students organize themselves in a circle in the order of the life stages on their bracelets. Numbers will not likely work out perfectly and some students may have to double up (i.e. 2 eggs next to each other).

Ask these **Reflection Questions** (can be done as a Think, Pair, Share by having them organize in groups of complete cycles):

1. What happens if a life stage is removed?
2. Is a life cycle a straight line or a circle? (You want them to get the idea that life is a continuous cycle of birth, growth, reproduction.)


Life Cycle of the Atlantic Salmon
Adult
Smolt
Parr
Fry
Alevin
Eggs
Eyed Eggs
Spawning in a Redd

Life Cycle Stages

EGG	ALEVIN	FRY
PARR	SMOLT	ADULT
EGG	ALEVIN	FRY
PARR	SMOLT	ADULT
EGG	ALEVIN	FRY
PARR	SMOLT	ADULT
EGG	ALEVIN	FRY
PARR	SMOLT	ADULT
EGG	ALEVIN	FRY
PARR	SMOLT	ADULT
EGG	ALEVIN	FRY
PARR	SMOLT	ADULT

Class size:	Unlimited
Setting:	Classroom
Time:	**50 – 60 Minutes**

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Grade 1 Classroom Hatchery Activities

Lesson 3: Aquarium Add Up

Lesson Objectives:

- Apply previously acquired grade 1 math skills in the context of the classroom hatchery
- Familiarize students with terminology related to the life cycle stages of the Atlantic Salmon they will observe in their hatchery unit
- Familiarize students with reading an aquarium thermometer

Materials:

- 1 page worksheet (print one per each student)
- Atlantic Salmon Life Cycle diagram (attached)
- Pencils

Background

The classroom hatchery program offers an excellent opportunity to connect previously acquired math concepts with concrete elements of the hatchery program and to reinforce an understanding of the life stages students will observe in their aquarium: eyed egg, alevin, and fry.

Temperature is an important factor for the growth and survival of young fish; too cold and the eggs can freeze and the aquarium may be damaged; too warm and the fish will develop too fast and will suffer a higher mortality rate. A temperature of 4 degrees Celsius on the thermometer (not the chiller thermostat) is ideal for most of the timeframe of the classroom project; the temperature will be slowly and strategically raised in the last couple of weeks leading up to release day.

Students can be engaged and utilized to assist in the monitoring of the tank temperature. A data sheet for recording temperatures is included in this lesson.

Teaching and Learning Sequence

Part A. Share this **Cool Atlantic Salmon Fact:** *A female Atlantic Salmon can lay up to 8,000 eggs each year she spawns!*

Part B. Ask these **Guiding Questions:**

1. What is the purpose of a thermometer?
2. How might you use a thermometer at home? To plan your day?

Part C. Procedure:

1. Share the **Cool Atlantic Salmon Fact (above)**.
2. Show the students the aquarium thermometer. Explain how to read the scale and the importance for the fish of maintaining the proper temperature.
3. Distribute the handout.
4. Work through question #1 with the class.
5. Have the students work independently through the rest of the activity assisting where needed (particularly with regards to terms/reading) and then hand in their worksheet.
6. You can involve groups of students each day to monitor and record aquarium temperatures on the data sheet.

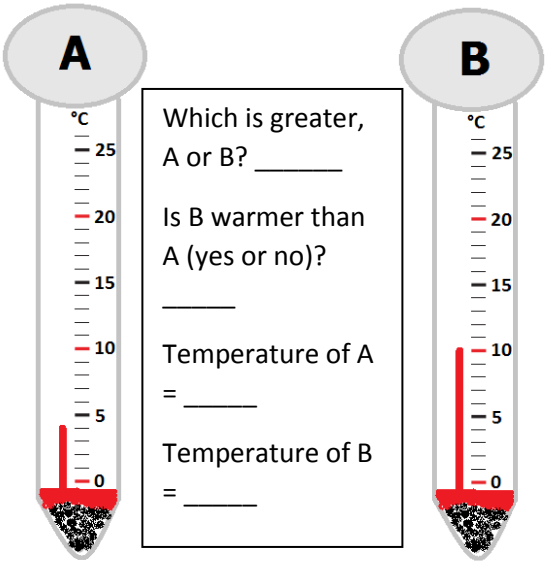
Part D. Ask these **Reflection Questions** (can be done as a Think, Pair, Share):

1. Why is it important to monitor the tank temperature?
2. What happens if the tank is too cold? Too warm?

Atlantic Salmon Math Worksheet

Name _____

TEMPERATURE



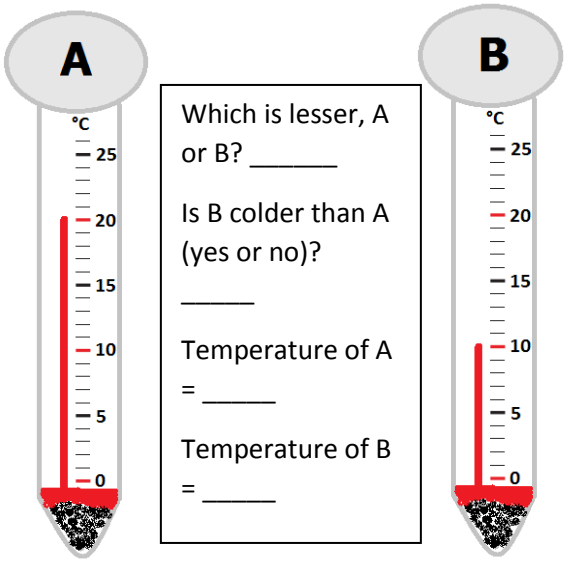
Which is greater, A or B? _____

Is B warmer than A (yes or no)? _____

Temperature of A = _____

Temperature of B = _____

TEMPERATURE



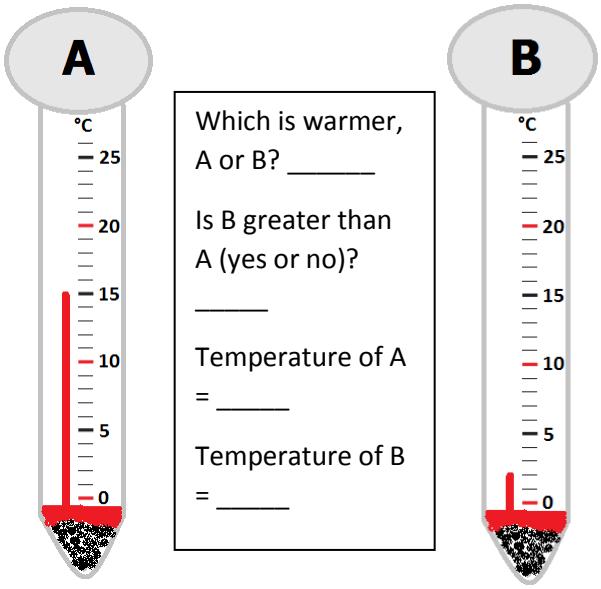
Which is lesser, A or B? _____

Is B colder than A (yes or no)? _____

Temperature of A = _____

Temperature of B = _____

TEMPERATURE



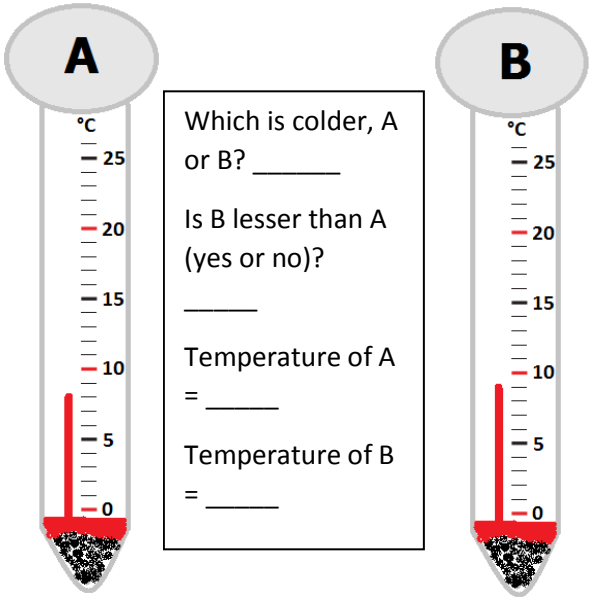
Which is warmer, A or B? _____

Is B greater than A (yes or no)? _____

Temperature of A = _____

Temperature of B = _____

TEMPERATURE



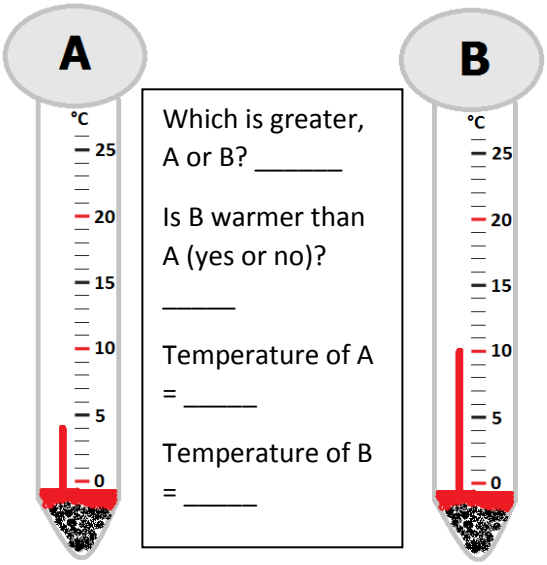
Which is colder, A or B? _____

Is B lesser than A (yes or no)? _____

Temperature of A = _____

Temperature of B = _____

TEMPERATURE



Which is greater, A or B? _____

Is B warmer than A (yes or no)? _____

Temperature of A = _____

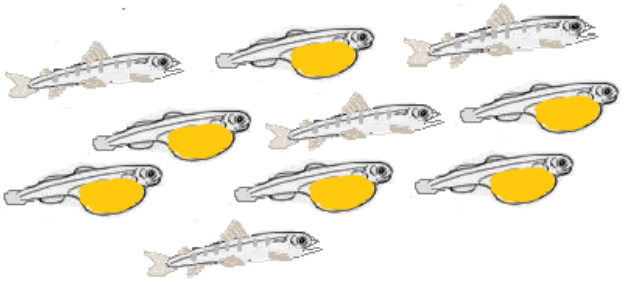
Temperature of B = _____

EYED EGGS

Circle the 2nd and 5th eyed egg

If 8 alevin hatch out of the eyed eggs above, how many didn't hatch? Draw your answer below.

ALEVIN AND FRY



How many alevins (with yolk sacs) are there? _____

How many fry are there? _____

Are there more fry than alevins (yes or no)? _____

If two of the above alevins grew into fry, how many alevins would be left? ___

How many fry would there be now? ____

How many eyed eggs are in each group?

 = _____

 = _____

 = _____

 = _____

Classroom Hatchery Daily Checks							Month/Year:	
			Functioning		Filter		#	
Date	Time	Temp ºC	Aerator Y/N	Filter Y/N	Screen Intact Y/N	Insulation Intact Y/N	Dead Fish	Checked By: Initials

NOTES:

Class size:	Unlimited
Setting:	Classroom
Time:	60-120 Minutes

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Grade 1 Classroom Hatchery Activities

Lesson 4: Salmon Song

Lesson Objectives:

- Familiarize students with the story of Lake Ontario Atlantic Salmon including its history, habitat requirements, and life cycle
- Create a song that helps connect the students and listeners to this story
- Inspire creativity

Materials:

- Chalk board, white board, or similar (to make lists as a group)
- Instruments (optional)

Background

This activity requires a teacher with some musical ability (even if it is limited). The song can be created acapella or with an instrument such as a guitar, ukulele, or banjo. Students can be encouraged to play along with instruments such as shakers and tambourines or other instruments as skill and availability allows.

The benefits of song writing for children are numerous and include improvements in cognitive thinking, social skills, patience, and confidence. Songs inspire creativity and are a great form of expression. Music gets people excited and often will reach students who are difficult to engage. In the process the students connect with and remember the topic.

The song does not need to be complicated. As an example, *Trout in the Classroom*, a classroom hatchery program in New York, wrote this song for their fish releases:

BYE-BYE TROUT
(sung to the tune of "Bye-Bye Love," by the Everly Brothers)
Designed for the New York Trout in the Classroom Program, conceived and written by Melissa Johnson, TIC Teacher

Chorus:
Bye, bye Trout!
Bye, bye, aquatic friends!
We hope we'll see you when
You're swimmin' down the stream!
You're swimmin' down the stream!

Verse:
There go our fingerlings
They're doin' fine.
And now they're lookin'
For a place to dine.
Look out you Stoneflies!
And Mayflies too!
Our little fishes
Are comin' after you!
(repeat chorus)

Teaching and Learning Sequence

Part A. Inspire creativity in the students by playing some simple songs. Consider some nature-based songs like "Baby Beluga" by Raffi. This can be either a recording or by yourself.
Introduce the concept of creating a song about Atlantic Salmon.
Decide as a group whether you will do a parody (use an existing song and write new lyrics) or compose an entirely new song.

Part B. Read to yourself "The Story of Lake Ontario Atlantic Salmon" (below) and retell the story using your best story telling mind in a way that engages your students. Consider using some visuals.

- As a group make a list of words from the story.
- Have the students match rhyming words from the list.

Part C.

For a parody song:

1. Brainstorm as a group some songs that would work for your fish song and write their titles on the board. The songs should be familiar to you.
2. Hold a vote on which song to use.
3. Listen to the song.
4. Break down the composition of the first verse and the chorus of the song by writing them on the board and counting the syllables in each line and the rhyming structure.
5. Use the composition to write your new song.

For a new composition song:

1. Create a few lyrics about Atlantic Salmon.
2. Ask the students "how should this go?".
3. Let the melody bounce around the room and evolve until a good sound is found.
4. Continue writing lyrics to your selected melody.

Part D.

- The song can be a "shared reading" that the children can revisit while learning it. The children can also notice sight words and rhyming words in the song, and it can be printed on chart paper or typed on the smartboard.
- The Bring Back the Salmon program would love to hear your song!

The Story of Lake Ontario Atlantic Salmon

Around 12,000 years ago a large sheet of ice from the last glacial period was melting in Canada. Atlantic Salmon swam into the flooded landscape from the Atlantic Ocean and made what later became Lake Ontario their home. The waters in the rivers, creeks, and streams were clean and cold.

Atlantic Salmon adults lived out in the deep waters of the lake growing big on a diet of fish. Eventually the urge to spawn came over them and they swam upstream, jumping rapids and waterfalls up to 3 metres high! The females searched for an ideal location for a "redd"; the males searched for females. The ideal redd location consisted of a gravel bottom where the female could use her tail to dig a 10-30cm deep nest. The female laid between 2,000 and 8,000 eggs. The male fertilized the eggs and the female covered the redd with gravel. The eggs started to develop and eventually became *eyed eggs* (you can see the eyes in the egg). A few months after being deposited in the redd, the eggs began to hatch. When the baby salmon hatched from the egg, they had a yolk sac attached to their bellies. For the next few months this was their food. These baby fish, known as *alevin,* were fragile and vulnerable. They hide in the gravel of the redd. As the alevin developed, the yolk sac was slowly absorbed. In warmer temperatures the yolk was absorbed faster. As the streams warmed, small aquatic invertebrates became abundant which is good for the salmon as this was their food. Once the yolk sac was gone these little fish, now known as *fry,* needed to hunt for their own food. They hid in the rocks to avoid predators (like bigger fish, birds, and small mammals) and to catch aquatic invertebrates.

The fry grew larger throughout the summer and developed dark "parr" marks. At this stage they were called *parr*. The parr stayed in the stream for 1 – 3 years living with the same strategy as the fry (and all other living beings) – eat and don't get eaten!

When the parr got large enough they became *smolts* where they lose their parr marks and turn silver. The smolts migrated downstream to the lake to eat fish, grow big, and become adults. When they were ready to spawn they returned to the same place that they were born.

Atlantic Salmon thrived in Lake Ontario and became a major food source for indigenous populations. Lake Ontario Atlantic Salmon were a very important species ecologically and culturally from around 11,000 years ago until they disappeared over 120 years ago!

European settlers arrived in the Lake Ontario region in the 1600s. They found clean, clear, and cold waters loaded with fish, especially Atlantic Salmon. The rivers, creeks, and streams were surrounded by healthy, intact forests. Settlers benefitted from the bounty of fish. They caught them by the hundreds.

The settlers first started to clear the land of trees for farms and small settlements, then for larger settlements and industry. The loss of the shading provided by trees allowed the water to warm, which had a negative effect on the development and survival of coldwater fish like Atlantic Salmon. The loss of tree roots which hold together the soil of river banks allowed the soil to erode, covering up the gravel beds that the Atlantic Salmon depend on for protection of their eggs and the fry.

The settlers also built mills, which harnessed the energy of rivers to grind grains and saw logs into boards. These dams created barriers that even Atlantic Salmon could not jump past. Large ponds behind the dams also warmed the waters even further.

By the early 1800s people were noticing that this once extremely abundant fish was declining. Efforts to help the population were undertaken throughout the century, however the combination of overfishing, warmer water, soil erosion, barriers to migration, and increased water pollution was too much. The last of the original Lake Ontario Atlantic Salmon was caught in 1898!

Throughout the 20th century several attempts were made to bring back Atlantic Salmon to Lake Ontario. In the 20th and 21st centuries, habitat improvements such as tree planting, removal or alteration of dams to allow for fish passage, and the restriction and regulation of pollution accompanied education and stocking (raising fish in a hatchery and releasing them) campaigns. These efforts will hopefully re-establish a naturally reproducing population!

Class size:	Unlimited
Setting:	Outdoors on a sunny day with a temperature above freezing.
Time:	1-2 Hours

Grade 1 Classroom Hatchery Activities

Lesson 5: Water Temperature Experiment

Lesson Objectives:

- Explore the relationship between water temperature and environment
- Predict the outcome of experimentation
- Practice using measuring devices such as a thermometer

Materials:

- Clear containers (any material) for each location you plan to test out (4 or more)
- Water

Background

The temperature of water will vary depending on what environment it is in, what the air temperature is in that environment, and how much sun it receives. We are going to explore the ability of solar energy to heat up water to better understand how habitat changes in streams impact the water temperature and how this affects the survival of Atlantic Salmon.

Atlantic Salmon are a coldwater species. Their temperature range for thriving is between a winter minimum of -2.1ºC to a summer maximum of 20.6ºC. When trees are removed from the banks of streams, more sun is able to shine down on the stream and heat the water. This is not good for Atlantic Salmon because they need cool temperatures to survive and have their body processes occur normally. If it is too warm, over 20°C, they get stressed. At higher temperatures, they become unable to survive.

Most fish are **ectotherms** (cold-blooded), meaning they get their heat from the environment. They are unable to regulate their body temperature like us; we are **endotherms** (warm-blooded). Fish can only lower their body temperature by moving to an area where the water temperature is lower, such as a shaded or deeper area. If all the trees are removed, the water becomes warmer, and there are no shady places for fish to seek refuge. Even if the trees are removed in one section of the stream, this can make the temperature of the water flowing from that point onwards warmer. Much of the water in southern Ontario's coldwater streams originates from groundwater sources. This groundwater is colder than surface water and provides the right temperature for Atlantic Salmon even in the summertime, as long as there is enough shade to keep it cool.

Teaching and Learning Sequence

Part A. Share this interesting fact: Although most species of fish can't handle high temperatures, some have special ways to survive cold winter temperatures. Some species of cod produce an antifreeze that stops their tissues from freezing. Other species of fish will seek out the warmest areas of water below a frozen upper layer of ice and reduce their movement and energy use until spring arrives.

Part B. Talk about water temperature and why our salmon need cold water**.** Ask these **Guiding Questions:**

1. When you are in an area where it's too hot, how do you cool down?
2. Are there any other locations around your school yard that might be cooler or warmer than other areas? (Possible ideas: under a tree, under the playground, on the hot asphalt)

Part C.

1. Fill each of your containers ¾ full with room temperature tap water.
2. Take the initial water temperature of each container using a thermometer and record.
3. Take your containers outside and place them in the following positions:
    a. Shade under a tree or bush
    b. Shade under a man-made structure (car, tent, awning)
    c. Direct sunlight on a black surface (pavement)
    d. Direct sunlight on a grassy or light coloured surface
    e. Any other locations the students think would give interesting results
4. Leave the containers to sit for a minimum of 1 hour.
5. Return to each container and re-take the temperature.
6. If your school has any other water quality measuring devices such as a dissolved oxygen meter, you could also monitor this. Dissolved oxygen is expected to decrease as temperature increase because the solubility of oxygen is lower in warmer water.

Part D. Ask these **Reflection Questions** (can be done as a Think, Pair, Share):

1. Compare your final temperatures to the starting temperatures: did they get warmer or cool down? Which locations kept the water the coolest?
2. Why should we be worried about the water temperature where our salmon will be living? And what can we do to help protect them?

Location	Initial Temperature	End Temperature

Table 1. Recording chart for experiment with 2 temperature readings.

Location	Initial Temperature	Temperature Reading after one unit of time	Temperature Reading after two units of time	End Temperature

Table 2. Recording chart for experiment with multiple temperature readings (add more columns if needed).

Class size:	Unlimited
Setting:	Outdoors or gym
Time:	60-120 Minutes

Grade 1 Classroom Hatchery Activities

Lesson 6: Predator Tag

Lesson Objectives:

- Introduce the predator/prey community that Lake Ontario Atlantic Salmon live with
- Familiarize students with food webs
- Assist students to participate in a dynamic and active game developing personal and interpersonal skills

Materials:

- Scrunchies or pinnies to visually distinguish between 3 groups of students

Background

Adult Lake Ontario Salmon live in the open waters of Lake Ontario. In the fall they travel up streams to spawn and lay eggs. In doing so they bring nutrients from the lake ecosystem into the stream ecosystem in the form of eggs that they lay in the stream spawning beds. These eggs may become food for a variety of animals in the stream. Eggs that survive and hatch into juvenile salmon may become food sources for many different species of fish (such as bass), mammals, birds, and reptiles.

The growing juveniles depend on aquatic invertebrates as a food source. If they survive to become smolts they migrate downstream to the lake. As they gain size there are fewer animals capable of predating them, especially when the fish are in deep water away from aerial predators such as osprey and bald eagles. When the adults return to the streams to spawn they are more exposed to predation from mammals such as otters. Where tree cover is sparse, aerial predators like the osprey and bald eagle may take them.

Throughout their whole life, the Atlantic Salmon's greatest threat comes from humans! Humans degrade and destroy the environment and can overharvest fish.

Teaching and Learning Sequence

Part A. Share this **quote:** "When we try to pick out anything by itself, we find it hitched to everything else in the Universe." John Muir, Naturalist and Author. Explain that this means that basically, everything is connected. A good visualization is that a string is tied to every part of nature and all the strings are tied together.

Part B. Ask these **Guiding Questions:**

1. Are you part of this connection? How?
2. What is prey? What is a predator? (Help the students to understand these terms and give examples such as lions and zebras.) Name some species. Can they be both?

Part C.

1. Select an activity area. An area (50mx100m – 100mx100m) of open or lightly forested area is ideal; however a gym can also be used. Prior to class explore the area to ensure that it is free of hazards such as sharps and toxic plants. Identify any tripping hazards. Also be aware of areas that may be habitat for ticks.
2. Making sure the students are appropriately dressed for the conditions, proceed to the play area. Point out tripping and other hazards.
3. Describe the habitat, predator, and prey relationship of the Atlantic Salmon from the background section.
4. Explain the instructions of the game as described below:
    a. Divide the students into the following groups: aquatic invertebrates; juvenile salmon; adult bass. Assign more students as invertebrates, reducing the numbers through each group to bass (eg. 18 invertebrates, 6 juvenile salmon, 2 adult bass).
    b. The juvenile salmon will be hunting (tagging) aquatic invertebrates (inverts). When a juvenile salmon tags an invert the invert becomes a salmon. The bass are hunting juvenile salmon and inverts. Tagged students become bass. Use the scrunchies or pinnies to differentiate the groups and have the students move them accordingly. Eg. Inverts have a scrunchie on their ankle; move to wrist when juvenile salmon; remove when bass.
    c. Play until all students are bass. Play multiple rounds.

Part D. Ask these **Reflection Questions** (can be done as a Think, Pair, Share):

1. What would happen if there were fewer aquatic invertebrates?
2. What might cause the number of invertebrates to go down?
3. What activities that people do might cause invertebrate numbers to go down?