



The Life and Times of Kokanee

LESSON

GRADE LEVEL K-8

CATEGORY Plants, Animals
& Habitats

TOPIC Kokanee

TIME

45 to 90 minutes

MATERIALS

- Blackboard and chalk
- Bristol board
- Scissors
- Glue
- Crayons/coloured pencils
- Tissue paper
- Styrofoam balls
- String
- Wire rings

SETTING

Classroom

GROUP SIZE

Individually or in groups

SUBJECTS

Science, Art, Language Arts

KEYWORDS

Alevin, debris, embryo, fry, hormone, plankton, predator, redd, siltation, spawn, spawning channel, yolk sac

Overview

Using a guided imagery, students visualize the early stages of the kokanee life cycle, and afterward, draw all life cycle stages and create a life-cycle mobile.

Objectives:

Students will be able to:

- identify and describe kokanee developmental stages

Background

Eggs: A female kokanee holds 200 to more than 400 eggs within her body cavity, though larger females may hold more than 1600 eggs. Most of these she will deposit in the two or three redds (nest sites) she excavates. Each egg is about 2-4 mm in diameter. During the winter months the creek might look empty and lifeless, but actually the eggs, which are nest led underwater in the gravel of the creek, are very much alive. During early winter, embryos develop inside the eggs and two tiny black eyes can be seen. At this stage the "eyed eggs" are growing slowly since the water temperature is almost zero degrees Celsius. Later, the embryos emerge from the egg case and remain in the gravel.

Alevin: The tiny fish, with the yolk sac still attached, are now called alevin. The yolk sac supplies the alevin with enough nutrients for several months. The alevin remain fairly immobile and slowly grow in size as the yolk sac dwindles away. Just as the eggs were subject to many dangers (e.g., lack of oxygen, predatory fish, hungry birds), the alevin are also subject to dangers. Siltation, caused by human interventions, such as bulldozing or upstream logging, can be fatal to growing alevin.

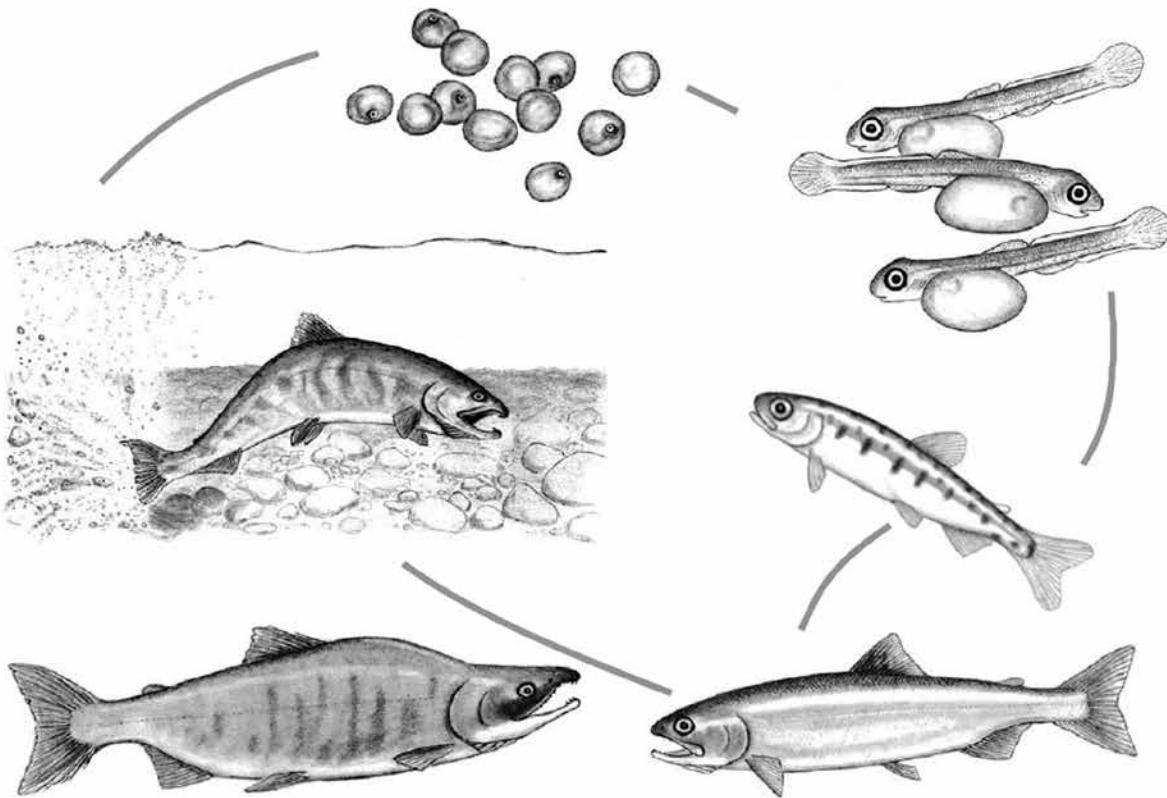
Fry: The velocity of rushing spring waters and the particles of sand and debris carried on these waters signal to the alevin that it is time to migrate to the lake. By now the yolk sac has disappeared and the alevin have grown into fully developed fish called fry. The fry emerge from the gravel at night to avoid predators. They migrate downstream and enter the lake in one night. In the shallow waters they feed on plankton.

Adult: The average age of a spawning kokanee is four years, but some spawn earlier or later than age four. To spawn means the female fish deposits her eggs and the male fish fertilizes them. Spawning channels are artificially constructed spawning areas, ideally suited for spawning kokanee. Kokanee, unlike seagoing sockeye, do not return to the sea.

Male/Female: At maturity, and while still in the lake, the fish undergo a number of changes. They turn red after being bright and silvery all their life. Hormonal changes cause a red pigment to move to the fishes' outer body cells. This colour is thought to differentiate kokanee from other species of salmon that may compete for the same spawning site. The male develops a long, hooked jaw and a hump on his back in anticipation of the fierce fighting in which he will participate. Both sexes absorb their scales – the fish have stopped eating and use the nutrients from the scales for energy.

Diggin the redd: Soon after these changes occur, kokanee are guided by a sense of smell to the creek or lake beach spawning area where they were hatched. After swimming a good distance up the creek and inspecting all possibilities, the female selects a suitable site for her redds. She creates a back eddy in the water flow that allows the eggs to be held in the gravel pocket and, at the same time, ensures a good supply of oxygen. The female turns onto her side and flips gravel with her tail. When the redd is finished, the female may fight a number of her suitors to determine a mate of equal strength.

Kokanee life cycle



Procedure

1. Conduct a guided visualization of the beginning stages in the life of a kokanee salmon.

Get comfortable...close your eyes...simply listen and follow the images the words create for you. Focus your attention on your breath and relax (pause).

Now imagine that you are walking along a stream. It is a beautiful sunny day and you smile as you hear the babbling of the water. As you walk, you notice a trap door. You lift the door and see a dirt staircase. As you walk down the stairs, you feel completely safe here...you find yourself in a long tunnel with glass walls, right beside the stream. (pause)

From the tunnel, you can see fish moving about in the gravel. You watch as one large-bellied red fish flips onto her side and pushes the gravel away with her flailing tail. When she is finished, an even larger red fish with a big, hooked jaw joins the first fish in the depression in the gravel. Their fins move constantly and their bodies twitch a bit as they maintain their place in the stream. Suddenly, the water is filled with hundreds and hundreds of little round eggs and a milky substance. You watch as the smaller fish covers the eggs with more gravel. (pause)

You walk down the tunnel and notice, as you walk, that you are not moving relative to the stream, but you are moving through time. The stream begins to freeze and is soon covered by ice... (pause)... everything grows much quieter... (pause)...you walk on....

You look at the gravel stream bottom and notice some movement. What could it be? Something is hiding in the gravel. By looking closely you see a tiny creature with a large sac attached to its belly. You have heard about these creatures... they are called alevin. The ice begins to melt and the stream comes to life again. You continue to watch the spot where the red fish deposited her eggs. You notice that many of the little alevin no longer have egg sacs... they are now tiny fish called fry. (pause)

The fry are moving about in the gravel, but as you watch, darkness envelopes you. You are still able to see the fry as they work their way up through the gravel into the stream. Under the cover of darkness you watch as they swim downstream... off to explore their new home in the lake. As you turn to walk out of the tunnel, you realize that you have witnessed a very special event – part of the life cycle of the Kokanee salmon.

You feel very happy as you return back up the tunnel to the stairs, then up the stairs and through the trap door to the trail beside the stream where you began. (pause)

Slowly open your eyes and return to the group.

2. Discuss with the students how they felt watching the female salmon digging her redd, the eggs being fertilized and the alevin emerging.
3. Brainstorm with students
 - a. the remaining stages in the life cycle;
 - b. requirements of the kokanee as they change and grow;
 - c. hazards the fish encounter at different stages;
 - d. predators the fish try to avoid; and
 - e. the roles of kokanee as part of their interconnectedness to food webs.
4. Using the blackboard, draw the arrows from the kokanee life cycle, then ask individual students to draw the different stages in the appropriate places.
5. Hand out materials for the life-cycle mobiles. Have students draw each stage in the kokanee life cycle on Bristol board, then cut them out. Encourage creative decorating, such as gluing on scales and fins, colouring the cutouts, and using different materials to represent different things (e.g., tissue paper for the water, styrofoam balls for the alevins' egg sacs).
6. Hang the life cycle stages in order on the wire ring to create a life cycle mobile.
7. Instruct students to add the appropriate food organisms, predators, and hazards the kokanee meet at each stage of their life cycle. Attach these items either immediately below the life cycle stage or nearby, on a longer string.

Extensions

1. Visit a field station to view stages of kokanee development.
2. Raise kokanee in the classroom or visit a class that does raise kokanee to observe their development.
3. Develop a public information display and set it up during spawning season, when kokanee are most visible to the public.
4. Develop a life-cycle game, where the object is to get from egg to spawner. Include natural and man-made hazards.



Assessment

1. Describe a stage in the life cycle and identify hazards the kokanee might encounter during that stage.

Ask students to assume the roles of the different stages of the kokanee life cycle (2 adults, 4 juveniles, 8 fry, 10 alevin and the remainder of class as eggs). Draw a large circle, with designated

spots for each stage of the kokanee life cycle, then instruct students to stand in the appropriate spots.

Ask students in each group to describe their stage in the life cycle and to identify hazards they might encounter.

Ask them which

hazards have the potential to endanger kokanee or cause their extinction.

2. Draw the kokanee life cycle on paper, with descriptions of each stage to support their illustrations.

