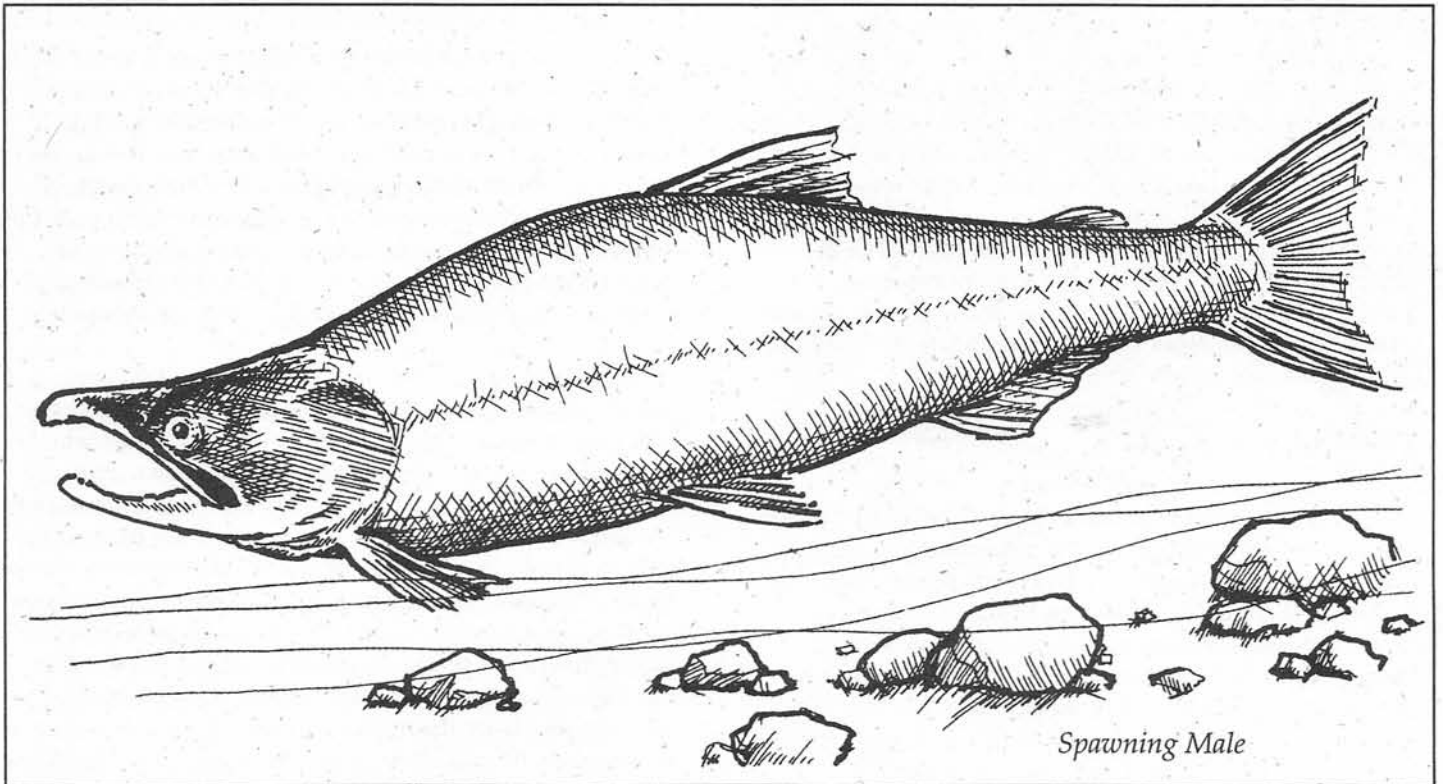


Kokanee

(*Oncorhynchus nerka*)



Spawning Male

Kokanee salmon (*Oncorhynchus nerka*) belong to the family Salmonidae and are a landlocked subspecies of the Idaho sockeye salmon. Idaho sockeye salmon are known for their dramatic spawning run, traveling up to 900 miles from the Pacific Ocean to the freshwater, inland stream in which they hatched. Although kokanee salmon remain inland, living in freshwater lakes instead of the ocean, they too journey back to spawn in the stream in which they hatched.

In Utah waters, kokanee salmon begin their spawning run in late August and September. During this time, the Utah Division of Wildlife Resources closes fishing on selected waters within the state to aid the success of the kokanee spawning populations. While these streams are closed to fishing, they remain open for sightseeing. Salmon run watching has recently become a tourist attraction along the shores of many salmon rivers, including several streams in Utah. Flaming Gorge, Porcupine and Strawberry reservoirs have established populations of kokanee salmon. The best places to view kokanee spawning runs are in Sheep Creek near Manila, the East Fork Little Bear River (main tributary to Porcupine Reservoir) and Indian Creek (tributary to

Strawberry Reservoir). The kokanee spawning run provides an excellent opportunity to witness one of nature's interesting and unique life cycles.

Life Cycle

For kokanee salmon, life begins in the form of eggs deposited in nests, called redds, which the female scrapes out of the stream gravel. Hatching may occur at any time from November through January. The newly hatched fish are called alevins and still have part of their yolk sacks attached. Alevins spend their first few weeks of life hiding in the stream gravel as they absorb their yolk sacks. Once the yolk sacks are absorbed, the young fish are known as fry. At this stage, the fry begin to emerge from the gravel and feed on plankton (floating, microscopic plants and animals). When danger threatens, the fry return to the gravel and vegetation for cover.

Kokanee fry gain size and weight over winter. By April, they grow to about one and a half inches long. Spring runoff triggers their next stage of development. As the stream begins to swell with melted snow, the young

fish (now called parr or small fingerlings) begin to move downstream, swept along with the spring runoff, until they reach the open water of a lake or reservoir. Once in the lake, the parr begin a more pelagic (open water) life, forming large schools and feeding on zooplankton.

Kokanee salmon prefer the cool temperatures (50-59°F) of deep waters but often rise to the surface at twilight for feeding. Kokanee will spend three to four years as a pelagic fish, foraging on zooplankton and gaining size until their biological clock tells them it is time to spawn. Those fish that survive fishermen and natural hazards (such as lake trout, ospreys or sudden water-quality changes) return to the same streams in which they were born. Spawning kokanee can grow to 24 or more inches in length and can weigh up to four pounds, but most are between 12 and 16 inches and weigh about one pound. Kokanee from Flaming Gorge tend to be larger with an average length of 15 to 18 inches.

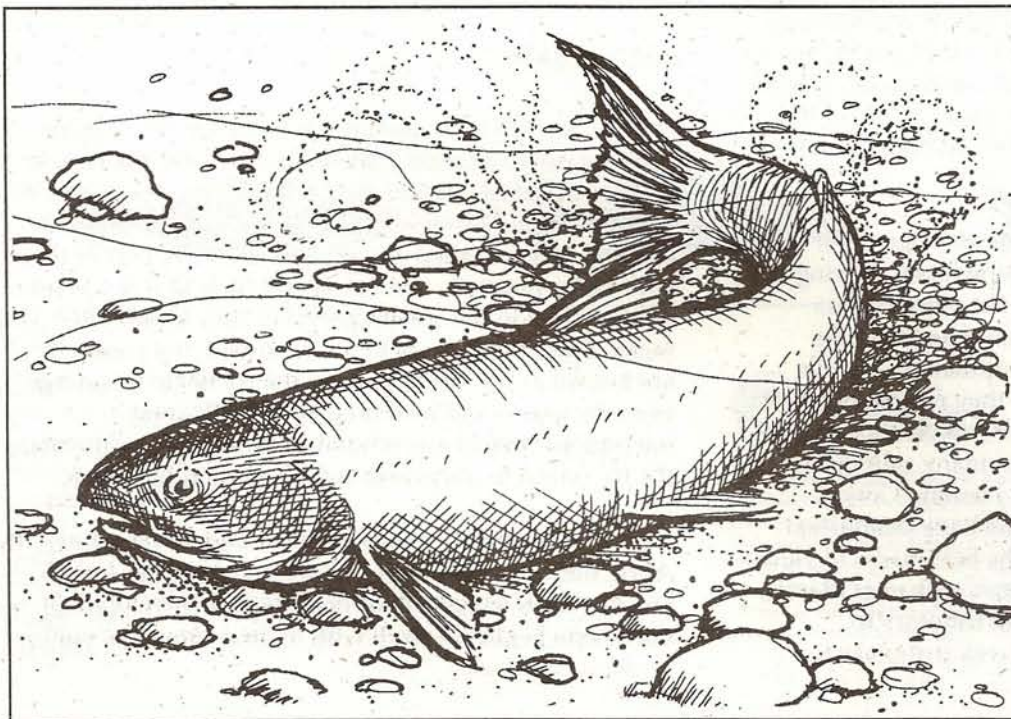
The Spawning Run

Early spawning runs begin in late August and reach a peak around the middle of September. As kokanee near the time for their spawning run, they stop feeding and congregate near the inlets of spawning streams. Then, kokanee salmon begin to physically change. Their bodies turn a bright red and the males develop humped backs and hooked jaws. As the changes become more advanced, the fish begin their spawning run. Studies have shown that the median age of spawning populations is four years old, but some two-, three- and five-year-old fish also spawn. A spawning

population composed of varied-aged kokanee works as a survival mechanism and helps strengthen genetic diversity. If something happens to destroy most of the population of one age group, spawners from other age groups can help replenish that year's run. In addition, having parental stock from several age groups protects against inbreeding.

Kokanee swim up spawning streams to get to the gravel bars. Some swim much farther than others in search of the right combination of water and gravel. Under natural conditions most kokanee, like the sockeye, return to or near to the gravel bar where they hatched. Studies have documented that a spawning adult uses the sense of smell to identify its own specific stream and gravel bar. The smell of the gravel bar and stream is imprinted in young kokanee early in their development.

Kokanee in Utah lay an average of 1,000 eggs per female. Generally, larger females produce bigger eggs and average more eggs per female. The kokanee female picks the locations to build her nests, or redds. She will usually build several redds and lay eggs in each one until she deposits all of her eggs. The female may mate with only one male or with several males. Mating with several males increases genetic diversity. Kokanee males compete for the right to fertilize a female's eggs. The male will guard the female while she digs her redds. As she lays her eggs, he will swim in and fertilize them, generally approaching from the upstream side. If another male approaches, he will attempt to drive him away. Kokanee males can fertilize the eggs of more than one female; thus,



*By fanning her tail,
the kokanee female covers her
redds
with gravel
to aid in the
protection of her eggs.*

the larger, stronger males have the potential to be more effective spawners.

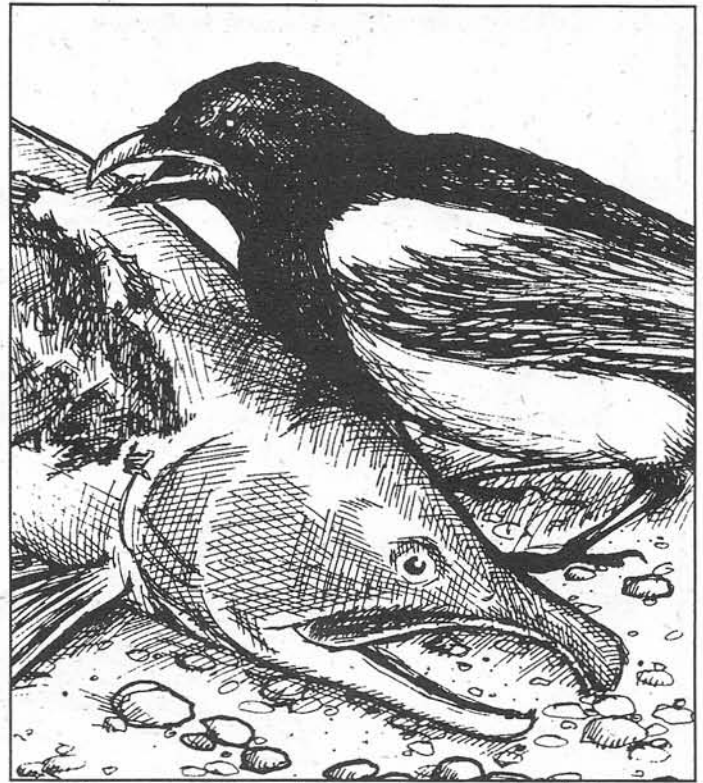
Soon after spawning, kokanee adults die to complete the salmon life cycle. Their bodies provide food for predators and scavengers such as magpies, seagulls, ravens, skunks, mink and coyotes. The salmon not eaten will decompose and fertilize the waters, increasing plankton growth for the time when young kokanee fry begin to forage for themselves. In four years, these kokanee young will return to the same stream to spawn.

Management and Current Status

Kokanee were first brought into Utah in 1922 from Washington State. In 1923, they were introduced into Bear Lake and then into Strawberry Reservoir in 1937. Since that time, kokanee have been introduced into several Utah waters, including Flaming Gorge, East Canyon, Scofield, Deer Creek, Moon Lake and Porcupine reservoirs, as well as Panquitch Lake. During 1992, fingerling kokanee were introduced into Causey and Stateline reservoirs to establish new sport fishery populations.

In 1991, the Utah Division of Wildlife Resources began a kokanee stocking program at Strawberry Reservoir. Eggs collected in the fall at Sheep Creek and Porcupine Reservoir were raised in a hatchery. In the spring, hatchery crews planted fingerling kokanee into tributary streams of Strawberry Reservoir. The first successful spawning run occurred in 1992 with yearling kokanee returning to the tributary streams to spawn. Normally, the first spawning run is expected to occur when the kokanee reach four years of age. However, some researchers now believe that it is the size and condition of the fish, rather than the age, which determine when the fish will spawn. It was this growth factor that contributed to the kokanee in Strawberry Reservoir returning at an early age to spawn.

Today, kokanee populations are thriving in Flaming Gorge, Porcupine and Strawberry reservoirs, and future kokanee management looks bright for Utah. Most of our present kokanee waters are doing well, and other waters have been identified for future introductions. Introducing kokanee to new lakes and reservoirs is done by hatchery crews trapping fish as they move into the spawning streams and artificially spawning the males and females. The resulting fertilized eggs are taken to a hatchery where they are placed in a controlled environment and closely monitored. When kokanee are spawned artificially about 50 to 85 percent of the eggs hatch. While under natural spawning conditions, generally only a small percent of the eggs hatch. After the eggs hatch, the alevins are placed in troughs and allowed



After completing their spawning run, dead kokanee become an important food source for many animals.

to grow to fingerling size. The fingerlings are then transported to new waters and released.

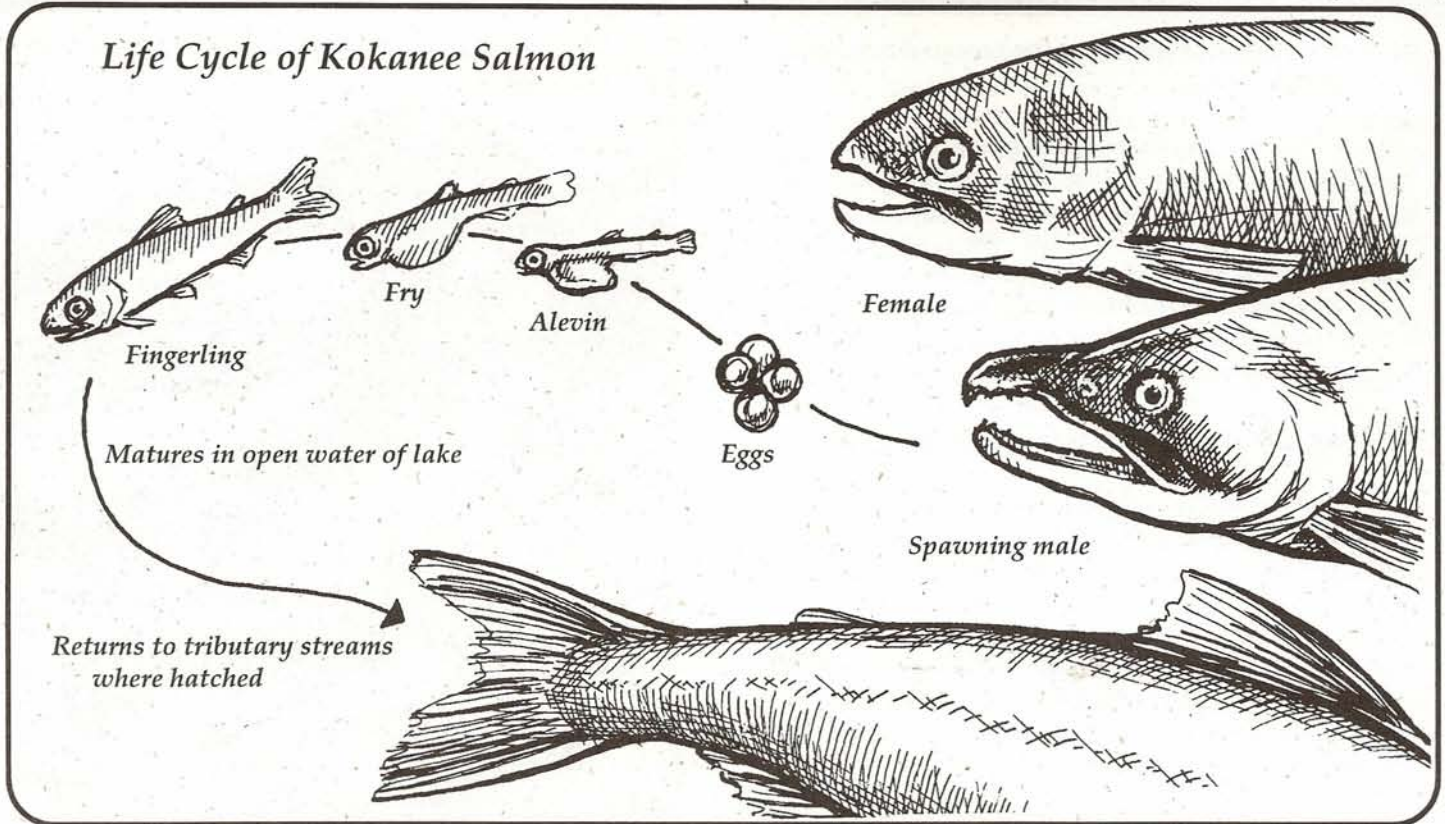
What You Can Do

- The opportunity to view kokanee salmon runs is a unique Utah wildlife experience. Most years, runs are underway by Labor Day weekend. Studies have shown that kokanee salmon are sensitive to human disturbances. Therefore, viewers are asked to stay on the river banks and to move and speak quietly to avoid disturbing the fish. Wading in the stream and throwing rocks or other objects at the fish can disrupt the run, destroy the redds, or cover the eggs with smothering silt.

- The kokanee spawning runs in Sheep Creek, Indian Creek, Strawberry River and the upper East Fork Little Bear River occur in late August through early October. Flaming Gorge Reservoir has a late-season spawning population which spawns in the Green River and along the shores of the reservoir in late October through November.

- For more information on kokanee salmon in Utah, contact the Aquatic Resource Section, Utah Division of Wildlife Resources, 1594 West North Temple, Salt Lake City, UT 84116-3154.

Life Cycle of Kokanee Salmon



Eggs are deposited in redds. Newly hatched fish, called alevins still have part of their yolk sacks attached. When the yolk sacks are absorbed, the young fish are known as fry. After reaching about an inch and a half long, the fingerlings swim downstream until they reach the open water of a lake or reservoir. Once there, kokanee will remain for several years until they return to the tributary streams to spawn.

Additional Reading

Miller, Robert Rush, and William F. Sigler. *Fishes of Utah*. Utah State Department of Fish and Game, Salt Lake City, 1963.
Sigler, John W., and William F. Sigler. *Fishes of the Great Basin: A Natural History*. University of Nevada Press, Reno, NV, 1987.



Wildlife Notebook Series No. 10

Produced by: Project WILD

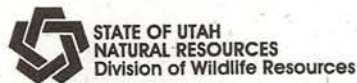
Written by: Ron Stewart, Regional Information/Education Manager

Edited by: Heather Kimball Hales

Illustrated by: Jill Rensel



Additional funding for this publication provided by the Sport Fish Restoration Act.



The Utah Department of Natural Resources receives federal aid and prohibits discrimination on the basis of race, color, sex, national origin, or handicap. For more information or complaints regarding discrimination, contact Executive Director, Utah Department of Natural Resources, P.O. Box 145610, Salt Lake City, UT 84116-5610 or Office of Equal Opportunity, U.S. Department of Interior, Washington, D.C. 20240. The Division of Wildlife Resources is funded by the sale of hunting and fishing licenses and through federal aid made possible by an excise tax on the sale of firearms and other hunting and fishing-related equipment.

Printed on recycled paper.