



Pacific Salmon

Oncorhynchus spp.

The upriver salmon migration is one of nature's most exciting dramas. But to the seven species of Pacific salmon (chinook, chum, coho, pink and sockeye salmon, as well as sea-run cutthroat and steelhead trout), it is a long, strenuous and desperate race against time, with every obstacle taking its toll.

Pacific salmon belong to a group called *anadromous* fish that includes Atlantic salmon, sturgeon, lampreys, shad and herring. Anadromous fish hatch and live the first part of their lives in fresh water, then migrate to the ocean to spend their adult lives, which may be as short as 6 months or as long as 7 years. When they reach sexual maturity, they return to the freshwater stream of their origin to lay their eggs. Although Atlantic salmon may repeat this cycle several times, Pacific salmon make the round trip only once.

Migration between fresh and salt water occurs during every season of the year, depending on the latitude and genetic characteristics of the fish. Groups of fish that migrate together are called *runs* or *stocks*. Salmon spawn in virtually all types of freshwater habitat, from intertidal areas to high mountain streams. Pacific salmon may swim thousands of miles to get back to the stream where they hatched.

However, only a small percentage of salmon live to reach their natal stream or spawning ground. Those males that survive the trip are often gaunt, with grotesquely humped backs, hooked jaws and battle-torn fins. The females are swollen with a pound or more of eggs. Both have large white patches of bruised skin on their backs and sides.

Since salmon do not feed after they leave the ocean, some die on the way to spawn because they lack enough stored body fat to make the trip. Many become caught in fishermen's nets. Those that evade the nets may have to swim through polluted waters near cities. Many make their way over power dams, leaping up from one tiny pool to the next along cement stairstep cascades called *fish ladders*. In the tributary streams, waterfalls and rapids are steep and swift enough to eliminate all but the strongest salmon. Otters, eagles and bears

stalk the salmon in shallow riffles. Once on the spawning grounds, the fish battle each other: females against females for places to nest, males against males for available females.

The female builds her nest, called a *redd*, by agitating the bottom gravel with her fins and tail and bending her body into a U shape first one way, then the other. As soon as she has excavated a depression, she settles into it and deposits her first batch of eggs, or *roe*. The male then moves alongside and deposits his sperm, called *milt*, over the roe. The female rakes her tail back and forth to cover the redd with loose gravel. She then excavates her next redd a short distance upstream.

The process continues until all the roe and milt have been deposited. One pair of salmon may have as many as seven redds, though four or five is average. The salmon die within a few days of spawning.

The translucent salmon eggs range in color from pale yellowish-orange to dark reddish-orange. The color varies both by species and within species and is determined by water temperature, sediment composition, age and other factors. The eggs vary in size

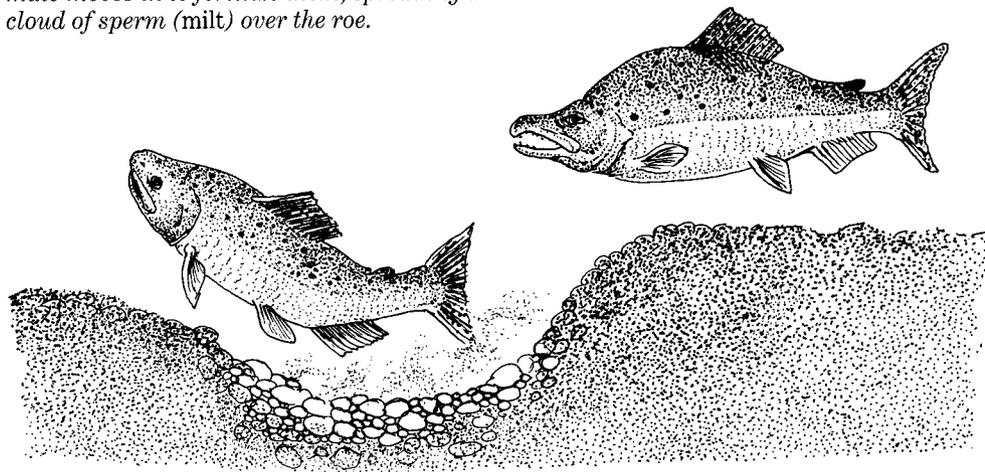
from the tiny sockeye roe (about 1/4 inch) to the large chum roe (almost 1/2 inch).

Incubation time ranges from 5 to 10 weeks. The newly hatched fish are called *fry*, or *sac fry* because they continue to feed on the yolk sac attached to their bellies. Depending on water temperature, species and other factors, they may stay in the gravel for several weeks before swimming up into the open water of the stream, where they feed on plankton and other tiny aquatic organisms. By the time they reach fingerling size (about 3 inches), most pink and chum salmon have begun the long journey downstream and out to sea. Sockeye, coho and most chinook spend from 1 to 2 years in fresh water before heading out to sea.

As the stream current carries the young salmon to the ocean, where they will spend the majority of their lives, their bodies undergo *smoltation*, physical and chemical changes that enable them to survive in salt water.

Most adult Pacific salmon species feed on aquatic insects and small fish. However, sockeye are filter feeders. They take in water full of plankton, and as the water flows back out of their mouths, specialized

When salmon return to their home spawning grounds, the female selects a place to nest and digs a depression (called a redd) in the streambed gravel. She then deposits her first batch of eggs (roe) and the male moves in to fertilize them, spreading a cloud of sperm (milt) over the roe.



organs called *gill rakers* act like strainers, holding the plankton in to be swallowed.

Some species of Pacific salmon stay within a few hundred miles of their home river, while others disperse north, south, west, or in the case of salmon originating in Russian and Japanese rivers and streams, east into feeding grounds in the Aleutian islands and other areas of the north Pacific. Chinook salmon may travel as far as 2,500 miles from their home stream and stay out at sea 4 to 7 years. Pink salmon, on the other hand, seldom range more than 150 miles from the mouth of their home river or stream where they hatch in the fall, and turn homeward in the spring, sometimes traveling 45 miles per day to reach their spawning grounds.

Pacific salmon encounter increasing human-caused hazards in their migrations to and from spawning grounds. All salmonids require pure, well-oxygenated cold water

when water quality is degraded. Many salmon stocks are seriously threatened by habitat destruction, hydroelectric dams on migratory rivers, harvest of rare stocks and competition with hatchery fish. Some stocks are so severely reduced that they have been listed as endangered or threatened species under the Endangered Species Act. Endangered means they are likely to become extinct. Threatened means they are likely to become endangered in the near future.

The winter-run of chinook salmon originating in California's Sacramento River was listed as threatened in 1990 but was reclassified to endangered in 1994. In 1992, the Snake River stock of sockeye salmon was listed as endangered wherever found. The spring-summer and fall runs of chinook originating in Idaho's Snake River were listed as threatened in 1992, but are currently being considered for endangered

status. Others being considered for listing include the Columbia River (Washington) chinook. Coho salmon in southern Oregon and along the northern and central California coasts were recently designated as threatened.

A 1991 report by the American Fisheries Society indicated that 214 of about 400 stocks of salmon, steelhead and sea-run trout in the Northwest and California are at risk of extinction. The report also indicated that 106 are nearly extinct. Steelhead on the central California coast and in the upper and lower Columbia River areas are among populations recently listed as threatened species.

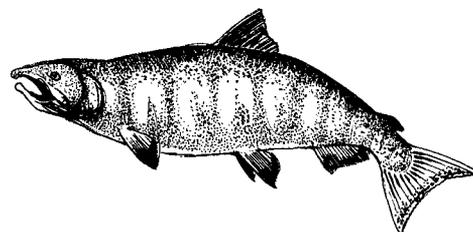
Primary listing and recovery responsibilities for Pacific salmon belong to the Department of Commerce's National Marine Fisheries Service. The U.S. Fish & Wildlife Service and other federal and state agencies also have recovery responsibilities.

Pacific salmon may swim hundreds of miles to get back to the stream where they hatched to spawn. The many obstacles the salmon face on this journey are often evident by bruised skin and torn fins.



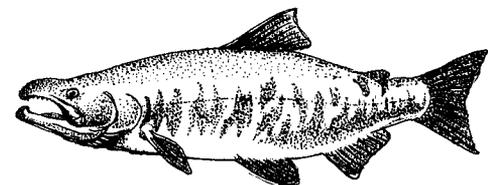
Chinook
(*Oncorhynchus tshawytscha*)

The largest of the Pacific salmon, chinook average about 24 pounds when they return to their natal river to spawn, most after 2 or 3 years at sea. The chinook is the least abundant of the Pacific salmon.



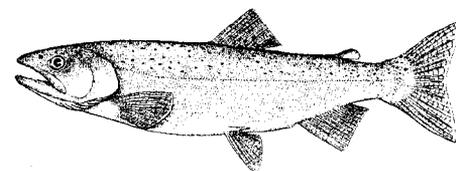
Chum salmon
(*Oncorhynchus keta*)

Chum make up about 13 percent of the West Coast catch. They follow Pacific migration paths and reach a common weight of about 12 pounds before returning to their natal river to spawn.



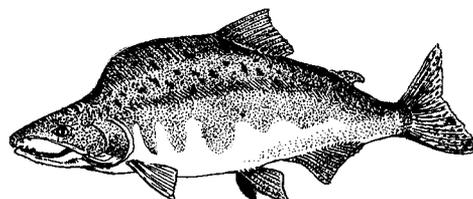
Coho salmon
(*Oncorhynchus kisutch*)

Fourth in Pacific fishery abundance, coho salmon is the number one sport fish. It spends only one winter at sea, returning the next fall to spawn. It averages about 10 pounds when full grown.



Pink salmon
(*Oncorhynchus gorbuscha*)

The smallest of the Pacific salmon, pink salmon average only about 3 to 5 pounds. However, they make up more than half the total West Coast commercial catch. Pink salmon seldom travel more than 150 miles from the mouth of their natal river.



Sockeye salmon
(*Oncorhynchus nerka*)

Sockeye salmon make up about 25 percent of the West Coast salmon catch. Like the chum, they follow Pacific migration paths and reach a weight of about 12 pounds before returning to their natal river to spawn.

