Chinook Salmon

Image from http://www.pac.dfo-mpo.gc.ca/

Oncorhynchus tshawytscha

Onkos = hook
Rynchos = nose

Physical Description:

Chinook salmon are the largest of the Pacific salmon. Although they can grow to 100 lbs, fish that size are rare and most are under 50 lbs. Chinook have a dark mouth with a black gum line, large sharp teeth, and large spots on the back and both lobes of the caudal fin. At sea they are blue-green in color with silver flanks. During mating season they develop a reddish tint around the back fins and tail. Male Chinook have a hooked nose at the top of the mouth and a ridged back.

Natural History:

Note - many of the life histories described here apply to all Pacific salmon. Chinook salmon life histories and population structure can be subdivided into broad categories as is done here. These broad categories are central themes around which a great deal of diversity has evolved in Chinook. For conservation purposes, maintaining life history diversity is key. Chinook salmon have evolved different races or life history strategies and variable timing for spawning as an evolutionary adaptation to ensure that a locally catastrophic event does not decimate the population.

Species Subtypes:

There are two distinct subtypes of Chinook salmon.

Stream-type Chinook: are commonly found in headwater streams of large river systems. They remain in freshwater longer and once they enter saltwater they migrate long distances offshore. Chinook in the northern part of their range (northern B.C., Alaska) are usually stream-type.

Ocean-type Chinook: are commonly found in coastal streams. They generally migrate to sea within three months to one year after hatching. They use estuaries and coastal areas more for rearing juveniles and tend to spend their ocean life in coastal waters. Chinook in the southern part of their range (Puget Sound, Skagit, Nooksack, Snohomish) generally fall under this type.

Spawning:

Chinook spawn in large rivers or small streams with sufficient water flow. They are able to spawn in larger gravel than other salmon because of their large size. When

they reach their spawning streams, females dig a 'redd' or nest in the gravel to lay their eggs which are then fertilized by the males. Different stocks of Chinook salmon enter their streams at different times of year. Those that travel hundreds of miles upstream to reach their spawning grounds tend to enter streams earlier and make up the spring and summer runs. Those that spawn closer to the ocean make up the fall runs.

Life Cycle:
Young Chinook life stages:

- Alevin - salmon life stage between an egg and a fry. At this stage, they do not have a protective shell and are essentially small fish with an attached yolk sac from which to derive nourishment. After the yolk sac has been completely absorbed the alevin leave the redd.

- Fry - a juvenile salmon that has absorbed its egg sac and is rearing in a stream.

- Parr (also known as a fingerling) - a large juvenile salmon that has vertical 'parr' bars and spots that are useful for camouflage.

- Smolt - a juvenile salmon that is preparing to enter the ocean.

Chinook remain in fresh water for varying lengths of time depending on their location and the temperature of the water. Spring Chinook tend to stay in streams for a year while fall Chinook tend to enter the ocean within a few months of hatching and emerging from the gravel. Once young Chinook enter the ocean they remain in the estuary or nearshore habitat for several weeks to months. They remain at sea an average of two to four years before returning to their natal streams to spawn. After mating, adult Chinook remain and guard the redd for several days to a month before dying. Their bodies provide nutrients for many other species of plants and animals as well as juvenile salmon, and are an important part of healthy ecosystems in the Pacific Northwest.

Range:
Chinook salmon range from the Chukchi Sea, Alaska, to Southern California in North America and from the Anadyr River, Siberia, to Hokkaido, Japan.

Diet:
Adult Chinook are piscivorous (fish eating) while young salmon eat crustaceans and other invertebrates, amphipods, and insects. In the Salish Sea, larval rockfish appear to be an important part of the diet of young Chinook.

Status:
Chinook salmon runs have experienced major declines in the past century and are a fraction of what they once were. Some runs have declined by 90%. Columbia River salmon numbers are only at about 3% of what they were when Lewis and Clark arrived there. There are currently two Evolutionarily Significant Units (ESU) listed as federally endangered in the United States, seven ESUs listed as threatened, one ESU listed as a candidate species, and

one ESU (two separate "races" under a single ESU) that is a Species of Concern under the federal Endangered Species Act.

Threats:

The major threats for Pacific salmon have been identified as the 4 Hs:

- Harvest - Chinook salmon have historically been, and continue to be, an important target species for recreational and commercial fisheries. In the late 1800s, 20 to 30 million Chinook were taken annually from the Columbia River alone. Harvest is being controlled more today but might still be a factor where populations are small and weak. Chinook are an important species to indigenous people both culturally and for subsistence.

- Habitat - chemical pesticides can alter the 'smell' of a stream, disrupting homing mechanisms. Soaps and detergents can clog the gills of fish and result in high mortality. Copper from brake pads can be toxic to salmon in fresh water. Land-use activities such as logging, road construction, urban development, mining, agriculture, and recreation result in habitat modification. Examples of habitat modification include: alterations in steam banks, changes in stream water temperatures and water quality, reduction in available prey, elimination of spawning and rearing habitat, and removal of native vegetation which results in erosion and increased sedimentation. Most western states have lost 80 to 90 percent of their historic riparian habitat. Over the past 200 years, the lower 48 states have lost over 50% of their wetlands. Most of the estuaries in Washington, which are especially important to salmon smolts, have been altered by dredging, diking, filling of wetlands and tidal areas, and degraded water quality. Because Chinook salmon spawn largely in the main stems of larger rivers, splash dams and log drives down rivers were particularly devastating to Chinook habitat in the 19th and half way through the 20th centuries.

- Hydro - dams have reduced or eliminated accessible habitat and resulted in high mortality of salmon. Changing the natural flow of dammed rivers results in increased water temperature and reduced water flow necessary for migration, spawning, rearing, sediment flushing from spawning areas and transport of debris, all of which have a negative effect on salmon.

- Hatcheries - extensive hatchery programs were established to mitigate fisheries and habitat destruction. While hatcheries successfully provide fishing opportunities, impacts on wild salmon may include competition, genetic hybridization, and disease transmission. Fisheries that target mixed stock of hatchery and wild salmon can over harvest the wild fish. Hatchery fish have decreased fitness due to being fed pellets, and therefore not having to search for food, as well as being protected from predation. Glenwood Springs Hatchery on Orcas Island, operated by Long Live the Kings, is a progressive hatchery that strives to rear the salmon in a more natural setting.

In addition to these threats there is increasing concern over the effects that salmon farming has on wild Pacific salmon populations. Some of the detriments of salmon farms include escapement of non-native Atlantic salmon, lethal outbreaks of sea lice, antibiotic resistance, disease, and toxins, all of which can affect wild salmon. Climate change is also a concern as it can increase the risk of diseases in wild salmon and reduce the quality and quantity of water in spawning habitat. Short term changes in weather such as El Nino and La Nina,

which dictate rainfall levels, can have devastating effects on salmon populations for a given year. Additional information on threats to Pacific salmon can be found at https://www.fisheries.noaa.gov/data-tools/west-coast-salmon-vulnerability-species-specific-results.

Conservation Efforts:

There are a variety of conservation efforts currently being undertaken. Critical habitat has been designated for the nine listed Chinook ESUs. More information on the recovery plans can be found at https://archive.fisheries.noaa.gov/wcr/protected_species/salmon_steelhead/recovery_planning_and_implementation/. Removal and modification of dams that obstruct salmon migration has been undertaken. A successful example of this is the Elwha Dam Removal Project in Washington State. More information on this project can be found at http://www.nps.gov/olym/naturescience/elwha-ecosystem-restoration.htm. Restoration of degraded habitat and improved water quality are being attempted in many areas.

The Puget Sound Partnership is the regional salmon recovery organization for Puget Sound salmon. They are focusing on protecting and restoring habitat, raising awareness, reforming hatchery management, and developing and monitoring an adaptive management strategy. More information about the Puget Sound Partnership can be found at https://psp.wa.gov/.

The Pacific Coastal Salmon Recovery Fund (PCSRF) was established by Congress in 2000 to support the restoration of salmon species. The fund is overseen by NMFS (also known as NOAA) and carried out by state and tribal governments. PCSRF grantees, such as the Washington Department of Fish and Wildlife (WDFW), contract with local watershed groups, conservation agencies, land trusts, and other entities to manage salmon habitat restoration projects. In turn, those agencies contract with local businesses and suppliers to carry out the work. In 2018, NOAA (in collaboration with WDFW) issued a paper on priority Chinook salmon stocks for the endangered Southern Resident killer whales as Chinook salmon is a critical food source for them and essential to the recovery of their population. The prioritization will inform salmon recovery actions such as habitat restoration and perhaps production of fish at hatcheries, which are designed to increase the abundance of salmon overall. The list can help inform funders and federal, state, and tribal managers in making decisions about a variety of salmon recovery actions and they may prioritize actions that benefit both salmon and Southern Resident killer whales. These benefits may also extend to other species of salmon and steelhead that support commercial and recreational fisheries. Connecting salmon recovery actions to recovery of Southern Resident killer whales could increase awareness and bring new partnerships and funding sources to the table.

Fun Facts:

- Chinook salmon are also known as king salmon because of their large size.
- In Puget Sound ‘blackmouth’ sometimes refers to young Chinook salmon that remain in the inland waters.
- A ‘tyee’ is a Chinook salmon that is larger than 30 pounds.

- A small percentage of yearling male Chinook, known as ‘jacks’ return to their natal streams after just a few months in salt water. Their breeding success is variable and is usually accomplished by ‘sneaking’ to mate with females.
- Research from NOAA Fisheries shows that over 80% of the summer diet of Southern Resident killer whales is Chinook – mostly from the Fraser River.

Sources:

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Chinook salmon photo by NOAA

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