Pacific salmon have played a pivotal role in the development and history of Alaska. Many Alaskans still depend on salmon for recreation, food, and employment. The fishing industry has provided Alaska with its largest private sector employment, and subsistence use of salmon is still an important part of the life of rural Alaskans.

Monitoring the status of salmon involves measuring salmon run sizes, including both catch and escapement information. However, other factors are also used to measure the well being of salmon stocks, such as fish sizes, fish quality, disease and infestations, and run timing. All of these characteristics are difficult to quantify and standardize. Even run size data (particularly data on escapement sizes) are hard to obtain because the salmon escapement routes into different river systems are usually not well known. The primary goal of salmon management is to allow adequate escapement so that spawning and replenishment of the salmon stock will occur. Thus, the yearly variation of salmon catch, after allowing escapement, may be used as the most consistent measure of the status of salmon stocks.

Overall Harvest Levels

Alaska commercial salmon harvests have generally increased over the last three decades. After reaching record low catch levels in the 1970s, most populations have rebounded, and fisheries in recent years have been at or near all-time peak levels in many regions of the state. The record-high commercial landing of 218 million salmon in 1995 was 17% higher than the previous record of 196 million in 1994. Throughout the mid- to late 1990s, recreational and subsistence fishermen harvested 2–3 million salmon annually.

Significant declines in commercial catches during the three years following the peak harvest in 1995 were thought by many to indicate that a major downturn in productivity of Alaska salmon might have started. The history of commercial landings shows a distinct cyclic pattern of high and low harvest levels often lasting decades. Much of this fluctuation is now believed to be caused by interdecadal climate oscillations in the ocean environment that affect the marine survival of juveniles. A major climatic regime shift that occurred in 1977 helped Alaska stocks rebound from the previous low-cycle years, while another regime shift in 1989 may portend a future downward trend in Alaska’s salmon resources.

An interesting correlation associated with Alaska’s cyclic salmon harvest is an inverse production regime with abundance levels of West Coast salmon. Recent increases in the numbers of West Coast salmon, therefore, may also suggest a declining trend for Alaska salmon. However, the correlation is still debatable. Alaska’s commercial catch did decline for three years after the record 1995 harvest, but it rebounded to 217 million fish in 1999, essentially matching the peak harvest year catch. Landings in 2000 fell to 137 million salmon, increased to 175 million fish in 2001, dropped to 131 million in 2002, and then increased to 173 million in 2003. All of these recent Alaska harvests were well above the long-term norm for Alaska, while West Coast salmon runs have continued to rebound from their lows.

A number of factors have contributed to the current high abundance of Alaska salmon:
• Pristine habitats with minimal impacts from extensive development;
• Generally favorable ocean conditions that allow high survival of juveniles;
• Improved management of fisheries by state and Federal agencies;
• Elimination of high-seas drift-net fisheries of foreign nations;
• A well-managed hatchery production system; and
• Reductions of salmon bycatch in fisheries for other species.

Management

Alaska’s 44,000-mile coast is nearly two-thirds the length of the coastline of the United States. Along the Alaska coastline, over 14,000 water bodies support populations of five species of salmon. Salmon management over such a vast area requires a complex mixture of domestic and international bodies, treaties, regulations, and other agreements. Federal and state agencies cooperate in managing salmon fisheries. The Alaska Department of Fish and Game (ADF&G) manages salmon fisheries within state jurisdictional waters, where the majority of the harvest occurs. ADF&G’s principal salmon conservation policy uses escapement-based management, providing adequate spawning escapement into natal streams over any preseason harvest goals. Management in the Exclusive Economic Zone (EEZ), 3–200 nautical miles offshore, is the responsibility of the North Pacific Fishery Management Council (NPFMC), which has deferred specific regulations to the State of Alaska. Management of Alaska’s salmon fisheries is based primarily on regional stock groups of each species and on time and area harvesting using specific types of fishing gear.

Over 25 commercial salmon fisheries in Alaska are managed by a special limited-entry permit system that specifies when, where, and what type of fishing gear can be used in each area of the state. The commercial gear used includes drift gillnets, set gillnets, beach seines, purse seines, hand troll, power troll, or fish wheel harvest gear. Sport fishing is limited to hook and line, while subsistence fishers may use gillnets, dip nets, or hook and line. Some subsistence harvesting of salmon is also regulated by special permits, and in some rivers, fish wheels can be used for subsistence fishing.

Management of some Alaska salmon fisheries is also negotiated with Canada under the Pacific Salmon Treaty. Some major issues of concern occur in Southeastern Alaska, while others occur in the Yukon River area.

On a broader international scope, the management of salmon harvest in the high seas of the North Pacific Ocean from 1957 to 1992 was authorized by the International North Pacific Fisheries Commission (INPFC) and via bilateral and multilateral agreements and negotiations with Taiwan and the Republic of Korea. In 1993 the North Pacific Anadromous Fish Commission (NPAFC) was formed to replace the INPFC. Membership of the NPAFC has now expanded from the original three countries (Canada, Japan, and the U.S.) to include the Russian Federation and the Republic of Korea.

The NPAFC Convention prohibits high seas salmon fishing and trafficking of illegally caught salmon. Coupled with United Nations General Assembly Resolution 46/215, which bans large-scale pelagic driftnet fishing in the world’s oceans, legal harvesting of Pacific salmon on the high seas no longer exists. This allows for effective management control to fully return to the salmon-producing nations.

Because salmon are anadromous species that spend up to seven years of their lives at sea and then return to freshwater streams, rivers, and lakes to spawn and die, the well-being of salmon in Alaska, in addition to harvest management practices, is also directly influenced by land management practices. The quality of freshwater habitats determines the success of reproduction and initial
rearing of juveniles. Several entities have significant influence on the quality of freshwater spawning and rearing habitats for salmon throughout Alaska. Among these are the U.S. Forest Service, the Bureau of Land Management, the National Park Service, the U.S. Fish and Wildlife Service, Alaska state parks and forests, Alaska Native regional and village corporations, municipalities, boroughs, and private landowners that control watersheds used by salmon.

**Species and Status**

All five species of Alaska salmon—pink, sockeye, chum, coho, and chinook—are fully utilized, and stocks in most regions of the state generally have rebuilt to near or beyond previous high levels. Although in recent years there has been a high statewide abundance of salmon in Alaska, there are also issues of serious concern for these resources, especially with some species in certain regions. For example, stocks in western Alaska, especially chinook and chum salmon, generally have been at very depressed levels since the mid-1990s. Also, some of the same factors affecting declines of salmon in the Pacific Northwest—issues associated with overfishing, incidental take as bycatch in other fisheries, and losses of spawning and rearing habitats in freshwater and in nearshore ocean environments—are of concern in some areas of Alaska.

Recreational fishing for salmon continues to grow and is an important component of the Alaskan lifestyle. This is partly because many Alaskan
households use sport fishing as a convenient method to collect seafood for the table. Some part of the total sport fish harvest of salmon in Alaska, therefore, might more appropriately be included in subsistence fishery statistics. Much of the recent growth in sport fishing is because of increased guided recreational fishing by tourists visiting Alaska. A total of 392,980 Alaska sport fishing licenses were issued in 2002, with 71% issued to nonresident anglers. More nonresident sport fishing licenses have been sold in Alaska than resident licenses since 1990. Sport fishing for salmon is a vital part of the recent rapid growth in Alaskan tourism. Coho salmon were the most popular sport-caught salmon in Alaska, representing 38% of the 3.2 million salmon caught by recreational fishermen in 2002, followed by pink salmon (25%), sockeye salmon (21%), chum salmon (7%), chinook salmon (5%), and non-anadromous landlocked salmon (4%).

**Pink Salmon**

Pink salmon are the most abundant of Pacific salmon in Alaska, accounting for 40–70% of the total harvest each year. During the past 33 years (1970–2003), pink salmon made up 58% of the average annual commercial harvest of salmon in Alaska. Pink salmon are harvested mostly in the southeastern, southcentral, and Kodiak Island regions of the state.

Unique among Pacific salmon, pink salmon have a fixed life-history cycle whereby the species always matures and spawns at two years of age. This cycle is genetically fixed, so spawners in even-numbered years are always separate and distinct from spawners in odd-numbered years.

Throughout much of its range, the species has viable populations in both odd- and even-numbered years; however, in some areas, pink salmon only occur in one or the other cycle year. In Bristol Bay and western Alaska, for example, pink salmon, near the effective limit of their northern range, essentially occur mostly in even-numbered years, whereas in the Pacific Northwest, near the effective limit of their southern range, they occur primarily in odd-numbered years.

**Sockeye Salmon**

Sockeye salmon, second in abundance among species caught in Alaska fisheries, generally accounted for 27% of the harvest in recent years. Sockeye salmon, however, provide greater dollar value to fishermen than all other commercially caught salmon in Alaska combined, usually yielding 60–70% of the ex-vessel value of the annual harvest. In more recent years, however, world salmon prices have declined significantly but have rebounded a little in 2004.

The largest fisheries for sockeye salmon occur in Bristol Bay, Cook Inlet, the Alaska Peninsula and Aleutian Islands, and the Kodiak regions, but there are also significant fisheries for this salmon.
in the southeastern, Prince William Sound, and Chignik regions.

The most common sockeye salmon life-history pattern is for juveniles to rear in lakes for 1–2 years before migrating seaward as smolts. The large lake complexes on Bristol Bay rivers provide this necessary life-history component and form a critical part of the important fishery in this region. The Bristol Bay fishery is concentrated in a narrow window of time from late June until mid-July, when millions of returning adult sockeye salmon pour into Bristol Bay rivers from the ocean.

During the five-year period from 1992 to 1996, returns to Bristol Bay ranged from 29.6 to 44.4 million and averaged 36.5 million sockeye salmon per year. The return to Bristol Bay in 1997, however, was only 18.9 million, with a fishery harvest of 12.1 million. This unexpectedly low return of sockeye salmon created a serious shortfall in the catch and in the incomes of fishermen and communities.

As bad as the 1997 sockeye salmon harvest in Bristol Bay was, commercial landings in 1998 were even worse, with a harvest of only 10.0 million fish. Returns improved somewhat in 1999 and 2000, with commercial catches of 26.1 and 20.5 million sockeye salmon, respectively, but more recently have declined again, with commercial catches of only 14.2, 10.7, and 14.9 million fish, respectively, in 2001, 2002, and 2003. All of these recent harvest levels of sockeye salmon in Bristol Bay are well below previous decadal averages.

Several hypotheses have been suggested to explain recent shortfalls of sockeye salmon returning to Bristol Bay. Unusually warm, calm weather during summers has resulted in high water temperatures, which may have caused high mortality and changes in the migration behavior of adult salmon entering Bristol Bay. Other suggested causes include changes in freshwater or ocean rearing conditions that affect the growth and survival of juveniles or immature adults, increased predation at sea, interception by other fisheries, disease, and, in some instances, over-escapements on spawning grounds. The true causes of these shortfalls, which likely involve a combination of many factors, remain unknown. A paramount unanswered question, however, is whether or not cyclic changes in oceanic environmental conditions have occurred that portend lower survival rates and smaller sockeye salmon returns to Bristol Bay in future runs.

Chum Salmon

Over the 33 years from 1970 to 2003, chum salmon have accounted for 10% of Alaska’s salmon harvest. Over the past eight years (1996–2003), the average annual chum salmon harvest across Alaska was 18.6 million fish, with the 2000 harvest well above this average at a record 24.3 million fish. Currently 60–70% of the commercially harvested chum salmon in Alaska occur in the southeastern region, where hatcheries produce a significant portion of the catch.

Chum salmon runs in southwestern and western Alaska, similar to sockeye salmon in Bristol Bay, were well below long-term averages. Managing chum salmon fisheries in western Alaska is complicated by another commercial fishery at False Pass in the Aleutian Islands. Western Alaska chum salmon may spend part of their ocean life in the Gulf of Alaska. These salmon, as maturing adults on their return migration, funnel through Aleutian passes into the Bering Sea. The False Pass fishery, targeted primarily on sockeye salmon returning to Bristol Bay, must be managed so as to not overharvest chum salmon destined for the Kuskokwim and Yukon Rivers in western Alaska.
The Alaska Board of Fisheries has placed major restrictions on the False Pass fishery in an effort to help rebuild depleted chum salmon resources in western Alaska. Chum salmon in western Alaska not only are an important part of commercial fisheries in that region but are also a significant subsistence resource for local residents.

Coho Salmon

Commercial catches of coho salmon across Alaska in 2003 totaled 4.1 million fish, a half million less than the recent six-year average but still well above the record low catches of the 1970s. This relatively high commercial harvest was due to generally favorable returns in the southeastern region, where 3.0 million or more coho salmon from hatchery and wild stock production were caught in four out of the last six years. Coho salmon, along with sockeye and chinook salmon, are a popular target species in recreational fisheries throughout Alaska.

Chinook Salmon

The annual commercial harvest of chinook salmon in Alaska has ranged between 300,000 and 700,000 fish over the past two decades. The statewide 13-year (1991–2003) average annual harvest was 559,000 fish. In general, chinook salmon are the first species each year to begin spawning migrations into Alaskan rivers. Only in a few Bristol Bay and western Alaskan rivers are fisheries permitted to directly target these early returning runs of chinook salmon. However, in fisheries targeting other salmon, chinook salmon are often taken incidentally.

The region-wide chinook salmon harvest in southeastern Alaska, where significant numbers of non-Alaska-origin fish are caught, is normally regulated by a quota under provisions of the Pacific Salmon Treaty. This annual harvest quota is then re-allocated among various fisheries by the Alaska Board of Fisheries.
References


Alaska Department of Fish and Game (2003) *Catch, Effort, and Value Statewide Harvest; Recent Years Harvest Statistics.* Reported at web site: http://www.cf.adfg.state.ak.us/.


