Status of Alaska's Salmon Fisheries

This article was prepared by William R. Heard, of NOAA's Alaska Fisheries Science Center, Auke Bay Laboratory, Juneau, Alaska; and Loh-Lee Low, of NOAA's Alaska Fisheries Science Center, Resource Ecology and Fisheries Management Division.

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.

Spawning salmon.

Overall Harvest Levels

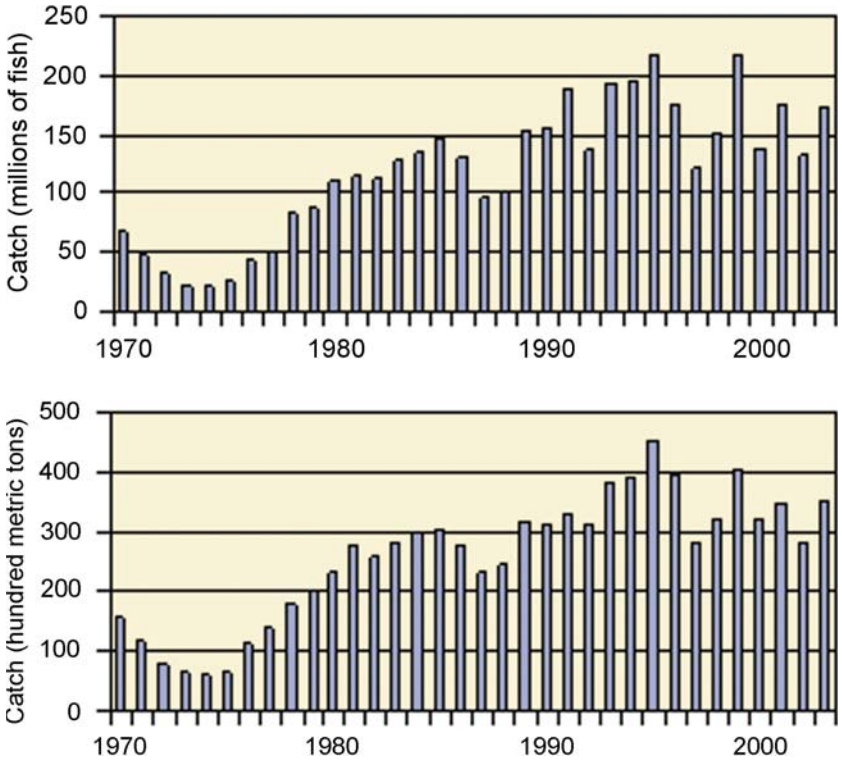
Alaska commercial salmon harvests have generally increased over the last three decades. After reaching record low catch levels in the 1970s, most populations have rebounded, and fisheries in recent years have been at or near all-time peak levels in many regions of the state. The record-high commercial 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;



Alaska salmon catch of all species combined, in numbers of fish and in metric tons.

- 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

Alaska Salmon Catch by Species in Numbers of Fish, 1970–2003.

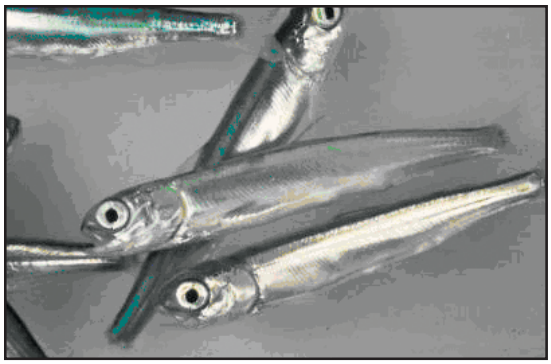
Year	Pink Salmon	Sockeye Salmon	Chum Salmon	Coho Salmon	Chinook Salmon	Total
1970	31,096,000	27,622,000	7,476,000	1,524,000	645,000	68,363,000
1971	23,539,000	14,177,000	7,679,000	1,444,000	661,000	47,500,000
1972	15,913,000	6,999,000	6,655,000	1,834,000	554,000	31,955,000
1973	9,805,000	4,448,000	5,928,000	1,455,000	550,000	22,186,000
1974	9,857,000	4,789,000	4,698,000	1,860,000	559,000	21,763,000
1975	12,987,000	7,458,000	4,323,000	1,014,000	455,000	26,237,000
1976	24,755,000	11,779,000	5,924,000	1,432,000	531,000	44,421,000
1977	28,647,000	12,465,000	7,326,000	1,789,000	620,000	50,847,000
1978	53,852,000	18,140,000	6,677,000	2,821,000	836,000	82,326,000
1979	50,137,000	28,696,000	5,608,000	3,122,000	779,000	88,342,000
1980	63,304,000	33,295,000	9,603,000	3,115,000	675,000	109,992,000
1981	60,089,000	36,348,000	12,613,000	3,416,000	823,000	113,289,000
1982	64,859,000	28,954,000	10,994,000	6,040,000	877,000	111,724,000
1983	60,359,000	52,875,000	10,222,000	3,636,000	828,000	127,920,000
1984	76,343,000	38,450,000	13,096,000	5,405,000	667,000	133,961,000
1985	90,335,000	38,983,000	10,570,000	5,749,000	721,000	146,358,000
1986	77,320,000	32,208,000	12,510,000	6,293,000	616,000	128,947,000
1987	46,493,000	35,431,000	10,527,000	3,493,000	680,000	96,624,000
1988	50,358,000	30,038,000	15,105,000	4,473,000	589,000	100,563,000
1989	96,869,000	44,139,000	7,896,000	4,650,000	572,000	154,126,000
1990	88,208,000	52,693,000	8,010,000	5,478,000	666,000	155,055,000
1991	128,336,000	44,646,000	9,769,000	6,153,000	613,000	189,517,000
1992	60,597,000	58,283,000	10,223,000	7,095,000	606,000	136,804,000
1993	109,631,000	64,314,000	12,238,000	6,050,000	667,000	192,900,000
1994	116,720,000	52,816,000	16,135,000	9,551,000	640,000	195,862,000
1995	128,333,000	63,532,000	18,796,000	6,471,000	663,000	217,795,000
1996	97,310,000	50,270,000	21,856,000	6,150,000	500,000	176,086,000
1997	71,280,000	30,910,000	15,620,000	2,900,000	650,000	121,360,000
1998	104,770,000	22,720,000	19,070,000	4,680,000	580,000	151,820,000
1999	145,990,000	45,120,000	20,480,000	4,590,000	430,000	216,610,000
2000	74,800,000	33,500,000	24,290,000	4,200,000	360,000	137,150,000
2001	127,620,000	26,520,000	15,400,000	4,950,000	370,000	174,860,000
2002	87,310,000	22,211,000	16,210,000	5,059,000	584,000	131,374,000
2003	121,696,000	31,013,000	15,931,000	4,105,000	599,000	173,344,000

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



Pink salmon fry.

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.

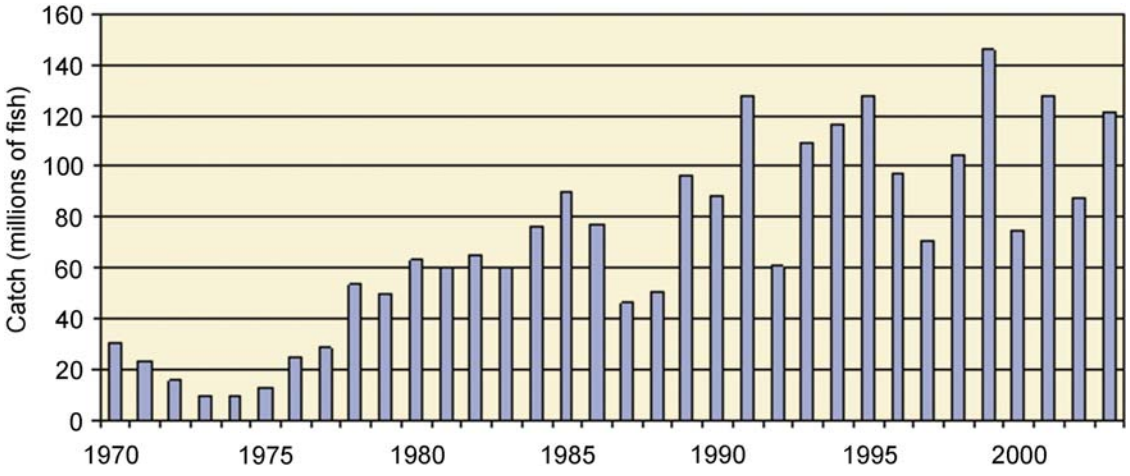
Throughout much of its range, the species has viable populations in both odd- and even-numbered years; however, in some areas, pink salmon only occur in one or the other cycle year. In Bristol Bay and western Alaska, for example, pink salmon, near the effective limit of their northern range, essentially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

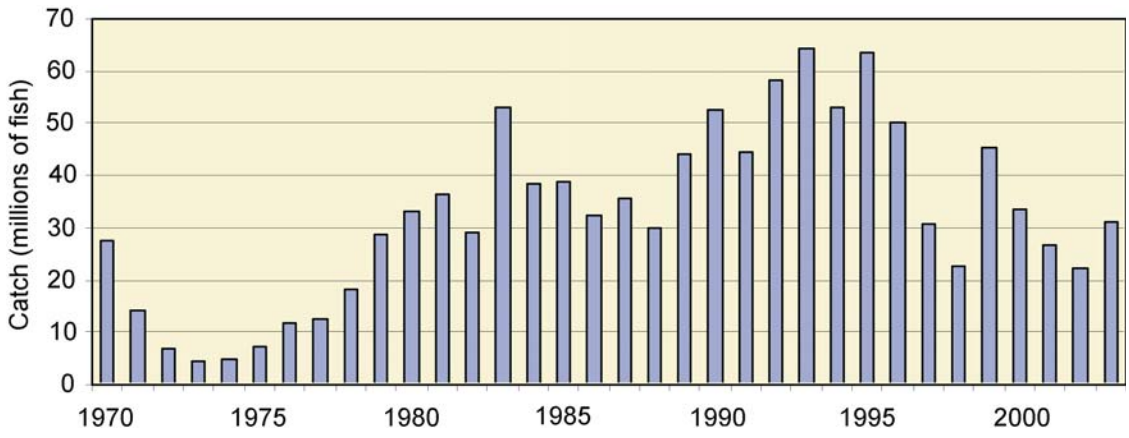
Sockeye Salmon

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

Alaska pink salmon catch, 1970–2003.





Alaska sockeye salmon catch, 1970–2003.

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.

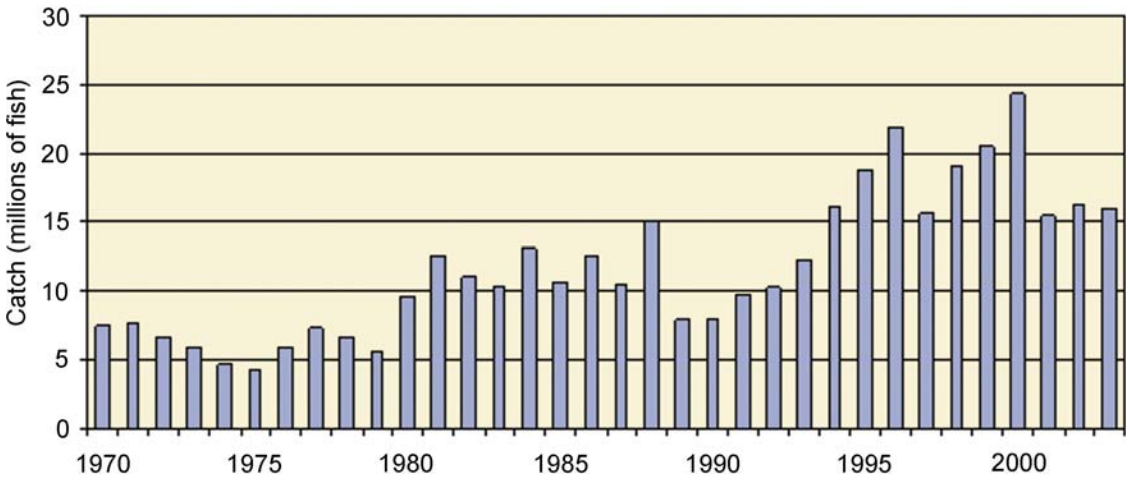
As bad as the 1997 sockeye salmon harvest in Bristol Bay was, commercial landings in 1998 were even worse, with a harvest of only 10.0 million fish. Returns improved somewhat in 1999 and 2000, with commercial catches of 26.1 and 20.5 million sockeye salmon, respectively, but more recently have declined 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.



Alaska chum salmon catch, 1970–2003.

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.

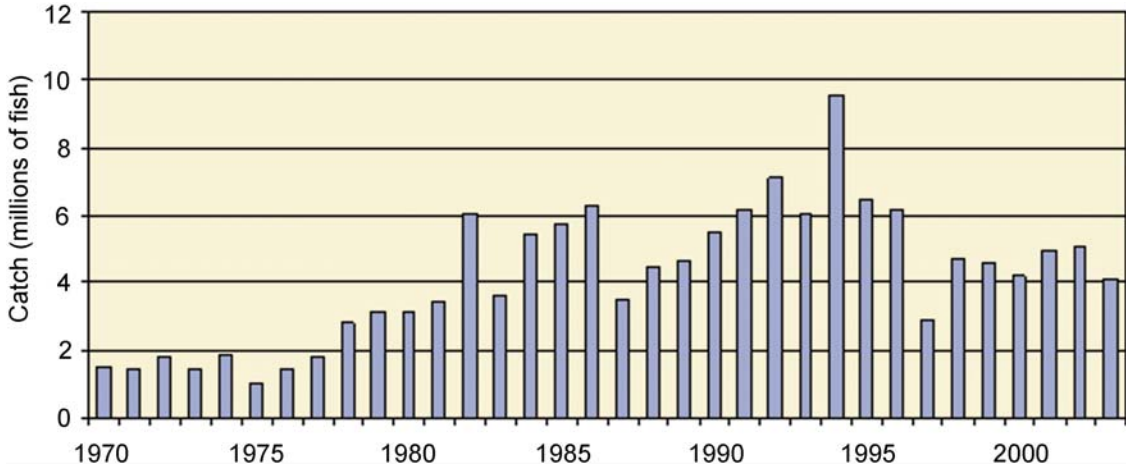
Coho Salmon

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.

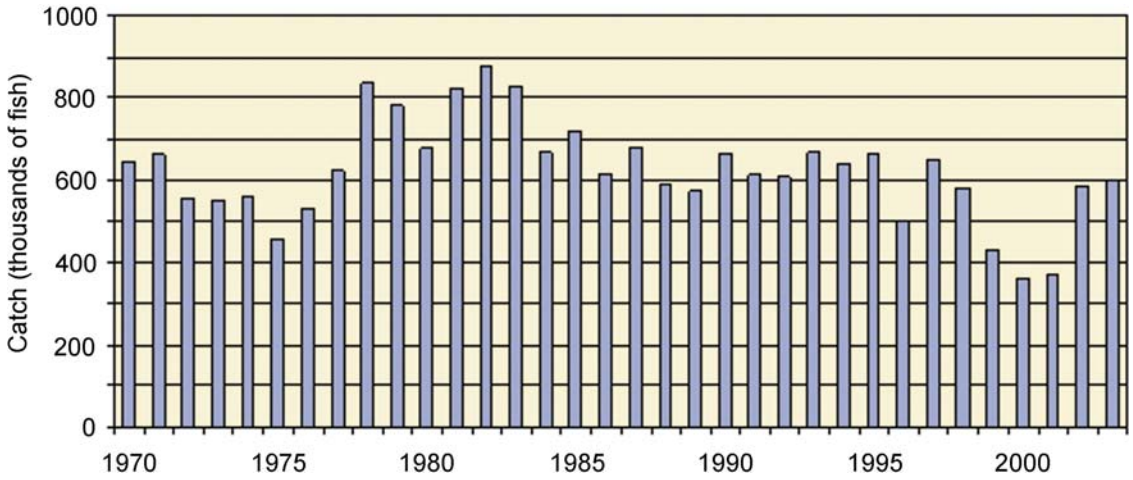
Chinook Salmon

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.



Alaska coho salmon catch, 1970–2003.



Alaska chinook salmon catch, 1970–2003.

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