5.0 CHINOOK SALMON

This chapter provides information on Chinook salmon biology, distribution, and current stock assessments. This chapter then analyzes the impacts of the alternatives on Chinook salmon. The first part of the analysis estimates the numbers of salmon saved under each alternative. The second part describes the changes in the estimated returns of adult equivalent Chinook salmon on region or river of origin under the alternatives. Chapter 3 provides a description of the methodology and data used to conduct these analyses.

5.1 Overview of Chinook salmon biology and distribution

Overview information in this section is extracted from Delaney (1994). Other information on Chinook salmon may be found at the ADF&G website, http://www.cf.adfg.state.ak.us/geninfo/finfish/salmon/salmhome.php.

The Chinook salmon (*Oncorhynchus tshawytscha*) is the largest of all Pacific salmon, with weights of individual fish commonly exceeding 30 pounds. In North America, Chinook salmon range from the Monterey Bay area of California to the Chukchi Sea area of Alaska. In Alaska, it is abundant from the southeastern panhandle to the Yukon River. Major populations return to the Yukon, Kuskokwim, Nushagak, Susitna, Kenai, Copper, Alsek, Taku, and Stikine rivers. Important runs also occur in many smaller streams.

Like all species of Pacific salmon, Chinook salmon are anadromous. They hatch in fresh water, spend part of their life in the ocean, and then spawn in fresh water. All Chinooks die after spawning. Chinook salmon may become sexually mature from their second through seventh year, and as a result, fish in any spawning run may vary greatly in size. For example, a mature 3-year-old will probably weigh less than 4 pounds, while a mature 7-year-old may exceed 50 pounds. Females tend to be older than males at maturity. In many spawning runs, males outnumber females in all but the 6- and 7-year age groups. Small Chinooks that mature after spending only one winter in the ocean are commonly referred to as "jacks" and are usually males. Alaska streams normally receive a single run of Chinook salmon in the period from May through July.

Chinook salmon migrate through coastal areas as juveniles and returning adults; however, immature Chinook salmon undergo extensive migrations and can be found inshore and offshore throughout the North Pacific and Bering Sea. In summer, Chinook salmon concentrate around the Aleutian Islands and in the western Gulf of Alaska (Eggers 2004).

Juvenile Chinook salmon in freshwater feed on plankton and then later eat insects. In the ocean, they eat a variety of organisms including herring, pilchard, sand lance, squid, and crustaceans. Salmon grow rapidly in the ocean and often double their weight during a single summer season.

North Pacific Chinook salmon are the subject of commercial, subsistence, personal use, and sport fisheries, as discussed in more detail in Chapters 9 and 10. The majority of the Alaska commercial catch is made in Southeast Alaska, Bristol Bay, and the Arctic-Yukon-Kuskokwim areas. Fish taken commercially average about 18 pounds. The majority of the catch is made with troll gear and gillnets. Approximately 90 percent of the subsistence harvest is taken in the Yukon and Kuskokwim rivers.

The Chinook salmon is perhaps the most highly prized sport fish in Alaska and is extensively fished by anglers in the Southeast and Cook Inlet areas. The sport fishing harvest of Chinook salmon is over 76,000 annually, with Cook Inlet and adjacent watersheds contributing over half of the catch.

Unlike "other salmon" species, Chinook salmon rear in inshore marine waters and are, therefore, available to commercial and sport fishermen all year.

5.1.1 Food habits/ecological role

Western Alaskan salmon runs experienced dramatic declines from 1998 through 2002 with a record low in stocks in 2000. Weak runs during this time period have been attributed to reduced productivity in the marine environment rather than an indication of low levels of parent year escapements (Bue and Lingnau 2005). Recent Bering-Aleutian Salmon International Survey (BASIS) evaluations have examined the food habits from Pacific salmon in the Bering Sea in an attempt to evaluate potential interactions between salmon species as well as their dependence upon oceanographic conditions for survival.

Ocean salmon feeding ecology is highlighted by the BASIS program given the evidence that salmon are food limited during their offshore migrations in the North Pacific and Bering Sea (Rogers 1980; Rogers and Ruggerone 1993; Aydin et al. 2000, Kaeriyama et al. 2000). Increases in salmon abundance in North America and Asian stocks have been correlated to decreases in body size of adult salmon which may indicate a limit to the carrying capacity of salmon in the ocean (Kaeriyama 1989; Ishida et al. 1993; Helle and Hoffman 1995; Bigler et al. 1996; Ruggerone et al. 2003). International high seas research results suggest that inter and intra-specific competition for food and density-dependant growth effects occur primarily among older age groups of salmon particularly when stocks from different geographic regions in the Pacific Rim mix and feed in offshore waters (Ishida et al. 1993; Ishida et al 1995; Tadokoro et al. 1996; Walker et al. 1998; Azumaya and Ishida 2000; Bugaev et al. 2001; Davis 2003; Ruggerone et al. 2003).

Results of a fall study to evaluate food habits data in 2002 indicated Chinook salmon consumed predominantly small nekton and did not overlap their diets with sockeye and chum (Davis et al. 2004). Shifts in prey composition of salmon species between seasons, habitats and among salmon age groups were attributed to changes in prey availability (Davis et al. 2004).

Stomach sample analysis of ocean age .1 and .2 fish from basin and shelf area Chinook salmon indicated that their prey composition was more limited than chum salmon (Davis et al. 2004). This particular study did not collect many ocean age .3 or .4 Chinook, although those collected were located predominantly in the basin (Davis et al. 2004). Summer Chinook samples contained high volumes of euphausiids, squid and fish while fall stomach samples in the same area contained primarily squid and some fish (Davis et al. 2004). The composition of fish in salmon diets varied with area with prey species in the basin primarily northern lamp fish, rockfish, Atka mackerel, Pollock, sculpin and flatfish while shelf samples contained more herring, capelin, Pollock, rockfish and sablefish (Davis et al. 2004). Squid was an important prey species for ocean age .1, .2, and .3 Chinook in summer and fall (Davis et al. 2004). The proportion of fish was higher in summer than fall as was the relative proportion of euphausiids (Davis et al. 2004). The proportion of squid in Chinook stomach contents was larger during the summer in years (even numbered) when there was a scarcity of pink salmon in the basin (Davis et al. 2004).

Results from the Bering Sea shelf on diet overlap in 2002 indicated that the overlap between chum and Chinook salmon was moderate (30%), with fish constituting the largest prey category, results were similar in the basin (Davis et al. 2004). However notably on the shelf, both chum and Chinook consumed juvenile walleye pollock, with Chinook salmon consuming somewhat larger (60-190 mm SL) than those consumed by chum salmon (45-95 mm SL) (Davis et al. 2004). Other fish consumed by Chinook salmon included herring and capelin while chum salmon stomach contents also included sablefish and juvenile rockfish (Davis et al. 2004).

General results from the study found that immature chum are primarily predators of macrozooplankton while Chinook tend to prey on small nektonic prey such as fish and squid (Davis et al. 2004). Prey compositions shifts between species and between seasons in different habitats and a seasonal reduction in diversity occurs in both chum and Chinook diets from summer to fall (Davis et al. 2004). Reduction in prey diversity was noted to be caused by changes in prey availability due to distribution shifts, abundance changes or progression of life-history changes which could be the result of seasonal shift in environmental factors such as changes in water temperature and other factors (Davis et al. 2004).

Davis et al. (2004) found that diet overlap estimates between Chinook and sockeye salmon and Chinook and chum salmon were lower than the estimates obtained for sockeye and chum salmon, suggesting a relatively low level of inter-specific food competition between immature Chinook and immature sockeye or chum salmon in the Bering Sea because Chinook salmon were more specialized consumers. In addition, the relatively low abundance of immature Chinook salmon compared to other species may serve to reduce intra-specific competition at sea. Consumption of nektonic organisms (fish and squid) may be efficient because they are relatively large bodied and contain a higher caloric density than zooplankton, such as pteropods and amphipods (Tadokoro et al. 1996, Davis et al. 1998). However, the energetic investment required of Chinook to capture actively swimming prey is large, and if fish and squid prey abundance are reduced, a smaller proportion of ingested energy will be available for salmon growth (Davis et al. 1998). Davis et al. (2004) hypothesized that inter- and intra-specific competition in the Bering Sea could negatively affect the growth of chum and Chinook salmon, particularly during spring and summer in odd-numbered years, when the distribution of Asian and North American salmon stocks overlap. Decreased growth could lead to reduction in salmon survival by increasing predation (Ruggerone et al. 2003), decreasing lipid storage to the point of insufficiency to sustain the salmon through winter when consumption rates are low (Nomura et al. 2002), and increasing susceptibility to parasites and disease due to poor salmon nutritional condition.

5.1.2 Hatchery releases

Commercial salmon fisheries exist around the Pacific Rim with most countries releasing salmon fry in varying amounts by species. The North Pacific Anadromous Fish Commission summarizes information on hatchery releases by country and by area where available. Reports submitted to the NPAFC were used to summarize hatchery information by Country and by US state below (Table 5-1, Table 5-2). For more information see the following: Russia (Akinicheva et al. 2008; Anon. 2007; TINRO-centre 2006, 2005); Canada (Cook et al. 2008); USA (Josephson 2008; Josephson 2007; Eggers 2006, 2005; Bartlett 2007, 2006, 2005).

Chinook salmon hatchery releases by country are shown below in Table 5-1. There are no hatchery releases of Chinook salmon in Japan and Korea and only a limited number in Russia.

Table 5-1 Hatchery releases of juvenile Chinook salmon, in millions of fish

Year	Russia	Japan	Korea	Canada	USA	TOTAL
1999	0.6	-	-	54.4	208.1	263.1
2000	0.5	-	-	53.0	209.5	263.0
2001	0.5	-	-	45.5	212.1	258.1
2002	0.3	-	-	52.8	222.1	275.2
2003	0.7	-	-	50.2	210.6	261.5
2004	1.17	-	-	49.8	173.6	224.6
2005	0.84	-	-	43.5	184.0	228.3
2006	0.78	-	-	40.9	181.2	223.7
2007	0.78	-	-	44.6	182.2	227.6

For Chinook salmon fry, the United States has the highest number of annual releases (80% of total in 2007), followed by Canada (~20%). In Canada, enhancement projects have been on-going since 1977 with approximately 300 different projects for all salmon species (Cook and Irvine 2007). Maximum production for Chinook releases was reached in 1991 with 66 million fish in that year (Cook and Irvine 2007). Releases of Chinook in 2006 occurred in the following regions: Yukon and Transboundary River, Skeena River, North Coast, Central Coast, West Coast and Vancouver Island, Johnstone Strait, Straits of Georgia, and the Lower and Upper Fraser rivers. Of these the highest numbers were released in the West Coast Straits of Georgia (20 million fish) followed by Vancouver Island area (12.4 million fish) the Lower Fraser River (3.3 million fish) (Cook and Irvine 2007).

Of the US releases however, a breakout by area shows that the highest numbers are coming from the State of Washington (63% in 2007), followed by California (19% in 2007), and then Oregon (7% in 2007) (Table 5-2). Hatcheries in Alaska are located in southcentral and southeast Alaska; there are no enhancement efforts for the AYK region. Since 2004 the number of hatcheries has ranged from 33 (2004–2005) to 31 (2006) with the majority of hatcheries (18–22) located in southeast Alaska, while 11 hatcheries are in Cook Inlet and 2 in Kodiak (Eggers 2005, 2006; Josephson 2007).

Table 5-2 USA west coast hatchery releases of juvenile Chinook salmon, in millions of fish

Year	Alaska	Washington	Oregon	California	Idaho	WA/OR/CA/ID (combined)	TOTAL
1999	8.0	114.5	30.5	45.4	9.7		208.1
2000	9.2	117.4	32.3	43.8	6.8		209.5
2001	9.9	123.5	28.4	45.0	5.4		212.1
2002	8.4					213.6	222.0
2003	9.3					201.3	210.6
2004	9.35	118.2	17.0	27.4	1.7	164.2	173.6
2005	9.46	117.7	19.2	28.8	8.7	174.5	184.0
2006	10.2	110.5	19.2	29.4	12.0	171.0	181.2
2007	10.5	114.5	13.2	34.8	9.2	171.7	182.2

5.1.3 BASIS surveys

The Bering-Aleutian Salmon International Survey (BASIS) is an NPAFC-coordinated program of pelagic ecosystem research on salmon and forage fish in the Bering Sea.. Shelf-wide surveys have been conducted beginning in 2006 on the eastern Bering Sea shelf (Helle et al 2007). A major goal of this program is to understand how changes in the ocean conditions affect the survival, growth, distribution, and migration of salmon in the Bering Sea. Research vessels from U.S. (F/V Sea Storm, F/V Northwest Explorer), Japan (R/V Kaiyo Maru, R/V Wakatake Maru), and Russia (R/V TINRO), have participated in synoptic BASIS research surveys in Bering Sea since in 2002 (NPAFC 2001).

The primary findings from the past 5 years (2002–2006) indicate that there are special variations in distribution among species: juvenile coho and Chinook salmon tend to be distributed nearshore and juvenile sockeye, chum, and pink salmon tended to be distributed further offshore. In general, juvenile salmon were largest during 2002 and 2003 and smallest during 2006, particularly in the northeast Bering Sea region. Fish, including age-0 pollock and Pacific sand lance were important components of the diets for all species of juvenile salmon in some years; however, annual comparisons of juvenile salmon diets indicated a shift in primary prey for many of the salmon species during 2006 in both the northeast and southeast Bering Sea regions. In addition, the average catch per unit effort of juvenile salmon fell sharply during 2006 in the southeast Bering Sea region. It is speculated that spring sea surface temperatures on the eastern Bering Sea shelf likely impact growth rate of juvenile western Alaska salmon through bottom-up control in the ecosystem. Cold spring SSTs lead to lower growth and marine survival rates for juvenile western Alaska salmon, while warm spring SSTs have the opposite effect (NPAFC 2001).

Fig. 5-1 shows the 2007 juvenile Chinook salmon catches in the U.S. BASIS cruise. Fig. 5-2 shows the relative abundance of juvenile salmon in the Northern Shelf Region of the Bering Sea as determined by the U. S. BASIS cruises from 2002 to 2007. Relative abundance of juvenile Chinook salmon appears to be increasing after 3 straight years of decline (Jim Murphy, NMFS AFSC, personal communication).

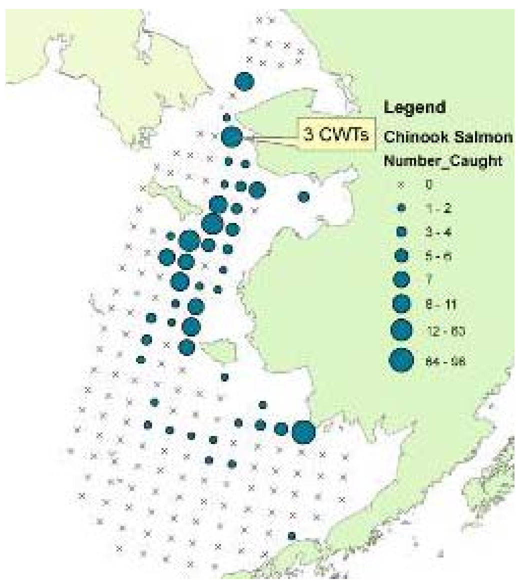


Fig. 5-1 U.S. BASIS juvenile Chinook salmon catches in 2007. The location of three coded-wire tag (CWT) recoveries for Canadian Yukon is noted in the callout box. *Source: Jim Murphy and Adrian Celewycz, NMFS AFSC.*

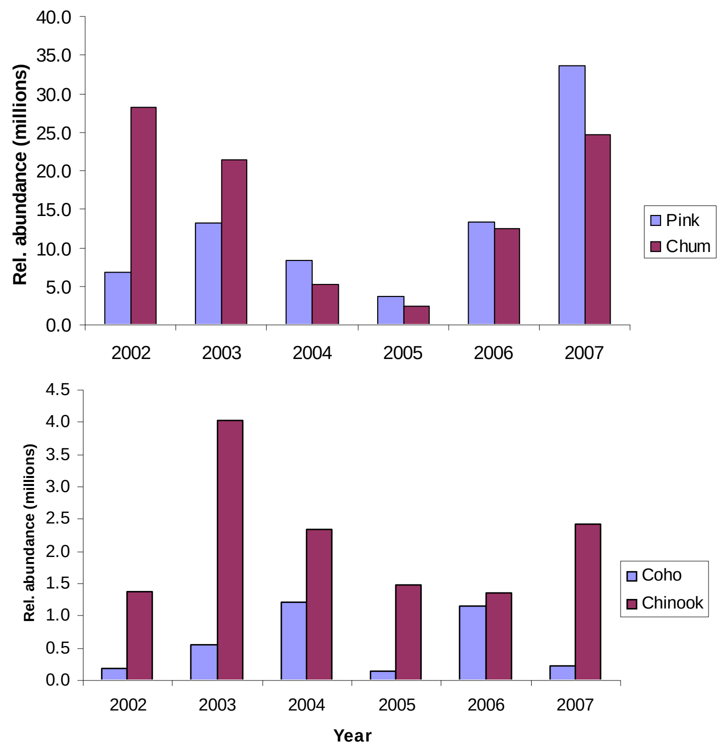


Fig. 5-2 Relative abundance of juvenile salmon in the Northern Shelf Region (60°N-64°N latitude) of the U.S. BASIS survey, 2002-2007. *Source: Chris Kondzela, NMFS AFSC.*

5.1.4 Migration corridors

BASIS surveys have established that the distribution and migration pathways of western Alaska juvenile salmon vary by species. Farley et al. (2006; Fig. 5-3) reported on the distribution and movement patterns of main species in this region. The Yukon River salmon stocks are distributed along the western Alaska coast from the Yukon River to latitude 60ºN. Kuskokwim River salmon stocks are generally distributed south of latitude 60ºN from the Kuskokwim River to longitude 175ºW. Bristol Bay stocks are generally distributed within the middle domain between the Alaska Peninsula and latitude 60ºN and from Bristol Bay to longitude 175ºW. The seaward migration from natal freshwater river systems is south and east away from the Yukon River for Yukon River chum salmon, to the east and south away from the Kuskokwim River for Kuskokwim River chum, Chinook, and coho salmon, and east away from Bristol Bay river systems for Bristol Bay sockeye salmon stocks.

During the 2007 BASIS cruise, three juvenile Chinook salmon caught off the Seward Peninsula were coded wire tagged in the Canadian Yukon indicating a northward migrating component in juvenile Yukon River Chinook salmon (Fig. 5-4; Farley et al. 2007).

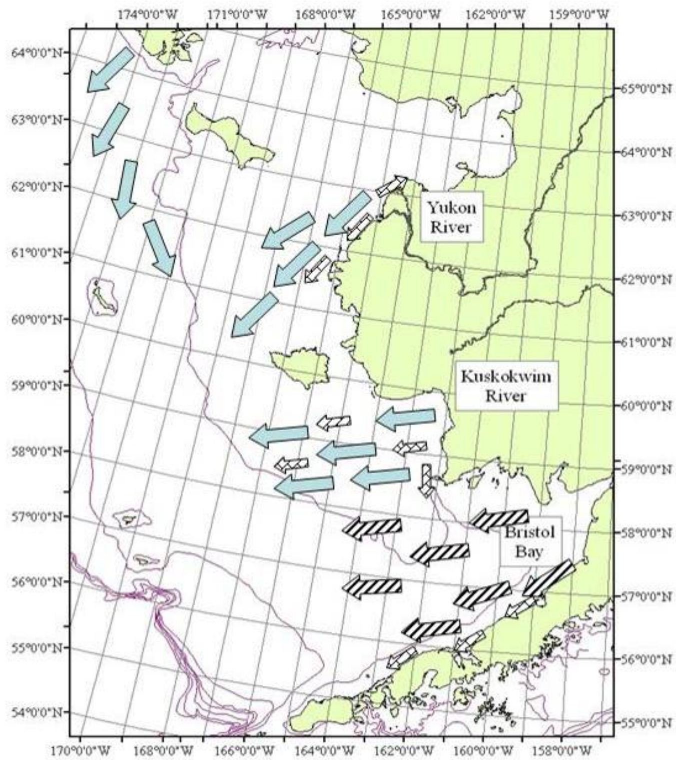
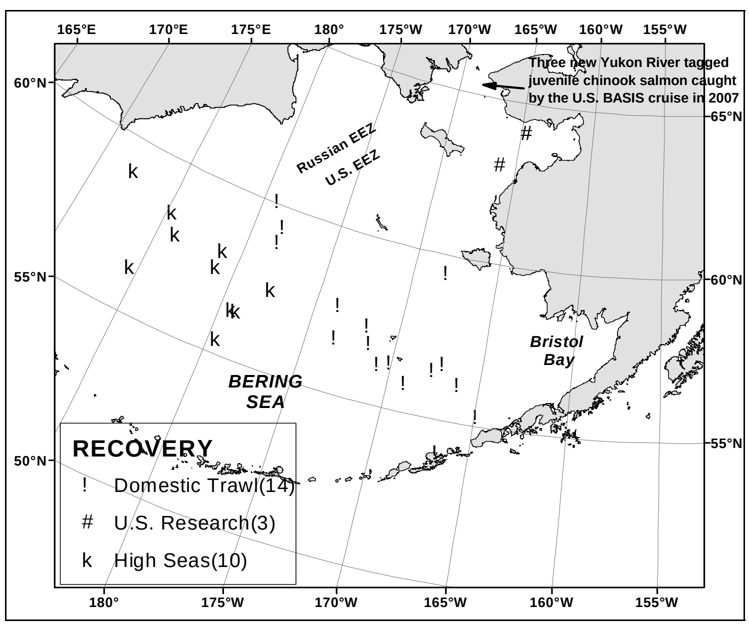


Fig. 5-3 Seaward migration pathways for juvenile chum (solid arrow), sockeye (slashed line arrow), coho, and Chinook (boxed line arrow) salmon along the eastern Bering Sea shelf, August through October. *Source: Farley et al 2007.*



Note: Three new recoveries were made by the 2007 U.S. BASIS cruise near the Bering Strait.

Fig. 5-4 Coded wire tagged Chinook salmon from the Whitehorse hatchery recovered from the domestic and research catches in the Bering Sea, and high seas tagged Chinook salmon recovered in the Yukon River. *Source: Adrian Celewycz, NMFS AFSC.*

5.2 Chinook salmon assessment overview by river system or region

5.2.1 Management and assessment of salmon stocks

The State of Alaska manages commercial, subsistence, personal use, and sport fishing of salmon in Alaskan rivers and marine waters and assesses the health and viability of individual salmon stocks accordingly. The catches of Chinook salmon in Southeast Alaska are regulated by quotas set under the Pacific Salmon Treaty. In other regions of Alaska, Chinook salmon fisheries are also closely managed to ensure stocks of Chinook salmon are not overharvested. No gillnet fishing for salmon is permitted in federal (3-200 miles) waters, nor commercial fishing for salmon in offshore waters west of Cape Suckling.

Directed commercial Chinook salmon fisheries occur in the Yukon River, Norton Sound District, Nushagak District, Copper River, and the Southeast Alaska Troll fishery. In all other areas Chinook are taken incidentally and mainly in the early portions of the sockeye salmon fisheries. Catches in the Southeast Alaska troll fishery have been declining in recent years due to U.S./Canada treaty restrictions and declining abundance of Chinook salmon in British Columbia and the Pacific Northwest. Chinook salmon catches have been moderate to high in most regions over the last 20 years (Eggers 2004).

5.2.1.1 Escapement goals and Stock of Concern definitions

The State of Alaska Sustainable Salmon Fisheries Policy (SSFP) 5 AAC 39.222 (ADF&G/BOF 2001) defines three types of escapement goals (from ADF&G 2004):

Biological Escapement Goal (BEG): means the escapement that provides the greatest potential for maximum sustained yield; BEG will be the primary management objective for the escapement unless an optimal escapement or inriver run goal has been adopted; BEG will be developed from the best available biological information, and should be scientifically defensible on the basis of available biological information; BEG will be determined by ADF&G and will be expressed as a range based on factors such as salmon stock productivity and data uncertainty; ADF&G will seek to maintain evenly distributed salmon escapements within the bounds of a BEG.

Sustainable Escapement Goal (SEG): means a level of escapement, indicated by an index or an escapement estimate, that is known to provide for sustained yield over a 5 to 10 year period, used in situations where a BEG cannot be estimated due to the absence of a stock specific catch estimate; the SEG is the primary management objective for the escapement, unless an optimal escapement or inriver run goal has been adopted by the board, and will be developed from the best available biological information; the SEG will be determined by ADF&G and will be stated as a range that takes into account data uncertainty; ADF&G will seek to maintain escapements within the bounds of the SEG.

Sustained Escapement Threshold (SET): means a threshold level of escapement, below which the ability of the salmon stock to sustain itself is jeopardized; in practice, SET can be estimated based on lower ranges of historical escapement levels, for which the salmon stock has consistently demonstrated the ability to sustain itself; the SET is lower than the lower bound of the BEG and lower than the lower bound of the SEG; the SET is established by ADF&G in consultation with the board, as needed for salmon stocks of management or conservation concern.

In general BEGs are established to provide levels of escapement that will produce large returns with large harvestable surpluses on average (ADF&G 2004). Escapements at or below these levels will be sustainable but with a lower surplus for harvest. SEGs are set to provide levels of escapement that will produce runs and harvests that are similar to historical levels. Most escapement goals in the AYK Region are SEGs as data are inadequate to determine total escapement or total returns for given stocks (ADF&G

2004). For stocks where a BEG is not possible due to a lack of stock specific catch estimates, a (SEG) is utilized. An Optimal Escapement Goal (OEG) is a specific management objective for escapement that considers biological and allocative factors and may differ from the SEG or BEG (Menard 2007).

An interdivisional Escapement Goal Team was formed in 2002 and met periodically from 2002-2003 to review escapement goal data for AYK stocks and where possible establish appropriate escapement goals for these stocks. The team felt that the data were insufficient to establish BEGs for most stocks. For those stocks where sufficient escapement data was available but insufficient estimates of total returns, SEGs were recommended. BEGs and SEGs where established by stock (and the methodology by which they were determined) are contained in stock status sections to follow.

The Sustainable Salmon Fisheries Policy (SSFP) 5 AAC 39.222 (ADF&G/BOF 2001) also defined in regulation "stock of concern" as a measure of the stock status declining below threshold levels and requiring additional management measures accordingly. A 'stock of concern' is defined as "a stock of salmon for which there is a yield, management or conservation concern". The terms "yield concern", "management concern" and "conservation concern" are defined in state regulations under the SSF policy. Here "yield concern" is defined as "a concern arising from a chronic inability, despite the use of specific management measures, to maintain expected yields, or harvestable surpluses, above a stock's escapement needs". "Management concern" indicates a "concern arising from a chronic inability, despite use of specific management measures, to maintain escapements for a salmon stock within the bounds of the sustainable escapement goal (SEG), the biological escapement goal (BEG), optimal escapement goal (OEG) or other specified management objectives for the fishery". Finally a "conservation concern" is defined as "concern arising from a chronic inability, despite the use of specific management measures, to maintain escapements for a stock above a sustained escapement threshold (SET)". It is further noted that "a conservation concern is more severe than a management concern which is more severe than a yield concern" (ADF&G/BOF 2001).

The SSF policy requires that a management plan and an action plan be developed to address the stock of concern. These are developed by the ADF&G and provided to the BOF and the public for the regulatory process to discuss. A part of the action plan process is to review other fisheries that may be harvesting the stock of concerns and whether any regulatory action may be necessary.

5.2.1.2 Precision of management estimates

Annually the ADF&G provides pre-season salmon run and harvest forecasts for the upcoming season as well as an annual report of the forecast and the actual catch (Fig. 5-5). Actual catch is rarely equivalent to projected catch for a variety of reasons including market conditions and precision of escapement estimates. The primary goal of ADF&G managers is to maintain spawning population sizes, not to meet preseason catch projections (Nelson et al. 2008).

Formal run size forecasts are not produced for all Chinook salmon runs; however, local salmon biologists prepare harvest projections or harvest outlooks for all areas. Projections are based on formal forecasts where available and on historical catches and local knowledge of recent events when formal forecasts information is not available (Nelson et al. 2008).

Precision of actual escapement information and river system assessment varies by the methodology utilized to enumerate salmon. To the extent possible, the section by river include information on both the projection for stock status in the upcoming season as well as a discussion of the precision of assessment methods utilized.

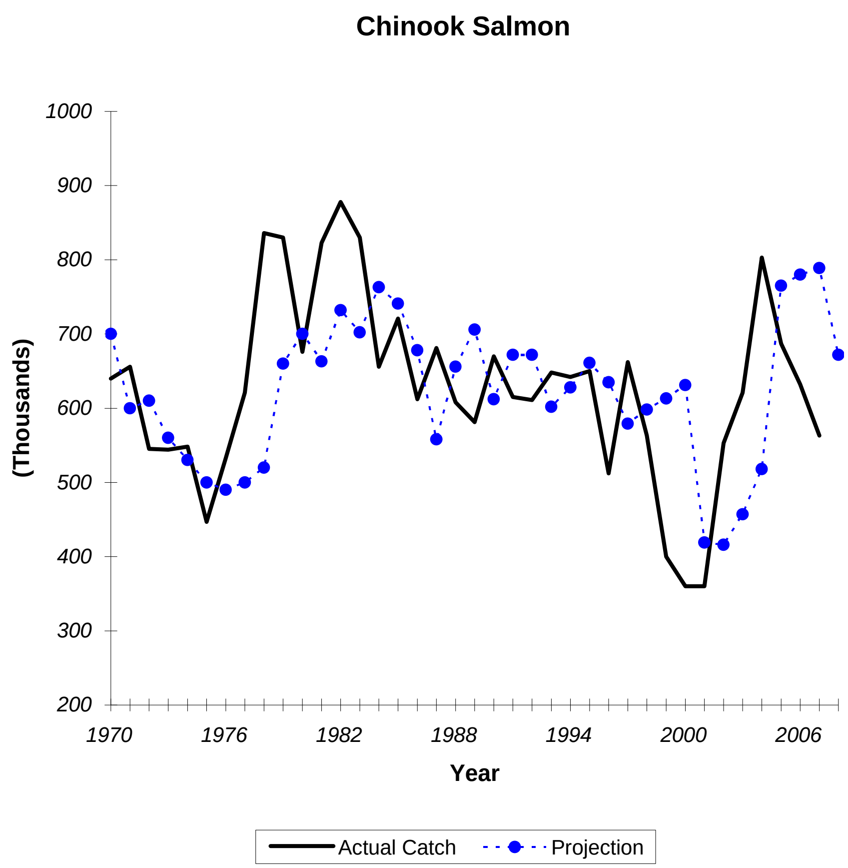


Fig. 5-5 Relationship between actual catch and projected catch in thousands, for Alaskan Chinook salmon fisheries from 1970 to 2007, with the 2008 projection (Nelson et al. 2008).

5.2.2 Overview of western Alaskan stock status

Western Alaska includes the Bristol Bay, Kuskokwim, Yukon, and Norton Sound areas, and the Nushagak, Kuskokwim, Yukon, Unalakleet, Shaktoolik and Kwiniuk rivers make up the Chinook salmon index stocks for this region. In general, these western Alaska Chinook salmon stocks declined sharply in 2007 and declined even further in 2008. A general overview of 2008 stock status is contained in Table 5-3 and by stock in detail in subsequent sections. Preliminary information of escapements in 2009 is presented in the next section.

Table 5-3 Overview of western Alaskan Chinook stock status 2008

Chinook Stock	Total run estimated?	2008 preliminary run estimate above or below projected/forecasted	Escapement estimates?	Escapement goals met?	Stock of concern?
Norton Sound	No	Below	Yes	No	Yield concern (since 2004)
Yukon	Yes	Below	Yes	Most in Alaska No-Canadian treaty goal	Yield concern (since 2000)
Kuskokwim	Yes	Below	Yes	Some [30]	No Yield concern discontinued 2007
Bristol Bay	Yes	Below	Yes	Some	No

5.2.2.1 2009 salmon run synopses for all western Alaskan stocks

Preliminary 2009 stock status information is summarized generally below for all stocks while detailed information by stock through 2008 is summarized in region-specific sections below. The 2009 season is still on-going (August 2009) thus characterizations of run strengths, escapement and trends for this season are preliminary.

Norton Sound: The 2009 Norton Sound run appears to have been similar to the historically low return of 2008 (ADF&G 2009). In Unalakleet, passage at the counting tower on the North River was weak and there are concerns that the lower end of the North River tower escapement goal range (1,200-2,600 Chinook) may not be reached (ADF&G 2009).

Yukon: Preliminary escapements at upriver projects have been variable. Management strategies concentrated on protecting the early portion of the run in order to pass fish upriver. As of August 10, 2009, approximately 68,400 Chinook had passed the Eagle Sonar station (ADF&G 2009). The interim management goal of 45,000 fish to Canadian spawning grounds was therefore met. The Chena River counts were near the upper end of the BEG (5,700 fish) and Salcha River counts were double the upper end of the BEG (6,500 fish) for that river. In contrast, preliminary data indicates that Chinook escapements for East Fork Andreafsky and Gisasa Rivers were below average.

Kuskokwim: Preliminary escapement data through August 31, 2009, indicated that many of the weir projects (Kwethluk, George, Kongrukluk, Middlefork Goodnews) reached or neared their lower end of goal range with projects remaining open until mid-September. Run timing at the Bethel test fishery appeared normal. Returns overall to the Kuskokwim region were expected to be similar in abundance to 2008 which exceeded escapement (and subsistence) needs thus allowing for harvestable surplus.

Bristol Bay: The Nushagak River Chinook escapement for 2009 was 81,480, which is above the inriver goal of 75,000 established in the Nushagak Mulchatna King Salmon Management Plan (M. Jones, pers. comm.). A total of 145,000 Chinook salmon were forecasted to return to the Nushgak in 2009, which

[30] For the Kuskokwim: 3 of 4 weir goals were below while 3 of 5 aerial goals were below.

was a 4% decrease from the recent 10-year average (M. Jones, pers. comm.). Actual harvests were below average in every district (see RIR for more details on the 2009 Chinook harvest).

5.2.3 Norton Sound Chinook

Norton Sound is comprised of two districts, the Norton Sound District and Port Clarence District. There are few Chinook salmon in the Port Clarence District. In the Norton Sound District, only the eastern area has sizable runs of Chinook salmon and the primary salmon producing rivers are in the Shaktoolik and Unalakleet subdistricts. The Shaktoolik and Unalakleet Subdistricts Chinook salmon stock was classified as a stock of concern in January 2004, and in 2007 the BOF continued this designation. This stock is classified as a stock of yield concern. The classification was in response to decreasing Chinook salmon yield. The BOF adopted a new management plan in 2007 for Unalakleet River Chinook which incorporates a restrictive subsistence fishing schedule as escapement goals had not been met since 2003 even with commercial fishing closed.

Stock assessment and historical stock estimates

Run sizes are not estimated for Norton Sound Chinook stocks except for the Unalakleet River. The Unalakleet test net catches, the North, Kwiniuk and Niukluk River towers, aerial surveys and subsistence reports are the primary assessment tools for judging run strength of Chinook salmon in Norton Sound. Escapement is assessed for major index river systems of Norton Sound. Assessments are often qualitative relative to historical escapement goals for indexed areas (Menard 2007).

Escapement goals are established for 3 stocks of Chinook in the Norton Sound Area, all are SEGs: Fish River/Boston Creek (SEG= >100), Kwiniuk River (SEG = 300-550) and North River (Unalakleet River) (SEG = 1,200-2,600). Other rivers have either aerial surveys or tower counts for enumeration, but data was deemed insufficient to establish escapement goals for those stocks. While aerial and tower enumeration methods are available on the Niukluk River, an escapement goal for this stock was not established due to the rationale that it was a very small Chinook salmon system and was not representative of the larger Fish River drainage (ADF&G 2004). Currently the only escapement project operating specifically for Chinook enumeration is the North River counting tower, located on a tributary of the Unalakleet River (J. Menard, pers. comm.).

Total escapement for Norton Sound Chinook is a combination of the observed escapements in the Kwiniuk, Niukluk, Nome, Snake Rivers (1995-2007), North River (starting 1996), and Eldorado River (starting 1997) with historical catch data (Table 5-4). Norton Sound Chinook salmon are fully exploited and management strives to protect the early portion of the return from overharvesting and to provide adequate escapements (Menard 2008).

Table 5-4 Total escapement for Chinook salmon for Kwiniuk (1995-2008), Niukluk, Nome, and Snake Rivers (1995-2008), North River (1996-2008), and Eldorado River (1997-2008).

Year	Escapement	Escapement and catch (escapement + commercial, subsistence, and sportfish catch)
1995	626	17,198
1996	2,027	14,918
1997	5,550	28,218[a]
1998	3,179	19,493[a]
1999	2,470	11,752
2000	1,324	7,113
2001	1,718	7,778
2002	2,946	9,222
2003	2,466	7,445
2004	2,022	6,977[b]
2005	1,530	5,202[b]
2006	1,256	4,570[b]
2007	2,332	4,997[b]
2008	1,276	3,438[c]

Source: Menard 2008.

[a] Subsistence totals for 1997 and 1998 include data from Savoonga and Gambell.

[b] Subdistrict 4 (Norton Bay) not surveyed for subsistence use; previous 5-year average, 1993-2003, was 423 Chinook salmon harvested.

[c] Data are preliminary.

The 2008 Norton Sound Chinook salmon run was the poorest return on record. At the onset of the season, a directed Chinook salmon commercial fishery was not expected, and early closures to the subsistence and sport fisheries were anticipated for Subdistricts 5 and 6 in early July. There was some optimism about meeting escapement needs while also avoiding an early closure, which was based on a combination of factors. These included: 1) sufficient escapements observed during the predominant parent years (2002 and 2003) for the 2008 return, 2) a restrictive subsistence fishing schedule that provides escapement windows throughout the run, and 3) mesh-size restrictions that were planned for the Unalakleet River on June 30, which were aimed at conserving age-5 and -6 Chinook salmon during their peak migration period.

By July 2nd, it was clear that the Unalakleet River Chinook salmon run had later than average run timing and was a very weak run. Despite proactive restrictions and an eventual early closure, the North River Chinook salmon escapement of 903 fell short of the tower-based SEG range of 1,200-2,600 for the 4th time since 2004 and was a new record low (Fig. 5-6). The tower-based SEG (300-500) at the Kwiniuk River also failed to be reached for the third consecutive year and has not been achieved in 5 of 9 years since 1999. In fact, the Kwiniuk River Chinook salmon escapement of 237 was the 4th lowest on record. Chinook salmon passage at the Niukluk River tower and Pilgrim River weir Chinook salmon escapement were also both below average.

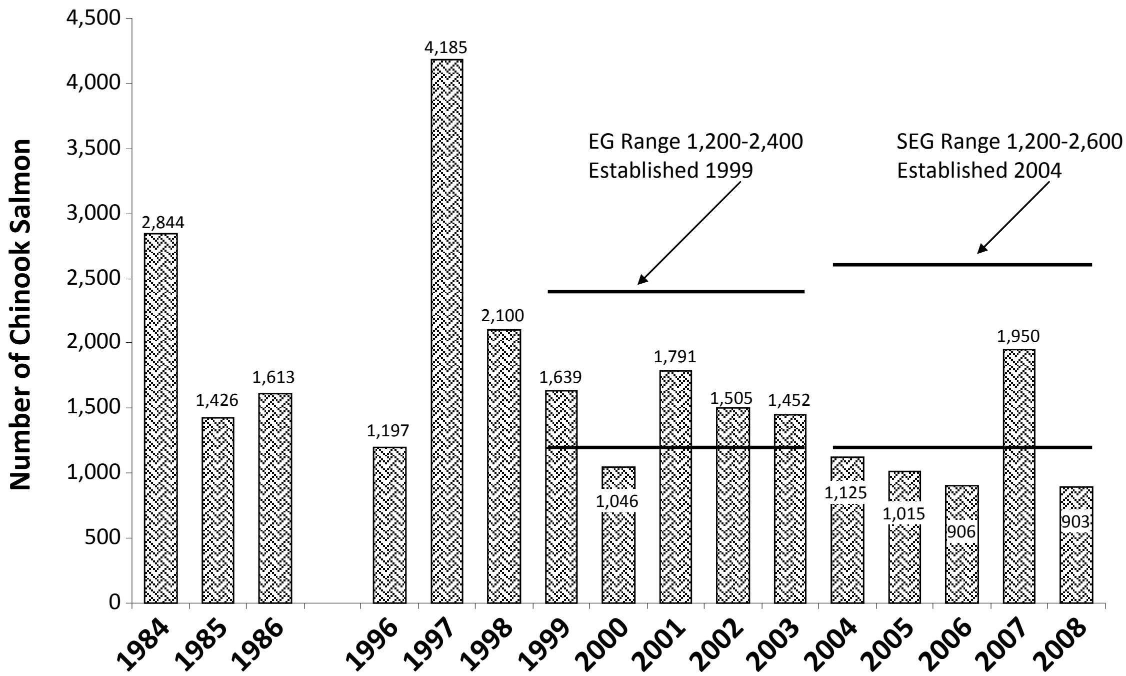


Fig. 5-6 Estimated Chinook salmon passage compared to the escapement goal range 1984-1986 and 1996-2008, North River counting tower, Unalakleet River drainage, Norton Sound.

The magnitude of the Chinook salmon escapement was poor in the Unalakleet watershed. On a positive note, however, mesh-size restrictions in the lower river subsistence fishery appear to have had the desired effect of conserving more age-5 and -6 Chinook salmon, thereby improving the quality of the escapement. Perhaps most notably, 83% of the 2008 test net samples were comprised of age-5 and older Chinook salmon, more than double the 36% age-5 and older observed in 2007. Samples collected from the Chinook salmon escapement captured in beach seines 28 km up river also showed a similar pattern. In 2007, the escapement was comprised of 27% age-5 and older compared to 62% in 2008 (S. Kent pers. comm.). Sex composition of the 2008 test net samples was only 24% females, which was only a 4% increase from samples collected in 2007, but the percentage of females in the escapement doubled from 11% in 2007 to 22% in 2008. Bank orientation bias associated with the test net site may account for the disparities in percentages of females between the test fishery and escapement. The data suggest that a greater portion of the run comprised of age-5 and -6 and predominantly female Chinook salmon reached spawning areas in the Unalakleet River drainage this season.

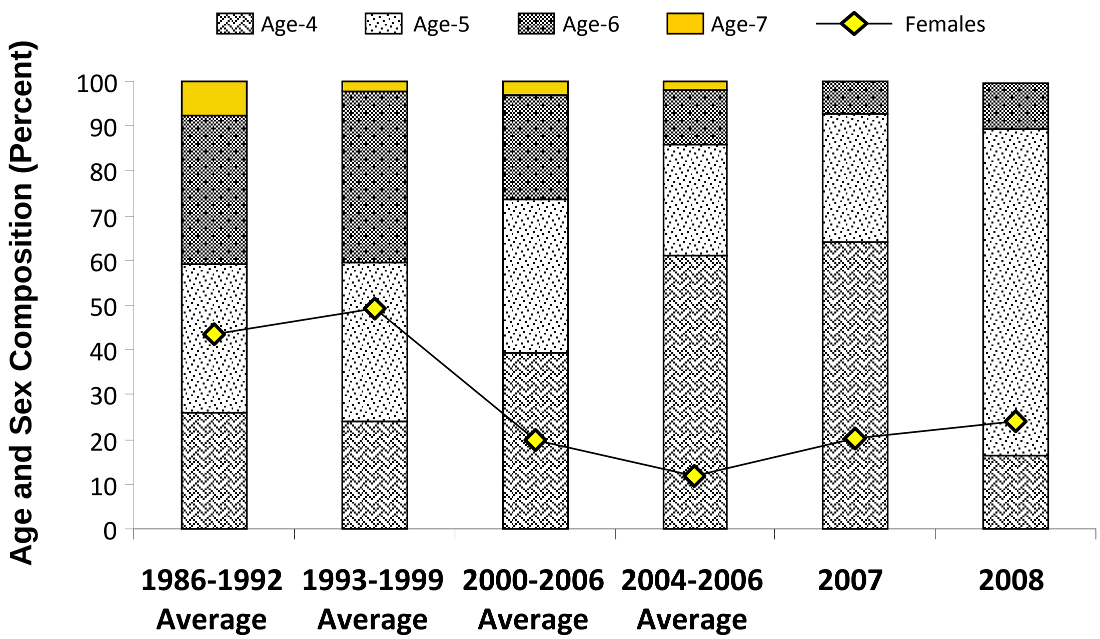


Fig. 5-7 Chinook salmon age and sex composition trends observed in the Unalakleet River test net samples (5 7/8" stretched mesh), 1986-2008, Norton Sound. *Source: S. Kent, ADF&G.*

Forecasts and precision of estimates

Salmon outlooks and harvest projections for the 2009 salmon season are based on qualitative assessments of parent year escapements, subjective determinations of freshwater overwintering and ocean survival, and in the case of the commercial fishery, the projections of local market conditions. No commercial fishery was anticipated (nor occurred) for Chinook salmon in 2009 due to the combination of poor historical run and a new BOF regulation regarding the raised passage goal at the North River tower (increased 50% from previous passage goals for commercial fishery threshold opening). Weak returns of Chinook salmon since 2000 have also precluded the prosecution of a chum salmon fishery in Subdistricts 5 and 6 due to concerns with the incidental harvest of Chinook salmon in early to mid-July. Typically when Chinook salmon runs are poor, chum commercial fishing is prohibited until the third week in July despite improved market conditions and interest in an earlier commercial fishery (S. Kent, pers. comm.).

5.2.4 Yukon River Chinook

The Yukon River is the largest river in Alaska, originating in British Columbia and flowing 2,300 miles to the Bering Sea. The Yukon River drainage encompasses about 330,000 square miles, and about one third of the land mass of Alaska. Significant runs of Chinook, chum, and coho salmon return to the Yukon River and are harvested in Alaska by subsistence, commercial, personal use, and sport fishermen as well as in Canada in aboriginal, commercial, sport, and domestic fisheries. Spawning populations of Chinook salmon occur throughout the Yukon River drainage in tributaries from as far downstream as the Archuelinuk River located approximately 80 miles from the mouth to as far upstream as the headwaters of the Yukon River in Canada over 2,000 miles from the mouth (Clark et al 2006).

The Yukon area includes all waters of the U.S. Yukon River drainage and all coastal waters from Point Romanof southward to the Naskonat Peninsula. Commercial fishing for salmon is allowed along the entire 1,200 mile length of the main stem Yukon River in Alaska and in the lower 225 miles of the Tanana River. The Yukon area includes 7 districts, 10 sub-districts, and 28 statistical areas which were established in 1961 and redefined in later years. The Coastal District was established in 1994, redefined in 1996, and is open for subsistence fishing only. The lower Yukon area (Districts 1, 2, and 3) includes some coastal waters near the mouth of the Yukon area and extends upstream to river mile 301 (the boundary between Districts 3 and 4). The upper Yukon area (Districts 4, 5 and 6) is that portion of the Yukon above river mile 301 extending to the U.S.-Canada border and including the lower Tanana River.

Management of the Yukon salmon fishery is difficult and complex because of the often inability to determine stock specific abundance and timing, overlapping multi-species salmon runs, increasing efficiency of the fishing fleet, the gauntlet nature of Yukon fisheries, allocation issues between lower river and upper river Alaskan fishermen, allocation and conservation issues between Alaska and Canada, and the immense size of the drainage (Clark et al 2006). Salmon fisheries within the Yukon River may harvest stocks that are up to several weeks and over a thousand miles from their spawning grounds. Since the Yukon River fisheries are largely mixed stock fisheries, some tributary populations may be under or over exploited in relation to abundance, it is not possible to manage for individual stocks in most areas where commercial and subsistence fisheries occurs (Clark et al 2006). In Alaska, subsistence fisheries have priority over other consumptive uses. Agreements between the U.S. and Canada are in effect that commit ADF&G to manage Alaskan fisheries in a manner that provides a Yukon River Panel agreed to passage of salmon into Canada to both support Canadian fisheries and to achieve desired spawning levels.

Stock assessment and historical run estimates

The Yukon is managed as a single river and catches are reported by district and use (sport, commercial, and subsistence). Postseason subsistence and commercial harvests are allocated by stock, grouping the lower Yukon, Middle Yukon and Upper Yukon (Fig. 5-8) through genetic stock identification. The Upper Yukon is the Canadian-Origin Yukon Chinook stocks. Total run estimates for the Yukon include lower, middle and upper Yukon stocks aggregated together. However, escapement and stock-specific run size estimates are provided only for the Upper (Canadian-origin) stock group.

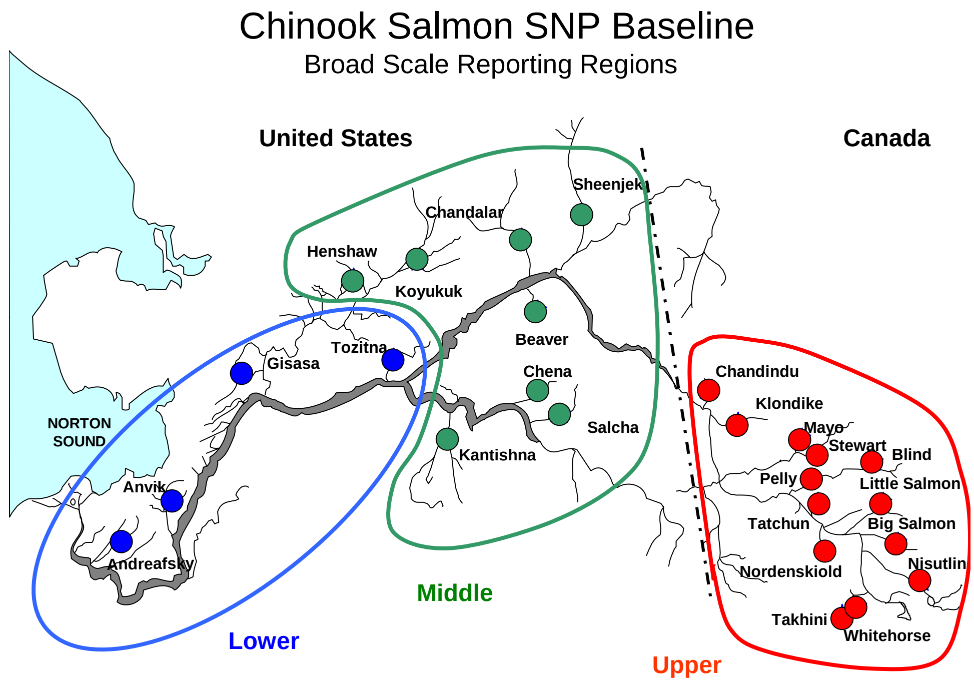


Fig. 5-8 Stock group delineations of the Yukon River: lower, middle and upper. *Source: D. Evenson, ADF&G.*

Chinook salmon production for many stocks in the Yukon River has been declining in recent years. Yukon Chinook salmon was designated as a Stock of Yield Concern by the BOF. The classification as a yield concern was originally based on low harvest levels for the previous three-year period (1998-2000) and anticipated low harvest in 2001. An action plan was subsequently developed by ADF&G and approved by the BOF in 2001. The BOF continued the classification as a yield concerns in 2004 (Lingnau and Bergstrom 2004) and 2007. The Yukon River Chinook salmon stock continues to meet the definition of a yield concern based on low yield from 1998-2008.

The commercial and subsistence salmon fisheries in the Yukon River are managed based upon perceived run strength and Alaska BOF approved fishery management plans. During the fishing season, management is based upon both pre-season and in-season run strength assessment information. Pre-season information involves run forecasts based upon historic performance of parent spawning abundance and is generally expressed as runs that will be below average, average, or above average. In-season run assessment includes: (1) abundance indices from test fishing, (2) sonar counts of passing fish, (3) various escapement assessment efforts in tributaries (e.g. tower counts, aerial surveys, weirs), (5) commercial and subsistence catch data and (5) catch per unit effort data from monitored fisheries (Fig. 5-9) (Clark et al 2006). ADF&G, several Federal agencies, the Canadian Department of Fisheries and Oceans (Canadian DFO), native organizations, and various organized groups of fishermen operate salmon stock assessment projects throughout the Yukon River drainage and fishery managers use this information to manage the Yukon salmon fisheries.

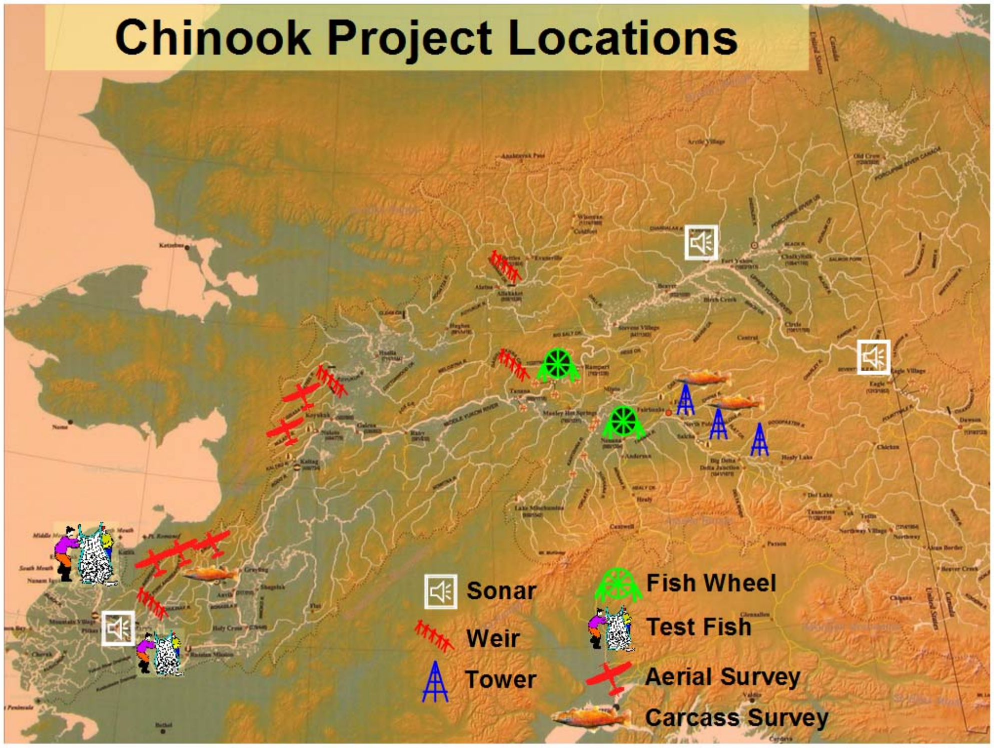


Fig. 5-9 Project location for assessing Yukon River Chinook salmon. Source: L. DuBois, ADF&G

Tributary escapements have been monitored with counting tower projects in the Chena and Salcha rivers, Goodpaster River, weir counts in the East Fork Andreafsky and Gisasa Rivers and with aerial surveys in the Andreafsky, Anvik, Gisasa, and Nulato rivers. Biological escapement goals (BEGs) have been established for the Chena and Salcha rivers in the Tanana River drainage (Table 5-5). Sustainable escapement goals (SEGs) for aerial survey assessments have been established for the East and West Fork Andreafsky, Anvik, Nulato and Gisasa rivers. Chinook salmon escapement goals were generally met throughout the Alaska portion of the Yukon River drainage the past five years 2003–2007.

Table 5-5 Yukon River Chinook salmon escapement goals, 2008.

Stream	**Current Goal**	**Type of Goal**	**2008**
East Fork Andreafsky River Aerial	960–1,900	SEG	278[1]
West Fork Andreafsky River Aerial	640–1,600	SEG	262[1]
Anvik River Index Aerial	1,100–1,700	SEG	992[1]
Nulato River Aerial (Forks Combined)	940–1,900	SEG	922
Gisasa River Aerial	420–1,100	SEG	487
Chena River Tower	2,800–5,700	BEG	3,080[3]
Salcha River Tower	3,300–6,500	BEG	N/A
Canadian Border	<45,000	IMEG[2]	34,000[3]

[1]Rated as incomplete and/or poor survey conditions resulting in minimal or inaccurate counts.
[2]The US/Canada Yukon River Panel agreed to a one year Canadian Interim Management Escapement Goal (IMEG) of >45,000 Chinook salmon based on the Eagle sonar program. In order to meet this goal, the passage at Eagle Sonar must include a minimum of 45,000 fish for escapement, provide for a subsistence harvest in the community of Eagle of approximately 2,000 fish, and incorporate the US/Canada Yukon River Panel allowable catch (20%-26% of the total allowable catch); this would have resulted in approximately 53,000 fish counted at Eagle Sonar necessary to meet the goal in 2008.
[3]Data are preliminary.

The Chena and Salcha rivers are the major Chinook salmon producing tributaries within the Alaska portion of the Yukon River drainage. The BEG for the stock of Chinook salmon that spawns in the Chena River is 2,800-5,700. Between 1986-2007, the Chena River stock of Chinook salmon failed to meet the established escapement goal only in 1989 (JTC 2008). The annual escapement of Chinook salmon in the Chena River in 2005 was not assessed. The Salcha River stock of Chinook salmon has a BEG of 3,300-6,500. The Salcha River Chinook salmon escapement goal has been met in 20 of the past 21 years (JTC 2008); escapements in 1989 failed to meet the goal (JTC 2008).

Escapement observations for those stocks indexed by aerial surveys (1996-2007) with an established sustained escapement goal are shown in Fig. 5-10(JTC 2008). The East Fork of the Andreafsky River has an SEG of 960-1,700 fish; escapement observations were not obtained in 1996, 1999, and 2003. The West Fork of the Andreafsky Chinook salmon population has an SEG of 640-1,600 fish; escapement observations were not obtained in 1998 and 1999 (Table 5-6, Table 5-7). In the Anvik River, the SEG is 1,100-1,700 fish; escapement observations were not obtained in 1998, 1999, and 2003. The Chinook salmon SEG in the Nulato River is 940-1,900 fish; escapement observations were not obtained in 1996, 1997, 1999, 2000, 2003, and 2004. The Gisasa River Chinook salmon population has an SEG of 420-1,100 fish; escapement observations were not obtained in 1986-1993 (Table 5-7, Fig. 5-10). Escapement data for the Canadian portion of the drainage are shown in Fig. 5-12and Fig. 5-13. Thus, there are 49 escapement observations out of the possible 60 stream by year cells from 1996-2007. In 39 of the 49 cases (80%), escapements met or exceeded the escapement goals. A full evaluation of escapement goal performance for these rivers is difficult due to incomplete aerial survey records or incomplete counts due to poor survey conditions. The escapements in the Chena and Salcha rivers were within the biological escapement goal ranges in 2007 (Table 5-6).

The rebuilding step escapement target of 28,000 in the Canadian mainstem Yukon River agreed to and adopted by the Panel has been exceeded each year averaging 36,981 fish, based on the Canadian DFO mark and recapture passage estimate, from 2001–2005 (Fig. 5-14). Escapements during this most recent period are approximately 42% higher than the average escapement of 27,858 Chinook salmon during the 1989–1998 period. The 33,000 escapement goal was not met in 2007. In their spring 2008 meeting, the Yukon River Panel agreed to a one year minimum Interim Management Escapement Goal (IMEG) of greater than 45,000 Chinook salmon based on the Eagle sonar project passage estimate (Fig. 5-12, Fig. 5-13). The IMEG was not met in 2008 and was more than 24% below the minimum goal.

Table 5-6 Chinook salmon aerial survey indices for selected spawning areas in the Alaskan portion of the Yukon River drainage, 1961–2007.

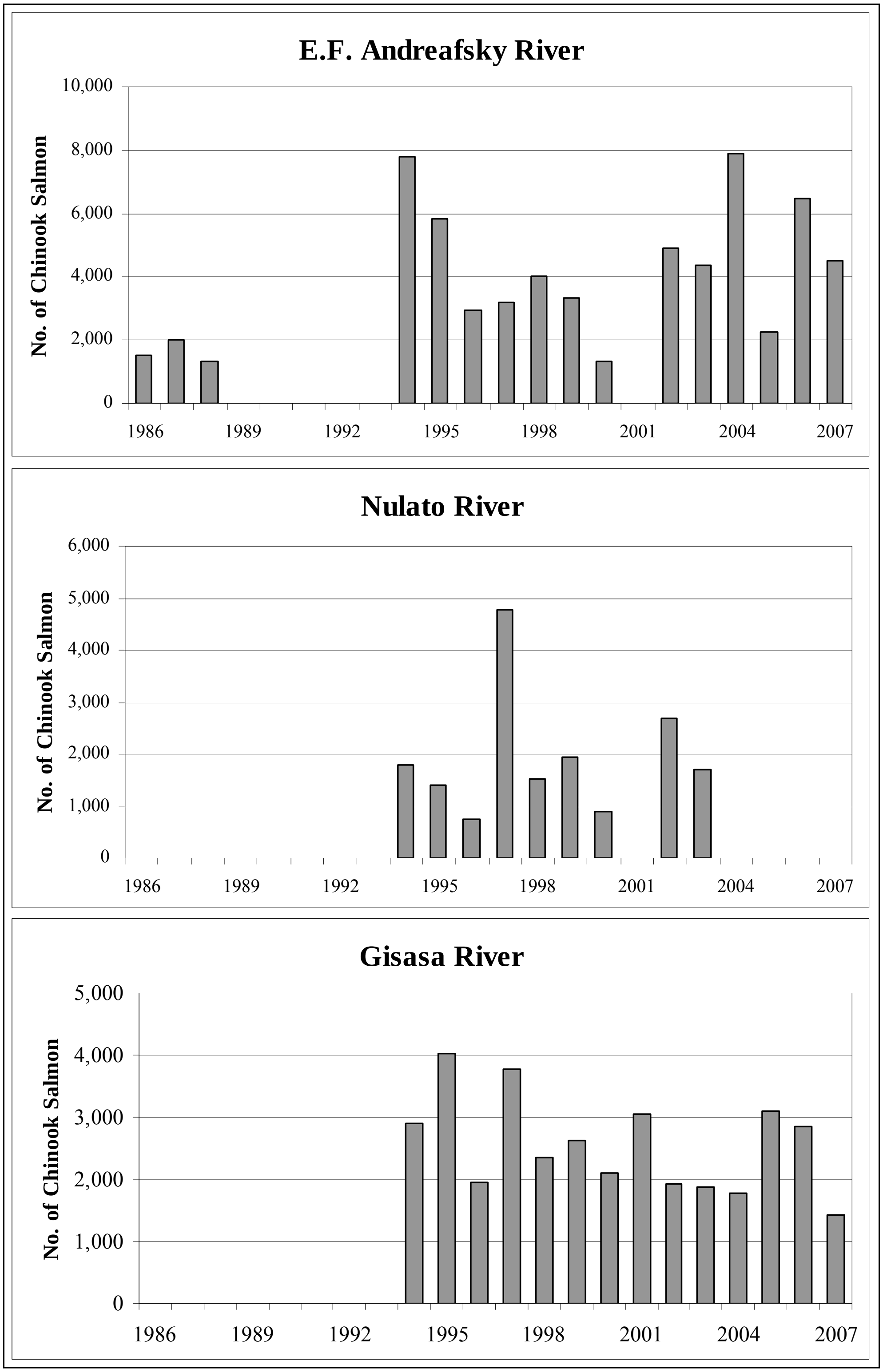
Year	Andreafsky River		Anvik River		Nulato River			Gisasa River
	East Fork	West Fork	Drainage Wide Total	Index Area	North Fork	South Fork	Both Forks	
1961	1,003		1,226		376 a	167		266 a
1962	675 a	762 a						
1963								
1964	867	705						
1965		344 a	650 [a]					
1966	361	303	638					
1967		276 a	336 [a]					
1968	380	383	310 [a]					
1969	274 a	231 a	296 [a]					
1970	665	574 a	368					
1971	1,904	1,682						
1972	798	582 a	1,198					
1973	825	788	613					
1974		285	471 a		55 a	23 a	a	161
1975	993	301	730		123	81		385
1976	818	643	1,053		471	177		332
1977	2,008	1,499	1,371		286	201		255
1978	2,487	1,062	1,324		498	422		45 a
1979	1,180	1,134	1,484		1,093	414		484
1980	958 a	1,500	1,330	1,192	954 a	369 a	a	951
1981	2,146 a	231 a	807 a	577		791		
1982	1,274	851						421
1983			653 a	376 b	526	480		572
1984	1,573 a	1,993	641 a	574 b				
1985	1,617	2,248	1,051	720	1,600	1,180		735
1986	1,954	3,158	1,118	918	1,452	1,522		1,346
1987	1,608	3,281	1,174	879	1,145	493		731
1988	1,020	1,448	1,805	1,449	1,061	714		797
1989	1,399	1,089	442 a	212 a				
1990	2,503	1,545	2,347	1,595	568 a	430 a	a	884 a
1991	1,938	2,544	875 a	625 a	767	1,253		1,690
1992	1,030 a	2,002 a	1,536	931	348	231		910
1993	5,855	2,765	1,720	1,526	1,844	1,181		1,573
1994	300 a	213 a		913 a	843	952		2,775
1995	1,635	1,108	1,996	1,147	968	681		410
1996		624	839	709		100		
1997	1,140	1,510	3,979	2,690				144
1998	1,027	1,249 a	709 a	648 a	507	546		889
1999	a	870 a	a	950 a	a	a		
2000	1,018	427	1,721	1,394	a	a		
2001	1,065	570	1,420	1,172			1,884 b	1,298
2002	1,447	917	1,713	1,329			1,584	506
2003	1,116 a	1,578 a	1,100 a	973 a				
2004	2,879	1,317	3,679	3,475			1,321	731
2005	1,715	1,492	2,421	2,421			553	958
2006	590 a	824	1,876	1,776			1,292	843
2007	1,758	976	1,529	1,580			2,583	593
SEG	960-1,700	640-1,600		1,100-1,700			940-1,900	420-1,100
Average								
1961-2006	1,386	1,137	1,257	1,199	774	564	1,327	781
1997-2006	1,333	1,075	2,069	1,683			1,327	767
2002-2006	1,549	1,226	2,158	1,995			1,188	760

Note: Aerial survey counts are peak counts only. Survey rating was fair or good unless otherwise noted.
[a]Incomplete, poor timing and/or poor survey conditions resulting in minimal or inaccurate counts.
[b]In 2001, the Nulato River escapement goal was established for both forks combined.

Table 5-7 Chinook salmon escapement counts for selected spawning areas in the Alaskan portion of the Yukon River drainage, 1986–2007.

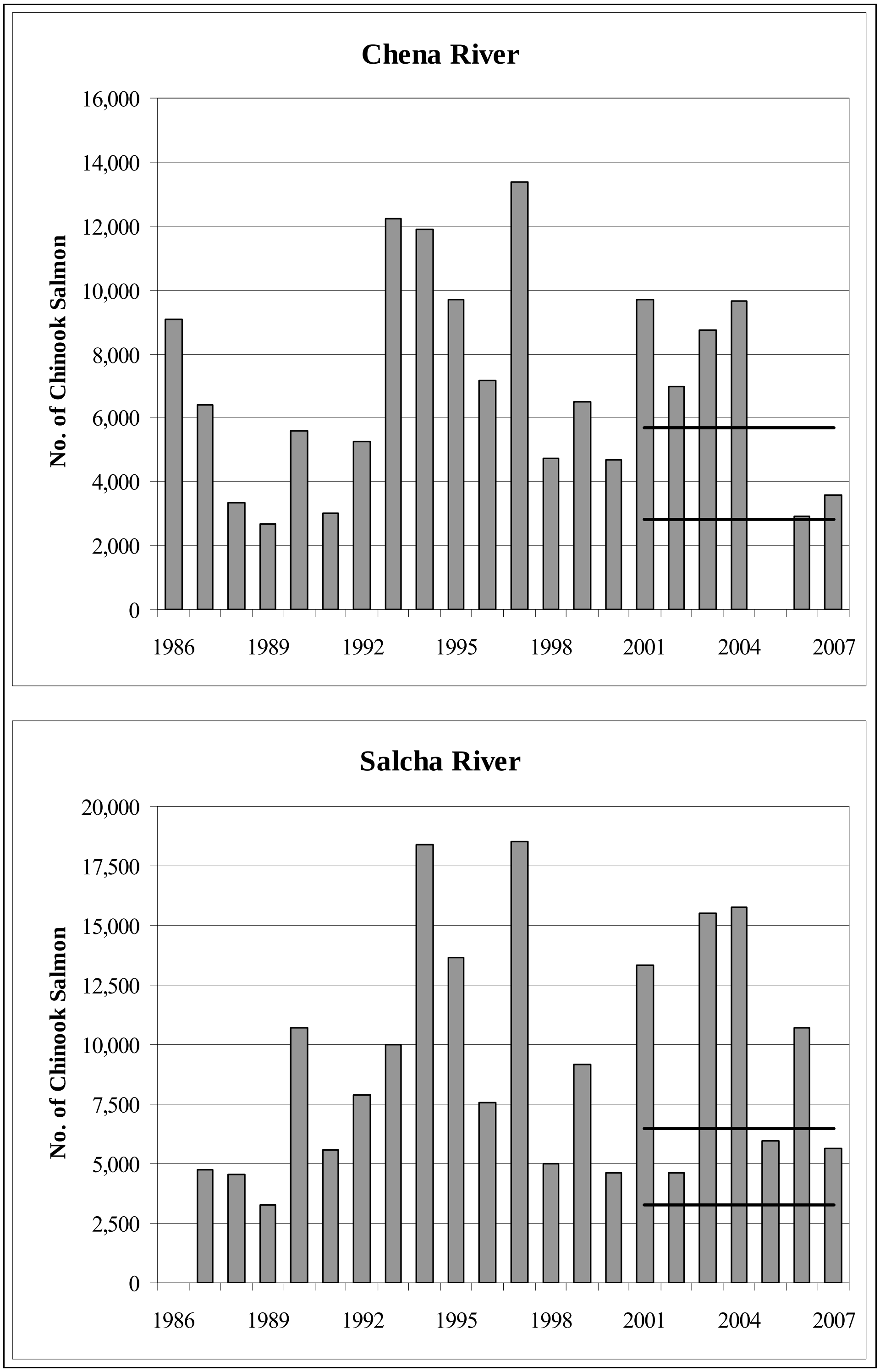
	Andreafsky River		**Nulato River Tower**	**Gisasa River Weir**		**Chena River**		**Salcha River**	
Year	No. Fish	% Fem.	No. Fish	No. Fish	% Fem.	No. Fish	% Fem.	No. Fish	% Fem.
1986	1,530	23.3[a]				9,065	20.0[d]		35.8
1987	2,011	56.1[a]				6,404	43.8[d]	4,771	47.0[d]
1988	1,339	38.7[a]				3,346	46.0[d]	4,562	36.6[d]
1989		13.6				2,666	38.0[d]	3,294	46.8[d]
1990		41.6				5,603	35.0[d]	10,728	35.4[d]
1991		33.9				3,025	31.5[d]	5,608	34.0[d]
1992		21.2				5,230	27.8[d]	7,862	27.3[d]
1993		29.9				12,241	11.9[a]	10,007	24.2[a]
1994	7,801	35.5[b,v]	1,795[c]	2,888	[c]	11,877	34.9[a]	18,399	35.2[a]
1995	5,841	43.7	1,412	4,023	46.0	9,680	50.3	13,643	42.2[a]
1996	2,955	41.9	756	1,991	19.5	7,153	27.0	7,570	26.3
1997	3,186	36.8	4,766	3,764	26.0	13,390	17.0[a]	18,514	36.3[a]
1998	4,034	29.0	1,536	2,414	16.2	4,745	30.5[a]	5,027	22.4[a]
1999	3,444	28.6	1,932	2,644	26.4	6,485	47.0[a]	9,198	38.8[a]
2000	1,609	54.3	908	2,089	34.4	4,694	20.0	4,595	29.9[a]
2001		[c]	[c]	3,052	49.2[c]	9,696	32.4[a]	13,328	27.9[a]
2002	4,123	21.1	2,696	2,025	20.7	6,967	27.0	4,644	34.8[c]
2003	4,336	45.3	1,716[c]	1,901	38.1	8,739	34.0[c]	15,500	31.8[c,e]
2004	8,045	37.3	[f]	1,774	30.1	9,645	47.0	15,761	47.0
2005	2,239	50.2	[f]	3,111	34.0		[c]	5,988	54.3
2006	6,463	42.6	[f]	3,030	28.2	2,936	34.0	10,679	33.0
2007[h]	4,504	44.7	[f]	1,425	39.0	3,564	[h]	5,631	[h]
BEG						2,800-5,700		3,300-6,500	
Average									
1986-2006	3,930	36.2	1,946	2,670	30.7	7,179	32.8	9,484	35.6
1997-2006	4,164	38.4	2,259	2,580	30.3	7,477	32.1	10,323	35.6
2002-2006	5,041	39.3		2,368	30.2	7,072	35.5	10,514	40.2

[a] Tower counts.
[b] Weir counts.
[c] Incomplete count because of late installation, early removal of project or inoperable.
[d] Mark–recapture population estimate.
[e] Expanded counts based on average run timing.
[f] Project did not operate.
[g] Data are preliminary.
[h] Data not available.



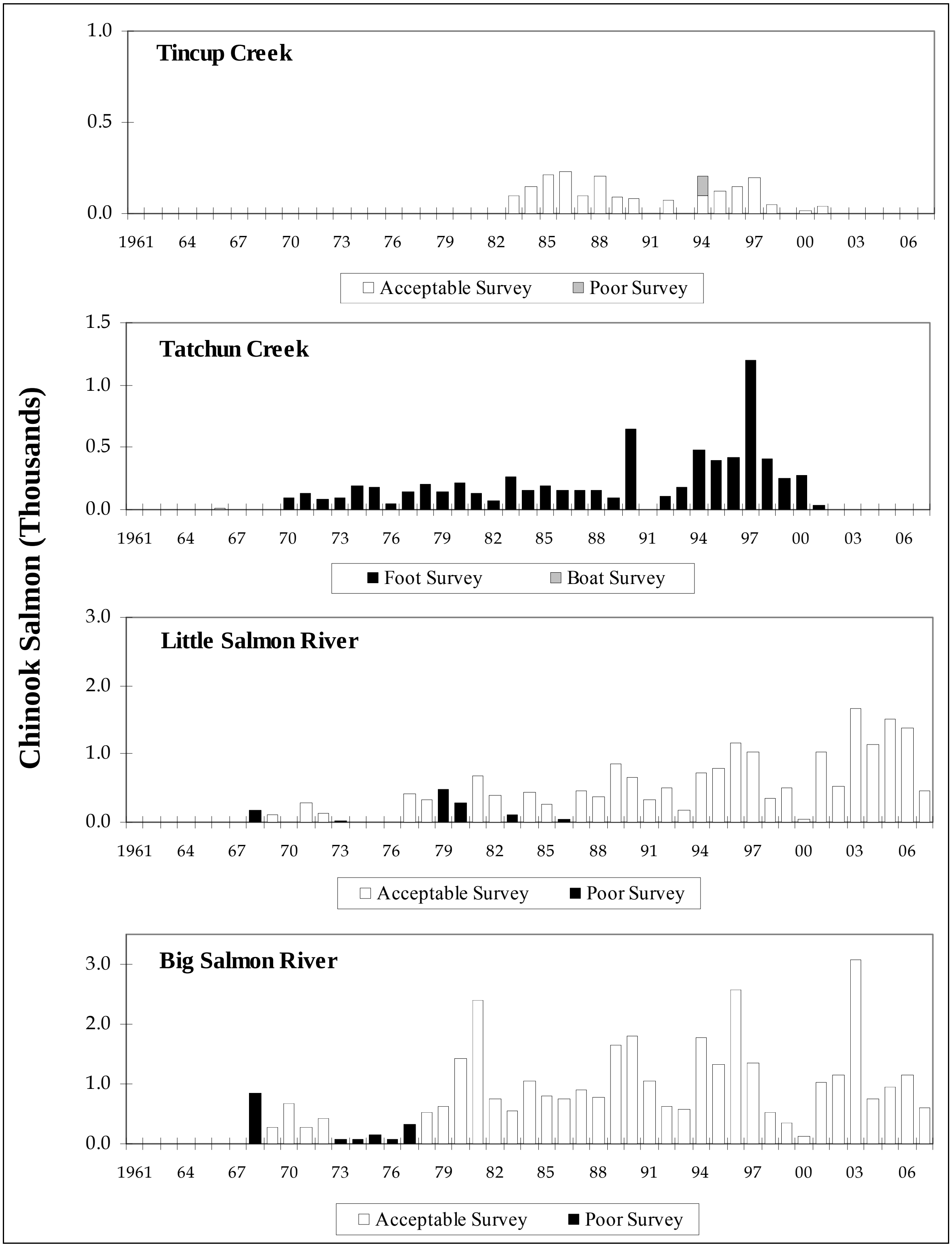
Note: The vertical scale is variable.

Fig. 5-10 Chinook salmon aerial survey based escapement estimates for selected tributaries in the Alaska portion of the Yukon River drainage, 1986–2007.



Note: The BEG range is indicated by the horizontal lines for tributaries with BEGs. The vertical scale is variable.

Fig. 5-11 Chinook salmon ground based escapement estimates for selected tributaries in the Alaska portion of the Yukon River drainage, 1986–2007.



Note: Data are aerial survey observations unless noted otherwise. The vertical scale is variable.

Fig. 5-12 Chinook salmon escapement data for selected spawning areas in the Canadian portion of the Yukon River drainage, 1961–2007

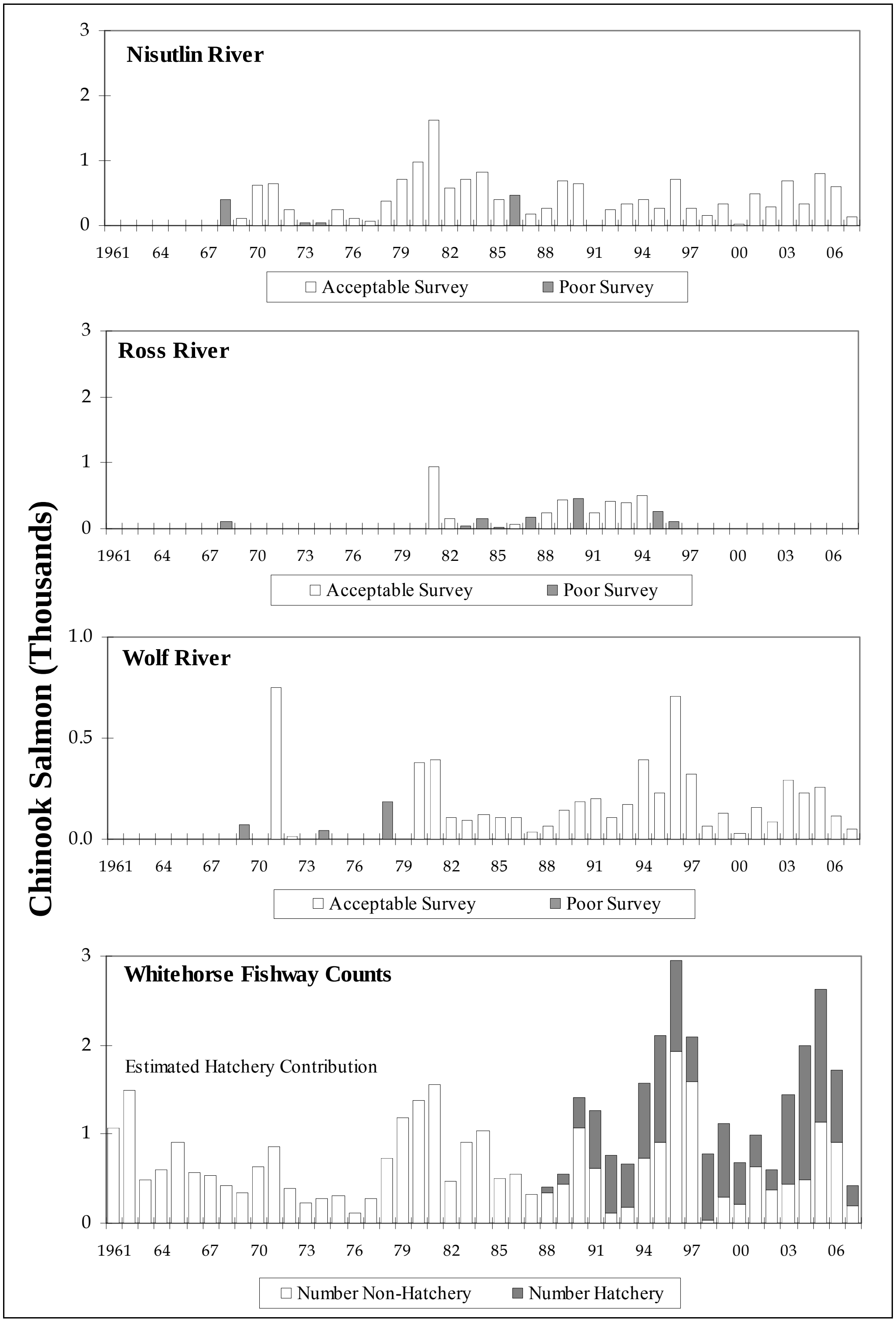


Fig. 5-13 Chinook salmon escapement data for selected spawning areas in the Canadian portion of the Yukon River drainage, 1961–2007.

Total run estimates are provided for the Yukon Chinook salmon population on an annual basis. These estimates are calculated from the sum of the Pilot Station Sonar passage estimates (Table 5-8), harvests below Pilot Station, and 2 times the East Fork Andreafsky weir counts (Table 5-9, D. Evenson, personal communication). Sonar assessment has provided abundance estimates for 1995, 1997-2007; however, problems with species apportionment, technological limitations and bank erosion have, at times, adversely affected the quality of those estimates. New technology (DIDSON sonar in 2005) and more appropriate net selectivity models (Bromaghin 2005), currently in use and applied to the historic data series have greatly improved Chinook salmon population estimates at Pilot Station since 2005. No brood table has been constructed for these data.

Table 5-8 Pilot Station sonar project estimates, Yukon River drainage, 1995, 1997–2007 (Source JTC 2008).

Date	Large Chinook	Small Chinook	Total Chinook	Summer Chum	Fall Chum	Coho	Pink	Others	Season Total
1995	130,271	32,674	162,945	3,556,445	1,053,245	101,806	24,604	1,011,855	5,910,900
1997	118,121	77,526	195,647	1,415,641	506,621	104,343	2,379	621,857	2,846,488
1998	71,177	16,675	87,852	826,385	372,927	136,906	66,751	277,566	1,768,387
1999	127,809	16,914	144,723	973,708	379,493	62,521	1,801	465,515	2,027,761
2000	39,233	5,195	44,428	456,271	247,935	175,421	35,501	361,222	1,320,778
2001 [a]	85,511	13,892	99,403	441,450	376,182	137,769	665	353,431	1,408,900
2002	92,584	30,629	123,213	1,088,463	326,858	122,566	64,891	557,779	2,283,770
2003	245,037	23,500	268,537	1,168,518	889,778	269,081	4,656	502,878	3,103,448
2004	110,236	46,370	156,606	1,357,826	594,060	188,350	243,375	637,257	3,177,474
2005 [b]	142,007	17,434	159,441	2,439,616	1,813,589	184,718	37,932	593,248	5,228,544
2006	145,553	23,850	169,403	3,767,044	790,563	131,919	115,624	875,899	5,850,452
2007	90,184	35,369	125,553	1,726,885	684,011	173,289	71,699	1,085,316	3,866,753
Average (1995–2006)	117,727	27,199	144,925	1,393,492	629,801	151,359	57,358	524,665	2,901,600

Note: Estimates for all years were generated with the most current apportionment model and may differ from earlier estimates.
The Pilot Station Sonar did not operate at full capacity in 1996 and therefore passage estimates do not exist.
Others include sockeye salmon, cisco, whitefish, sheefish, burbot, suckers, Dolly Varden, and northern pike.
Large Chinook salmon >655mm.
Estimates for fall chum and coho salmon may not include the entire run.
[a] Record high water levels experienced at Pilot Station in 2001, and therefore passage estimates are considered conservative.
[b] Estimates include extrapolations for the dates June 10 to June 18, 2005 to account for the time the DIDSON was deployed.

Table 5-9 Chinook run reconstruction for the Yukon based on Pilot Station (from D. Evenson ADF&G). 2006 and 2007 estimates are preliminary

	District 1			District 2			Marshall		East Fork	Pilot	
Year	Comm. fishery.	Subsist. fishery	Test Fishery	Comm. fishery	Subsist. fishery	Test Fishery	Comm. fishery	Subsist. fishery	Andreafsky River	Station Sonar	Total
1995	76,106	5,960	2,078	41,458	9,037	74	14,744	3,291	5,841	162,945	291,305
1997	66,384	7,550	2,791	39,363	9,350	20	9,800	1,511	3,186	195,647	316,166
1998	25,413	7,242	878	16,806	9,455	48	6,277	1,711	4,011	87,852	147,728
1999	37,161	6,848	1,049	27,133	10,439	156	11,279	2,780	3,347	144,723	220,144
2000	4,735	5,891	275	3783	9,935	322	968	3,279	1,344	44,428	67,810
2001[c]	0	7,089	0	0	13,442	0	0	4,498	3,596	99,403	122,628
2002	11,159	5,603	416	11,434	8,954	34	4,258	2,290	4,896	123,213	164,057
2003	22,750	6,332	561	14,178	16,773	46	4,808	2,059	4,383	268,537	331,076
2004	28,403	5,880	637	24,164	9,724	70	6,481	1,990	7,912	156,606	232,837
2005	16,694	5,058	310	13,413	9,156	0	2,819	1,804	2,239	159,441	203,927
2006	23,748	5,122	817	19,843	8,039	0	4936	1897	6,463	169,403	233,065
2007	18,615	5,353	849	13,302	8,973	0	2521	1897	4,504	125,305	176,987

[a] Includes personal use harvest in District 6
[b] District 2 harvest include fish harvested above and below Pilot Station.
[c] No commercial fishing occurred during the 2001 season.

While included in the total run estimates for the Yukon, the Canadian portion of the stock (Upper Yukon) is also assessed separately in order to evaluate treaty requirements for meeting border passage goals. It is also the only portion along the mainstem of the river whereby reasonably accurate estimates of passage provide the ability to construct a brood table (D. Evenson, personal communication). For the Upper Yukon component, various stock-recruitment datasets were examined including those developed from spawning escapements estimated from mark-recapture data and combinations of estimates derived from sonar, radio telemetry and aerial survey data. The S/R model selected for the 2008 outlook included border passage estimates developed from a combination of Eagle Sonar estimates (2005-2007) and radio-telemetry data (2002-2004). Total spawning escapements for 2002-2007 were calculated by subtracting the Canadian catch from these estimates. Linear regression of the estimated total spawning escapements vs. the 3-Area aerial survey index of Big Salmon, Little Salmon, and Nisutlin rivers for 2002 to 2007 was used to estimate historical spawning escapement estimates back to 1982. This escapement dataset best fit the observed trend in the escapement as depicted by the 3-area index. Age-specific returns were then calculated based on age, harvest and escapement data in the return years (D. Evenson, personal communication).

In 2002–2005 and 2008, preseason management strategies were developed which prohibited commercial fishing until near the midpoint of the Chinook salmon run. This strategy was designed to pass fish upstream for escapement, cross-border commitments to Canada, and subsistence uses in the event of a very poor run as occurred in 2000 (Hayes et al. 2006). Under this approach, however, the harvest is not spread out over the entire run and commercial fishing is concentrated on only those stocks migrating during the latter half of the run. The preferred strategy for managing commercial fisheries is to spread the harvest over the middle 50% of the run, starting near the first quarter point of the run.

Information utilized to assess inseason salmon runs include: Lower Yukon Test Fishery (LYTF) indices, subsistence harvest reports, and Pilot Station sonar passage estimates. As the run progresses upriver, other projects provide additional run assessment information.

2007 Season Summary

Yukon River Chinook salmon return primarily as age-5 and age-6 fish, although age-4 and age-7 fish also contribute to the run[31]. The 4-year-old component in 2006 was below average, whereas the 5-year-old component was above average. The previous 2 years (2005 and 2006) runs have been near average indicating good production from the poor runs of 2000 and 2001. In 2001, the brood year producing 6-year-old fish returning in 2007, successful aerial survey observations were made in all eight Yukon River index tributaries used for escapement assessment (JTC 2008).

Time and duration of the open fishing periods established by ADF&G are dependant upon preseason projections and inseason information. For example, in 2007, the LYTF nets observed the first and largest pulse of Chinook salmon from June 14 through June 17. Based on this pulse, the Chinook salmon run was estimated to be slightly later than average. ADF&G delayed opening the next commercial period targeting Chinook salmon until June 18, 2 days after the first quarter point of the Chinook salmon run at the LYTF in District 1. During the second pulse from June 20 to June 24, it appeared that Chinook salmon were entering the river at a slow, steady rate rather than the more typical pulse-like entry pattern, and the run was not as strong overall as anticipated. A strong first pulse followed by a weaker second pulse is unusual. During the poor runs of 1998 and 2000, the LYTF CPUE and Pilot Station sonar estimates were lower than average throughout the run. As the 2007 run progressed, it became clear that the Chinook salmon run was not developing as expected and was weaker than the run observed in 2006 (JTC 2008).

In 2007, the border passage estimate from the Eagle sonar project was approximately 41,200 Chinook salmon. However, the escapement target into Canada was based on the Canadian DFO fish wheel mark–recapture border passage estimate, and management was targeting a rebuilt escapement level of 33,000–43,000. Using this Canadian assessment project, an escapement estimate of approximately 17,000 Chinook salmon was estimated in Canada, which was well below the Yukon River Panel agreed to escapement level. However, the escapement target had been achieved consistently from 2001–2005. In summary, the 2007 Chinook salmon run was weaker than the run of 2006, and below the recent 10-year average of 210,000 Chinook salmon.

[31] Salmon ages given in this document represent the combined freshwater and saltwater age.

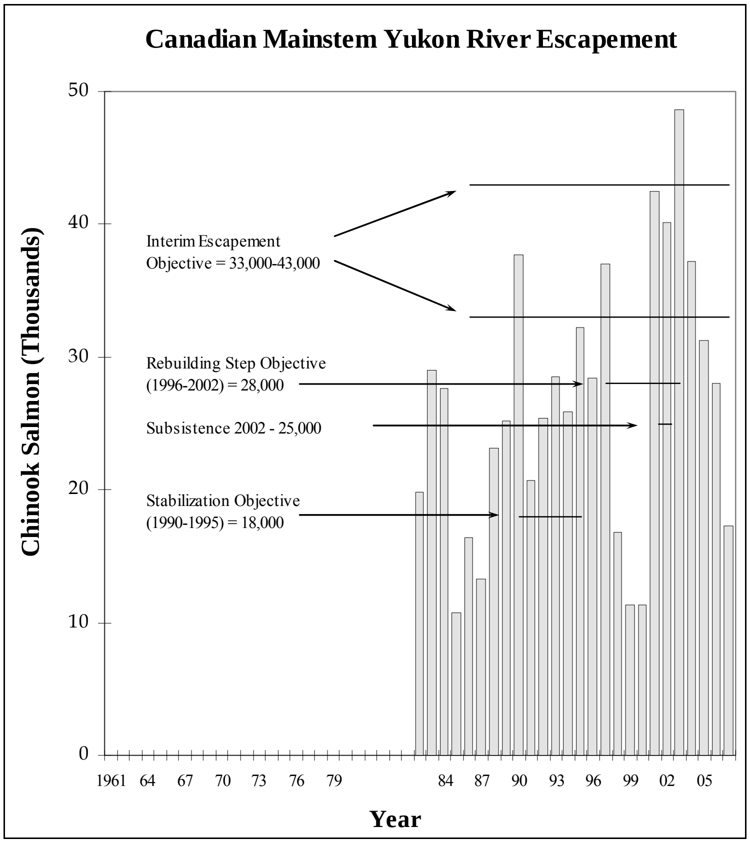


Fig. 5-14 Estimated total Chinook salmon spawning escapement in the Canadian portion of the mainstem Yukon River drainage based on Canadian mark-recapture, 1982–2007. Note: Horizontal lines represent the interim escapement objective range of 33,000–43,000 salmon, the rebuilding step objective of 28,000 salmon and the stabilization objective of 18,000 salmon.

5.2.4.1 Forecasts and precision of estimates

Long-term stock assessment information is needed to assess how various salmon stocks that spawn in the Yukon River drainage can support sustained fisheries. Long-term and accurate estimates of the abundance and composition of spawning stocks are needed along with estimates of the harvests of those salmon in the various fisheries of the Yukon drainage (Clark et al 2006). Much progress toward these objectives has been made since the late 1980s and in particular, over the last decade; however, the time series for many such data sets is relatively short. Obtaining such information in the Yukon is expensive and difficult due to the remoteness of the area (Clark et al 2006).

Assessment using sonar has been attempted over the last two decades, but success in doing so in the lower river has been elusive until 1995 (Hayes et al 2006). Recent efforts to assess Chinook salmon passage at Eagle, below the U.S.-Canada border look promising and coupled with genetic stock identification have provided break-through technology for annual assessment of Chinook salmon in the Yukon River drainage (Hayes et al 2006).

The performance of run outlooks developed from S/R models for the upper Yukon stock for the 1998 to 2006 period and the average of a S/R and sibling outlook which was used in 2007 are presented in Table 5-10. A review of the performance of preseason outlooks is an attempt to take into account a recent decline in the Upper Yukon Chinook salmon return per spawner values. Despite good brood year escapements, the observed run sizes within the 1998-2001 period and in 2007 were relatively low. Even though the 2001 (age-6) brood year spawning escapements were above average, the 2007 run was weak and the total spawning escapement was below target levels (JTC 2008). The S/R model predicted a total run of 111,000 Canadian-origin Chinook salmon in 2008. However, the estimated run size in 2007 was approximately 30% lower than expected for unknown reasons but possibly related to poorer marine survival. The 2008 return of Canadian-origin Yukon Chinook was well below the expected amount of 80,000 fish.

Table 5-10 Observed and expected run sizes based on S/R and sibling relationship models (from D. Evenson, ADF&G 2008).

Year	S/R		Sibling
	Observed	Expected	Expected
2000	52,843	127,777	85,889
2001	85,658	126,631	51,082
2002	81,486	113,688	107,211
2003	149,978	116,895	109,159
2004	119,743	123,469	124,219
2005	124,178	121,743	131,230
2006	119,788	115,939	122,726
2007	82,869	118,497	139,304
2008		111,468	117,442

The 2008 total run of approximately 155,000 Chinook salmon was insufficient to fully support any directed fisheries, including subsistence (ADF&G 2008). The 2008 run was approximately 36% below the recent 5-year (2003-2007) average of 235,000 Chinook salmon and 21% below the 10-year (1998-2007) average of 190,000 (Fig. 5-15). The 2008 run was expected to be below average and similar to the 2007 run of approximately 178,000, however, the run was anticipated to provide for escapements, support a normal subsistence harvest, and a small commercial harvest. However, there was no surplus available for a directed Chinook salmon commercial fishery and that sport and subsistence fisheries on the mainstem Yukon River were reduced in an attempt to provide adequate numbers of Chinook salmon on the spawning grounds. Despite these efforts, escapement was more than 24% below the minimum goal.

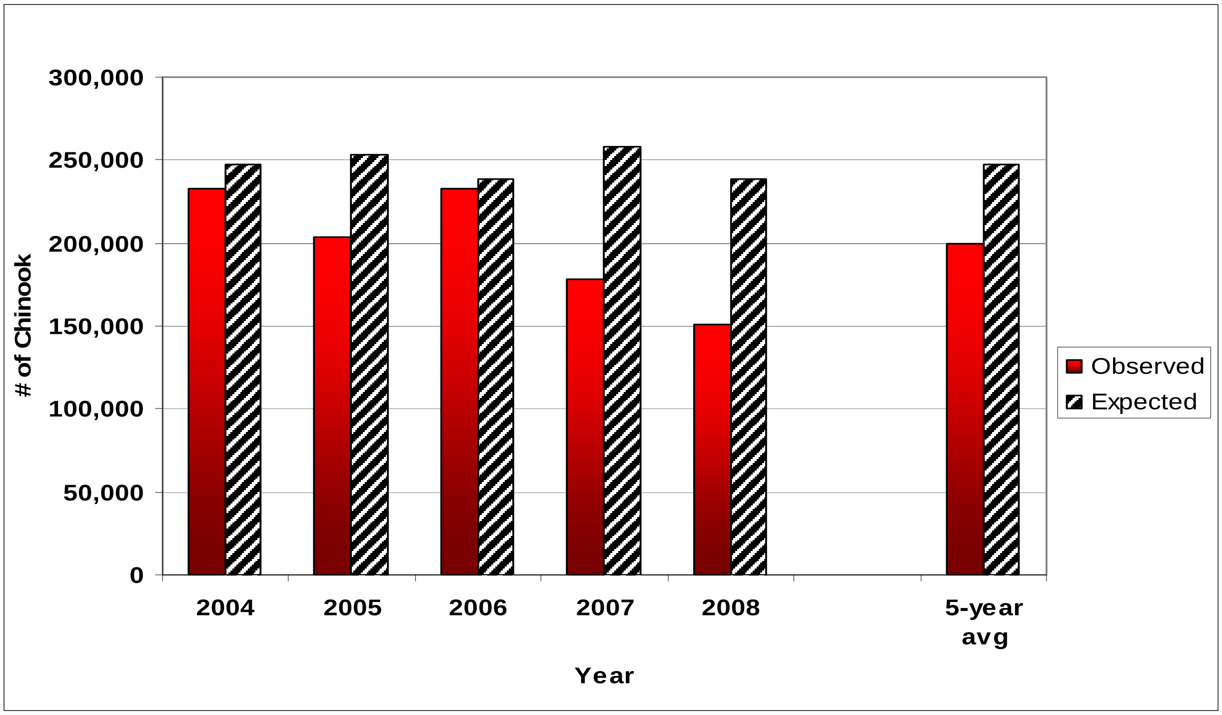


Fig. 5-15 Yukon River Chinook salmon observed versus expected total runs based on S/R and Sibling Relationships, 2004-2008, and 5-year average. 2008 data are preliminary (ADF&G 2008).

Sport fishing bag and possession limits were reduced from 3 to 1 Chinook salmon on the mainstem Yukon River, however, the sport fish harvest only occurs in a few tributaries and is very small (<3000). Additionally, commercial fishing targeting an abundant summer chum salmon run with gillnets restricted to 6 inch maximum mesh size was delayed until July 2 in order to allow most of the Chinook run to pass through. This resulted in reducing what could have been a harvest of greater than 500,000 chum salmon to 126,000. Approximately 4,300 Chinook salmon were taken incidentally.

In an effort to conserve Chinook salmon, it was also necessary to reduce the subsistence fishery (typically around 50,000 fish) throughout the mainstem of the Yukon River. Subsistence fishing time was reduced by half for approximately two weeks implemented chronologically with the Chinook migration and mesh size restrictions (<6-inch mesh) were implemented in the lower river districts. Fishermen were affected from the mouth of the river to across the border into Canada. Fishermen reported harvesting as little as 40% of their needs in some locations in Alaska and the Aboriginal Fishery in Canada harvested half of their average take. Historically, Chinook salmon subsistence fishing restrictions have only been implemented once before, in July of 2000 after the run was nearly over.

High water hampered efforts to accurately assess escapement in 2008 from tower counts and aerial surveys; thus, most escapement goals could not be assessed. Based on the available data, it appears that the lower end of the BEGs in the Chena and Salcha rivers, the largest producing tributaries of Chinook salmon in the Alaska portion of the drainage, were met. Typically, about 50% of the Chinook salmon production occurs in Canada; hence, the US/Canada Yukon River Panel agreed to one year Canadian Interim Management Escapement Goal (IMEG) of >45,000 Chinook salmon based on the Eagle sonar program is a top priority. The preliminary estimated escapement into Canada is approximately 34,000 or 24% below the goal.

5.2.4.2 Exploitation rates

The following is an excerpt from an ADF&G memorandum regarding US exploitation rates on Yukon River Canadian-origin Chinook salmon (Evenson 2008). Knowledge of exploitation rates is an essential component for effective management of the Yukon River Chinook salmon fishery. Exploitation rate is defined as that portion of the run that is harvested; hence, total run estimates, escapement and stock-specific harvests, are needed to calculate exploitation rates. Exploitation rates cannot be estimated for Chinook salmon stocks that spawn in the lower or middle regions of the Yukon River in Alaska because total escapement to these regions cannot be estimated. However, total run estimates for the upper river component, or the Canadian component, can be determined based on border passage estimates.

Border passage into Canada has been estimated since 1982 by the Canadian DFO using mark–recapture techniques, and more recently, by ADF&G using radiotelemetry (2002–2004) and sonar (2004–2007).

The Canadian DFO border passage estimates have been derived from mark–recapture estimates using two fish wheels near the border at river mile (RM) 1,224. This border passage estimate formed the basis for the U.S./Canada Yukon River Salmon Agreement. However, recent analyses indicate that the DFO mark-recapture estimates of border passage do not appear to be consistent through time (JTC 2008).

At their recent spring meeting, after examining various relationships between aerial survey indices and other independent border passage estimates, the U.S./Canada Joint Technical Committee (JTC) revised the basis for estimating the number of Chinook salmon that spawn in the mainstem Yukon River drainage in Canada (JTC 2008). Using escapement estimates derived from the radiotelemetry (2002-2004) and sonar (2005-2007) border passage estimates, in conjunction with the combined aerial survey counts of spawning Chinook salmon within the established index areas in the Big Salmon, Little Salmon, and Nisutlin River drainages (3-Area Index), escapements were estimated for the years 1982–2001. These 1982–2006 escapement estimates averaged 48,556 Chinook salmon, ranging from 25,870 in 2000 to 83,594 in 2003 (Fig. 5-16). The JTC also recommended using the Eagle sonar project in the future as the primary assessment of border passage (JTC 2008). Three studies further discuss the radiotelemetry work on the Yukon River; Eiler et al. 2006a, Eiler et al. 2006b, and Eiler et al. 2004.

From 1982–2003 scale-pattern analysis was used to apportion Alaskan Chinook salmon harvests to region of origin, including the Canadian Chinook salmon stock, which was later replaced in 2004 by genetic stock identification techniques. Apportionment of harvest to stock of origin indicates that the Canadian component comprises approximately 50% of the Alaska harvest, and probably, the run. This proportion has remained relatively constant over the years. Because of the gauntlet nature of Yukon River fisheries, it is believed that the exploitation exerted on Canadian fish is most likely the highest of any Yukon River Chinook salmon stock.

Based on harvest apportionment estimates from the two techniques in conjunction with the border passage estimates, the total run size of the Canadian Chinook salmon stock from 1982–2006 has been estimated (Table 5-27). Based on the newly developed escapement database, total run size of the Canadian Chinook salmon run has ranged from approximately 52,843 in 2000 to 182,504 in 1996. Accordingly, the exploitation rate that Alaskan fishermen exert on the Canadian stock was calculated (Fig. 5-17). Associated exploitation rates exerted by Alaskan fishermen on this stock ranged from 39% in 2001 to 76% in 1987 (Fig. 5-17). Average exploitation rates during the period 2001–2005 decreased by 19% from the 1989–1998 average (Fig. 5-17). Recent exploitation rates are therefore low compared to rates during the 1970s, 1980s, and 1990s.

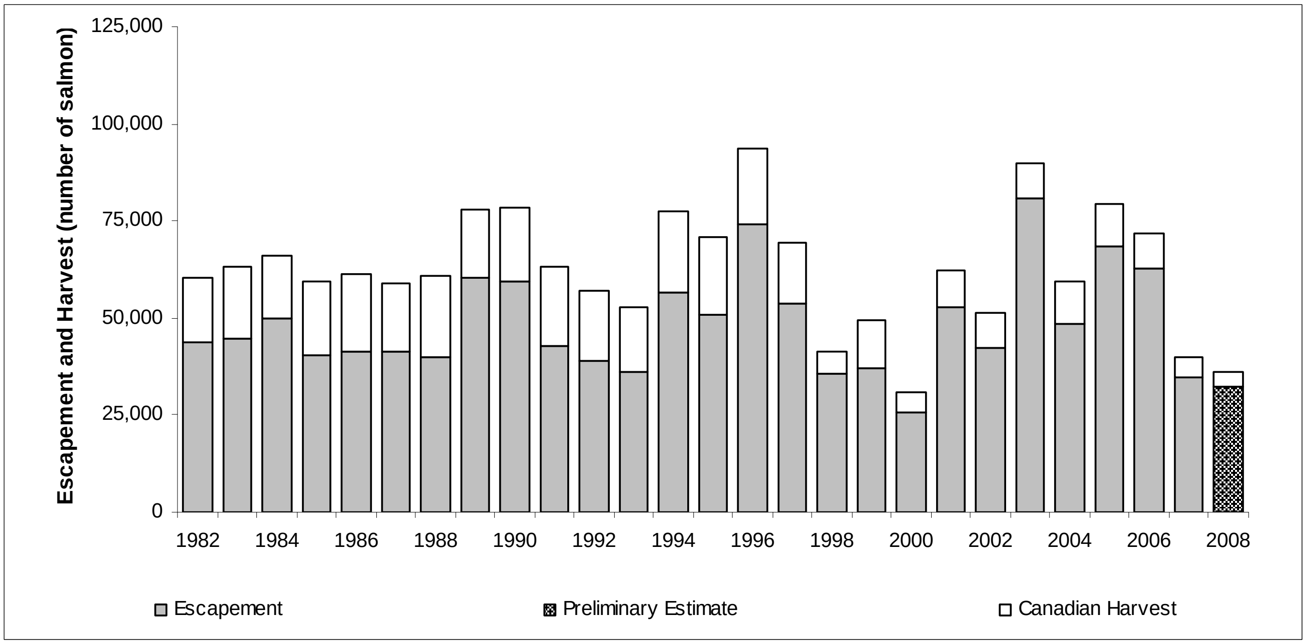


Fig. 5-16 Eagle sonar based estimates of Yukon River Chinook salmon passing from Alaska into Canada by harvest and escapement in the main-stem of the Yukon River, Canada, 1982–2006 (JTC 2009).

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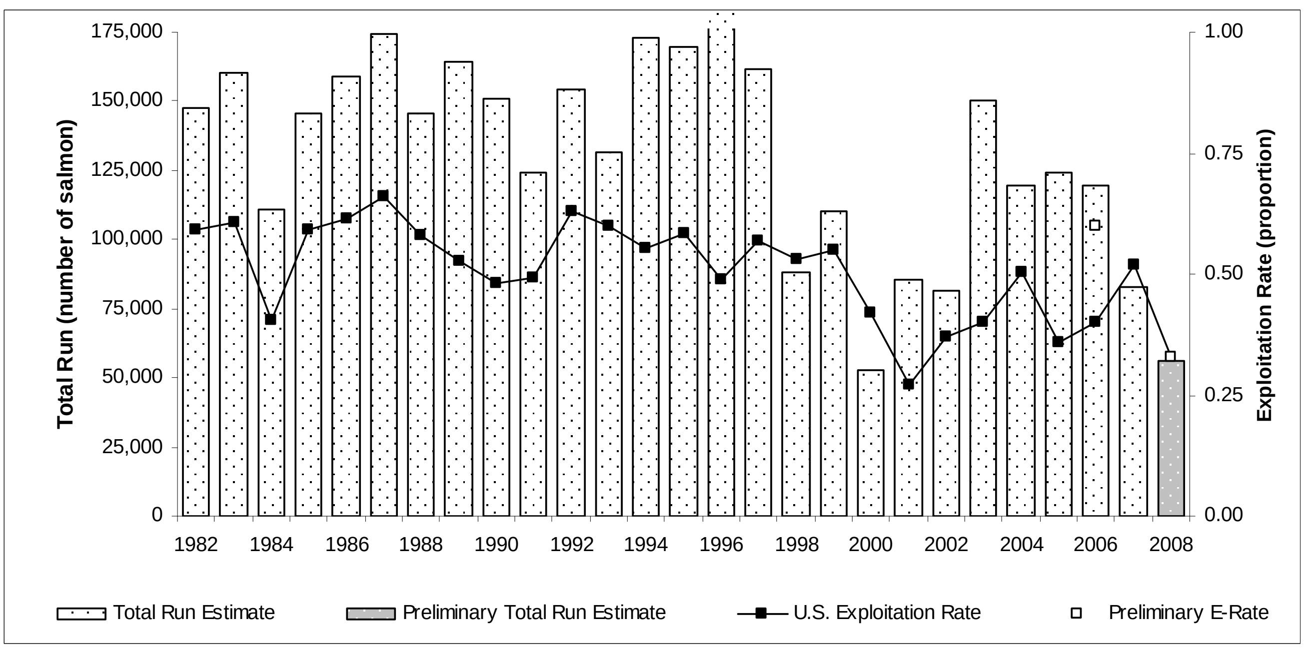


Fig. 5-17 Total run and U.S. exploitation rates of Yukon River Canadian-Origin Chinook salmon, 1982-2008. Border passage estimates are based on Eagle sonar, radio-telemetry, and a 3-area escapement index. 2008 data are preliminary.

5.2.4.3 Ichthyophonous

ADF&G began research on the prevalence of *Ichthyophonus* within Yukon River Chinook salmon in response to increasing concerns that this disease was affecting spawning escapement and spawning success. In 1999, Dr. Richard Kocan began a baseline of the disease's overall infection rate entering the Yukon River at Emmonak (Kocan et al. 2003). In 2002, ADF&G directed research to determine management and conservation implications of *Ichthyophonus* in Yukon River Chinook salmon. ADF&G continued to monitor infection prevalence at Emmonak which resulted in infection rates of 22%, 24%, 16% and 17% for the years 2004 through 2007 respectively. Sampling was also continued at two terminal spawning locations including the Chena and Salcha rivers (Hayes et al. 2006).

The research was designed to track changes in the baseline rate, test feasibility of non-lethal sampling techniques, and assess spawning success of infected versus uninfected Chinook salmon. Tissues used for non-lethal sampling did not contain the organism concentrated enough to detect at realistic levels and therefore lethal samples of heart tissue remained the standard. Spawning success was evaluated based on a classification of gamete expulsion including spawned out, partially spawned out and did not spawn. Samples collected (n=654) from female Chinook salmon from the spawning grounds in 2004 through 2006 indicated that 16% of the sample were infected with *Ichthyophonus,* while 84% were uninfected. Of these salmon only 19% of the infected and 15% of the uninfected salmon were classified as partially spawned out and 7% of the infected and 6% of the uninfected were classified as did not spawn. The comparisons between spawning success of infected and uninfected Chinook salmon, based on samples collected from 2004 through 2006, do not appear significantly different (Kahler et al. 2007, Kahler et al. *In Prep*).

In 2007, only Emmonak was sampled to maintain the baseline. Samplings was conducted in both Emmonak and Eagle in 2008 but have not been analyzed at this time.

5.2.5 Kuskokwim Chinook

The Kuskokwim management area includes the Kuskokwim River drainage, all waters of Alaska that flow into the Bering Sea between Cape Newenham and the Naskonat Peninsula, as well as Nelson, Nunivak, and St Matthew Islands. The management area is divided into 5 districts. District 1, the lower Kuskokwim District, is located in the lower 125 miles of the Kuskokwim River from Eek Island upstream to Bogus Creek. District 2 is about 50 miles in length and is located in the middle Kuskokwim River from above District 1 to the Kolmokov River near Aniak. An upper Kuskokwim River fishing district, District 3, was defined at Statehood, but was discontinued in 1966. Salmon returning to spawn in the Kuskokwim River are targeted by commercial fishermen in District 1 and 2, although District 2 has been inactive for commercial fishing since the late 1990's. District 4, the Quinhagak fishing district, is a marine fishing area that encompasses about 5 miles of shoreline adjacent to the village of Quinhagak. The Kanektok and Arolik Rivers are the primary salmon spawning streams that enter District 4. District 5, the Goodnews Bay fishing district, a second marine fishing area, was established in 1968. District 5 encompasses the marine water within Goodnews Bay. The Goodnews River (while not included in the district itself) is the major salmon spawning stream that enters District 5 (Clark et al 2006). Mainland streams north of the Kuskokwim River and streams of Nelson, Nunivak, and St Matthew Islands are not typically surveyed for salmon.

The BOF designated Kuskokwim River Chinook salmon as stocks of yield concern in 2000 because of the chronic inability to maintain near average yields despite specific management actions taken annually. The designations were discontinued in 2007 as harvestable surpluses of Chinook salmon have been at or above historical averages since 2002.

Management of Kuskokwim area salmon fisheries is complex. Annual run sizes and timing is often uncertain when decisions must be made, mixed stocks are often harvested weeks and hundreds of miles from their spawning grounds, allocative issues divide downriver and upriver users as well as subsistence, commercial, and sport users, and the Kuskokwim area itself is immense. In 1988, the BOF formed the Kuskokwim River Salmon Management Working Group in response to users seeking a more active role in management of fisheries. Working group members represent the various interests and geographic locations throughout the Kuskokwim River who are concerned with salmon management. The Working Group is primarily active in the inseason management of Kuskokwim River salmon fisheries. Over the last 10 to 20 years, the fishery management program in the Kuskokwim area has become both more precautionary and more complex with the addition of several BOF management plans, improved inseason and postseason stock status information, and more intensive inseason involvement by user groups in the salmon fisheries management process (Clark et al 2006). Escapement of salmon stocks have been sustained at a high level, and the large subsistence fishery has been sustained, while the commercial salmon fisheries of the Kuskokwim have been greatly reduced as a result of declining markets and participation and more precautionary management approaches implemented over the last 10 years.

5.2.5.1 Stock assessment and historical run estimates

Inseason management of the various Kuskokwim area salmon fisheries is based on salmon run abundance and timing factors, including data obtained through the Bethel test fishery, subsistence harvest reports, tributary escapement monitoring projects, and when available, commercial catch per unit effort data (Clark et al 2006).

Assessment of salmon escapement using aerial surveys has been conducted in the Kuskokwim Area since the late 1950s, and forms the most extensive escapement time series available. Water bodies are typically surveyed only one time each season, and are intended to index relative abundance of salmon escapement, as opposed to providing an estimate of total escapement (Molyneaux and Brannian 2006). Additionally, salmon escapements are monitored in eight streams in the area using weirs and in one stream (Aniak River) using sonar, although sonar does not specifically monitor Chinook salmon. Most of the streams have been monitored since the early to late 1990's, and in some cases the time series includes years in which the monitoring was done with counting towers instead of weirs. Data is also available from two recent radiotelemetry and mark-recapture studies that estimate abundance of Chinook in the Holitna River drainage and the Kuskokwim River from the Aniak River upstream. Fig. 5-18 illustrates the location of escapement projects in the management area.

ADF&G staff are in the final stages of developing total inriver run reconstruction from 1976 through 2007 based on 6 years of tagging studies that will be used to scale and abundance index from 1976 to 2007.

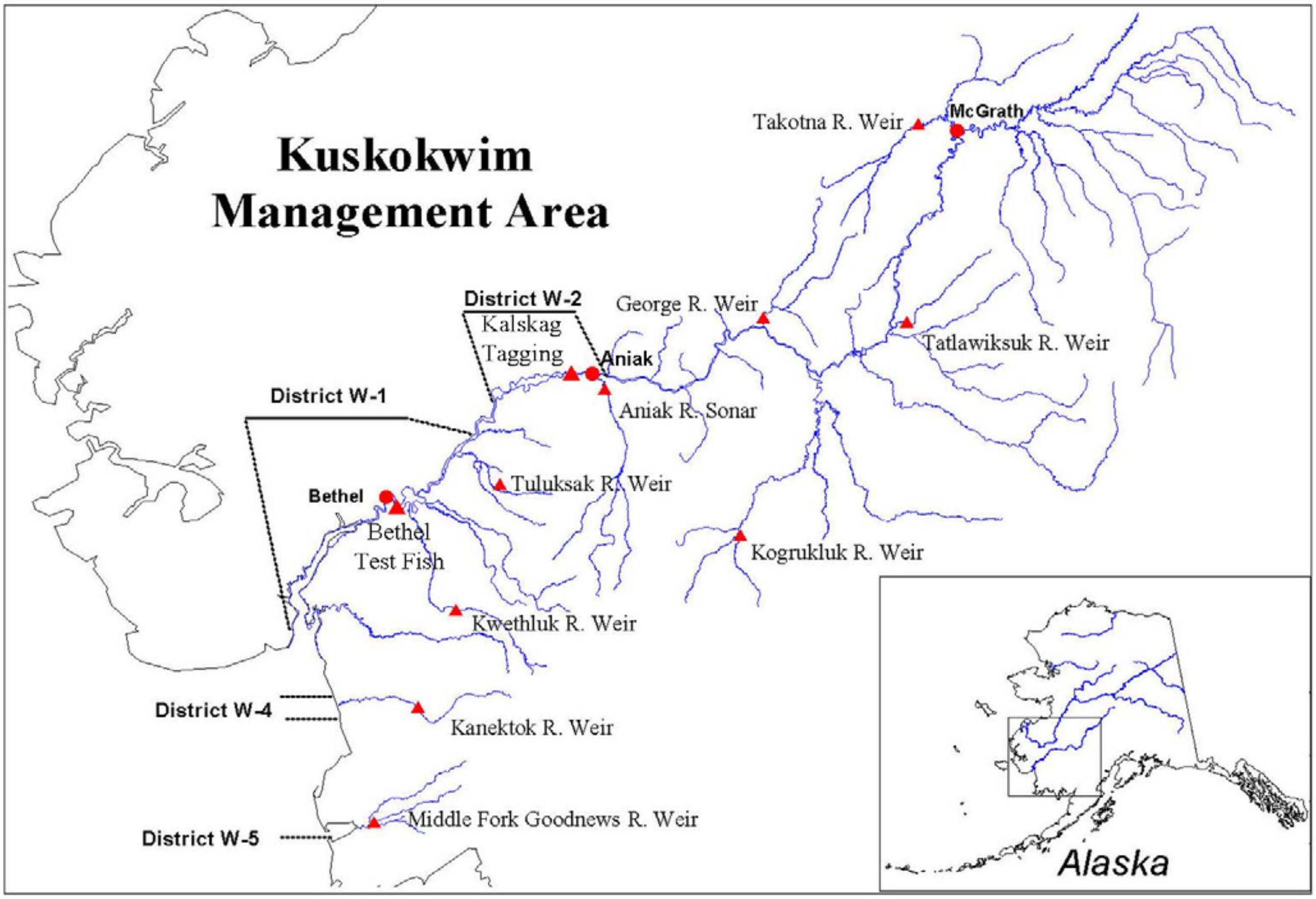


Fig. 5-18 Escapement projects in the Kuskokwim management area.

ADF&G has identified escapement goals for Chinook salmon in the Kuskokwim management area, which are listed in Table 5-11.

Table 5-11 Summary of Kuskokwim area Chinook salmon stocks with escapement goals.

Stock Unit	Enumeration Method	Goal	Type	Year established
Aniak River	aerial survey	1,200-2,300	SEG	2005
Cheeneetnuk River	aerial survey	340-1,300	SEG	2005
Gagaryah River	aerial survey	300-830	SEG	2005
George River	weir	3,100-7,900	SEG	2007
Holitna River	aerial survey	970-2,100	SEG	2005
Kisaralik River	aerial survey	400-1,200	SEG	2005
Kogrukluk River	weir	5,300-14,000	SEG	2005
Kwethluk River	weir	6,000-11,000	SEG	2007
Salmon River (Aniak drainage)	aerial survey	330-1,200	SEG	2005
Salmon River (Pitka Fork)	aerial survey	470-1,600	SEG	2005
Tuluksuk River	weir	1,000-2,100	SEG	2007
Goodnews River (Middle Fork)	weir	1,500-2,900	BEG	2007
Goodnews River (North Fork)	aerial survey	640-3,300	SEG	2005
Kanektok River	aerial survey	3,500-8,000	SEG	2005

Table 5-12 and Table 5-13 provide historical counts of Chinook salmon escapement from aerial surveys and the Kogrukluk weir.

Chinook salmon escapements were evaluated through aerial surveys on 13 index streams, by enumeration at weirs on 6 tributary streams, and through a mark and recapture at the mainstem tagging project near Upper Kalskag. Fig. 5-19 illustrates the Kuskokwim River Chinook salmon index for 1975-2006, which is a composite of median historical escapements for the 13 possible aerial survey index streams. Chinook escapements in 2007 were average to above average at nearly all monitored sites with the exception of Tuluksak River, where escapement was below average. Kogrukluk River Chinook escapement was within the escapement goal range and all aerial survey escapement goals were either exceeded or were within their respective escapement goal ranges. Weir based Chinook salmon escapement goals were established for the Kwethluk, Tuluksak, and George Rivers in 2007. The Kwethluk River escapement goal was exceeded, the Tuluksak River escapement goal was not achieved, and escapement to the George River was within the escapement goal range (ADF&G 2007a).

Table 5-12 Aerial survey counts of Chinook salmon in Kuskokwim River spawning tributary index areas and Kogrukluk weir Chinook salmon passage, 1975 - 2007.

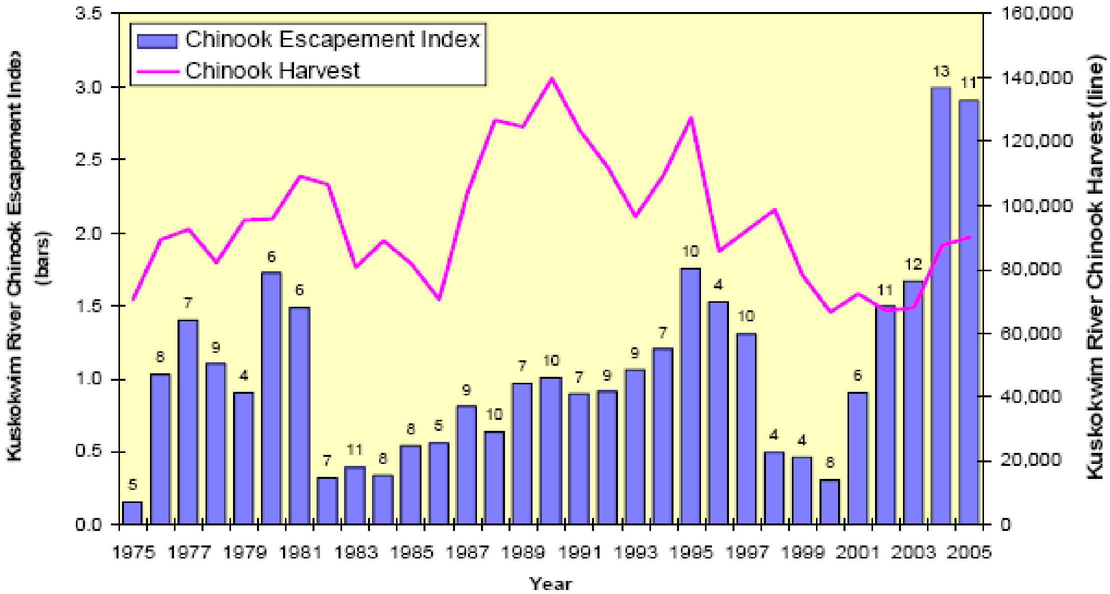
Year	Lower Kuskokwim River [a]				Middle Kuskokwim River [a]							Upper Kuskokwim River [a]		
	Eek	Kweth-luk Canyon C.	Kisara-lik	Tuluk-sak	Aniak	Kip-chuk (Aniak)	Salmon (Aniak)	Holo-kuk	Oska-walik	Holitna	Kogruk-luk Weir	Gagaray ah	Chee-neetnuk	Salmon (Pitka)
1975					202	94								
1976		997								2,571	5,579	663		
1977		1,116		439				60				897	1,407	1,940
1978		1,722	2,417	403			322			2,766	13,667	504		1,100
1979								45			11,338			682
1980	2,378			1,035			1,186							1,450
1981		2,034	672		9,074						16,655			1,439
1982		471	81					42		521	10,993			413
1983	188			202	1,909		231	33		1,069				572
1984											4,926		1,177	545
1985	1,118	51	63	142				135			4,619		1,002	620
1986					424		336	100		650	5,038		317	
1987	1,739					193	516	210	193			205		
1988	2,255		869	188	954		244		80		8,506			473
1989	1,042	610	152		2,109	994	631				11,940			452
1990			631	200	1,255	537	596	157	113		10,218			
1991	1,312		217	358	1,564	885	583				7,850			
1992					2,284	670	335	64	91	2,022	6,755	328	1,050	2,536
1993					2,687	1,248	1,082	114	103	1,573	12,332	419	678	1,010
1994			1,243			1,520	1,218				15,227	807	1,206	1,010
1995			1,243		3,171	1,215	1,446	181	326	1,887	20,630	1,193	1,565	1,911
1996							985	85			14,199			
1997					2,187	855	980	165	1,470	2,093	13,280		345	
1998	522	126	457		1,930	443	557							
1999								18	98		5,570			
2000					714	182	238	42		301	3,181			362
2001							598		186	1,130	9,298	143		1,033
2002		1,795	1,727			1,615	1,236	186	295	1,578	10,059	452		1,255
2003	1,236	2,628	654	94	3,514	1,493	1,242	528	844		11,760	1,095	810	1,241
2004	4,653	6,801	6,913	1,196	5,569	1,868	2,177	539	293	4,842	19,503	670	918	1,138
2005		5,059	4,112	672		1,944	4,097	510	582	2,795	21,993	788	1,155	1,809
2006			4,734		5,639	1,618		705	386	3,924	19,398	531	1,015	928
2007			1,373	173	3,984	2,147	1,458	146			13,070	1,035		1,014
Escapement Goal:			400-1,200		1,200-2,300		330-1,200			970-2,100	5,300-14,000	300-830	340-1,300	470-1,600
Median[b]	1,312	997		280		778		82	103					

[a] Estimates are from "peak" aerial surveys conducted between 20 and 31 July under fair, good, or excellent viewing conditions.
[b] Median of years 1975 through 1994.

Table 5-13 Peak aerial survey counts from Kuskokwim Bay[a] spawning tributaries, 1966 - 2007.[b]

Year	Kanektok River	Middle Fork Goodnews River	North Fork Goodnews River
1966	3,718		
1967			
1968	4,170		
1969			
1970	3,112		
1971			
1972			
1973	814		
1974			
1975			
1976			
1977	5,787		
1978	19,180		
1979			
1980		1,164	1,228
1981			
1982	15,900	1,546	1,990
1983	8,142	2,500	2,600
1984	8,890	1,930	3,245
1985	12,182	2,050	3,535
1986	13,465	1,249	1,068
1987	3,643	2,222	2,234
1988	4,223	1,024	637
1989	11,180	1,277	651
1990	7,914		626
1991			
1992	2,100	1,012	875
1993	3,856		
1994	4,670		
1995	7,386		3,314
1996			
1997		1,447	3,611
1998	6,107	731	578
1999			
2000	1,118		
2001	6,483	3,561	2,799
2002		1,470	1,195
2003	6,206	1,210	2,015
2004	28,375	2,617	7,462
2005	14,202		
2006	8,433		4,159
2007			
Escapement Goal:	3,500 - 8,000		640 - 3,300

[a] Kuskokwim Bay includes mainland coastal streams, excluding the Kuskokwim River, and incorporating commercial fishing District 4 near the community of Quinhagak, and District 5 of Goodnews Bay.
[b] Estimates are from "peak" aerial surveys conducted under fair, good, or excellent viewing conditions.



Note: The Kuskokwim River Chinook salmon escapement index is a composite of median historical escapements for the 13 possible aerial survey index streams (from Sandone 2007).

Fig. 5-19 Kuskokwim River Chinook Salmon Escapement Index, 1975-2005.

Data collected since 2002 are available to estimate the total run of Chinook salmon to the Kuskokwim River (Table 5-14). Annual total in-river run of Chinook salmon for 2002-2005 is estimated as total catch plus drainage-wide escapement upstream of the Eek River confluence (Eek River was excluded because of its proximity downstream of nearly all commercial and subsistence fishing). Escapement was estimated each year from the 2002-2005 radio tag mark-recapture estimates, coupled with the array of escapement projects in the drainage. The estimates provided here likely underestimate the actual total abundance (Doug Molyneaux, pers. comm., 3-16-08). A more formal historical total inriver run reconstruction is currently in development (Doug Molyneaux, pers. comm., 10-23-08).

Kuskokwim River Chinook salmon abundance is generally on a decline following a period of exceptionally high abundance years in 2004, 2005, and 2006 that ranged from 360,000 to 425,000 fish (Fig. 5-20). Abundance is estimated to have decreased in 2007 to about 250,000 fish, and may have declined a bit more in 2008 to about 225,000 fish. The 2007 and 2008 values are preliminary considering that the subsistence harvests estimates are not yet available. Annual subsistence harvest averages about 72,000 fish +/- 9,000. Kuskokwim River Chinook salmon were designated by the BOF as a Stock of Yield Concern in September 2000, but the designation was lifted in January 2007.

Kuskokwim Area Chinook salmon abundance in the 2008 season was expected to be about average, and comparable to 2007; inseason indicators suggested that to be the case, but actual abundance was lower than expected. Achievement of tributary escapement goals was mixed with six of 11 streams falling below goal, six within their respective escapement goal ranges, and two above range. Kuskokwim River subsistence harvest needs are thought to have been met, and there is some speculation that subsistence harvest may have been above average in partial compensation for sharp increases in local fuel and food costs. A modest Kuskokwim River commercial harvest of 8,865 fish was allowed in 2008; of note, managers required use of gillnets with six inch or smaller mesh size, which effectively focused harvest on male Chinook salmon that accounted for about 90 percent of the commercial harvest, plus allowed for optimizing concurrent sockeye harvest. Overall Chinook salmon preliminary estimate of the exploitation rate in 2008 is near 40%, compared to the 10-year average of 29%. Subsistence fishermen target king salmon by use of gillnets with 8 inch or larger mesh size. Additionally, Chinook salmon commercial harvest in Kuskokwim Bay districts were below average in 2008.

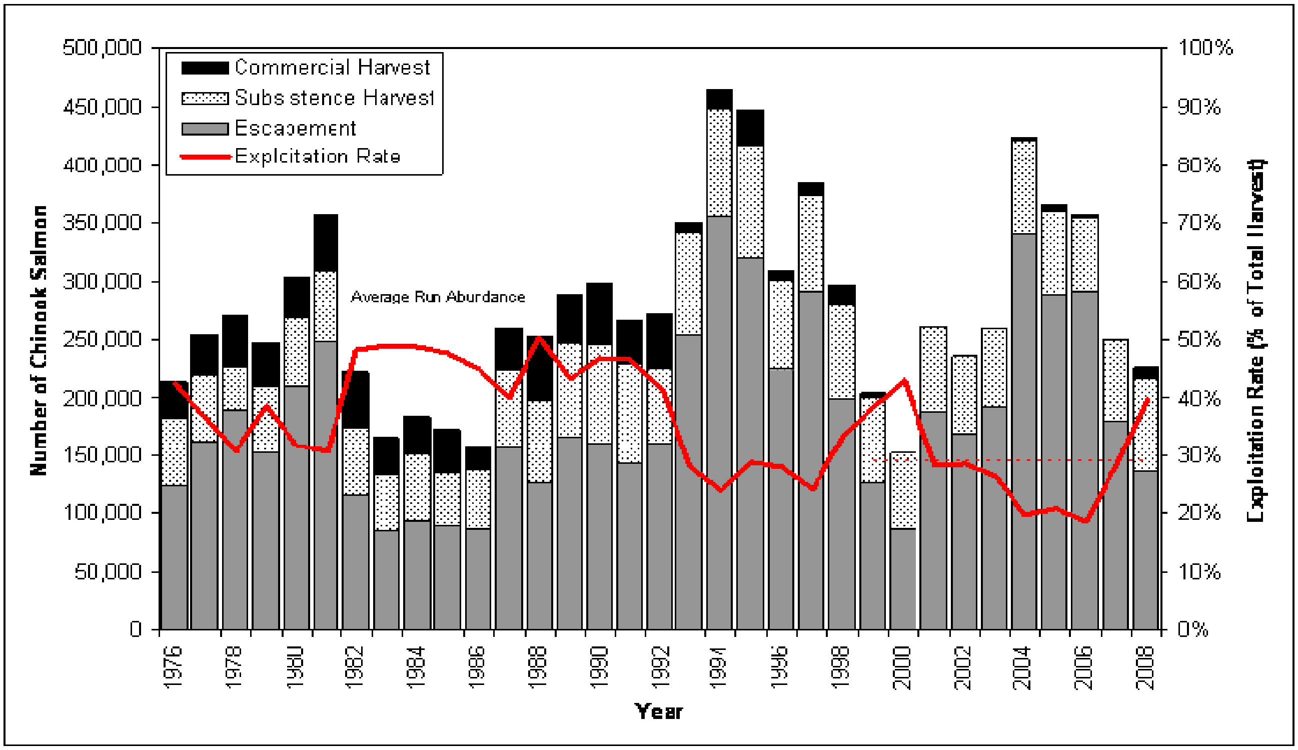


Fig. 5-20 Preliminary Kuskokwim River Chinook salmon run reconstruction and exploitation rate, 1976-2008. 2007 and 2008 data are preliminary.

Table 5-14 Run reconstruction for Kuskokwim River Chinook salmon (from Molyneaux and Brannian 2006)

	Run component	Enumeration Method	2002	2003	2004	2005
Harvest	Subsistence		66,807	67,788	80,065	68,213
	Commercial		72	158	2,300	4,825
	Sport		300	401	330	330
	TOTAL		67,179	68,347	82,695	73,368
Escapement	Kwethluk River	weir	8,502	14,474	28,605	22,217 [a]
	Kisaralik River	estimate [b]	8,500	14,500	28,600	22,200
	Tuluksak River	weir	1,346	1,064	1,479	2,653
	Aniak River	estimate [c]	21,451	21,007	40,981	36,345
	Mainstem upstream of Aniak River	radiotelemetry	100,733	103,161	146,839	144,953
	TOTAL		140,532	154,206	246,504	228,368
Total Abundance Statistics	Total Abundance		207,711	222,553	329,199	301,737
	Annual exploitation (minimum)		32%	31%	25%	24%

[a] Kwethluk River escapement in 2005 was estimated as an expanded aerial survey count.
[b] Chinook salmon escapement into the Kisaralik is estimated to be equal to the Kwethluk River weir count.
[c]Chinook escapement into the Aniak is estimated as 50% of the radiotelemetry estimate for the Holitna River based on subjective judgment.

5.2.5.2 Forecasts and precision of estimates

ADF&G does not produce formal forecasts for salmon runs in the Kuskokwim region, due to lack of information with which to develop rigorous forecasts. Commercial harvest outlooks are typically based upon available parent year spawning escapement indicators, age composition information, recent year trends, and the likely level of commercial harvest that can be expected to be available from such indicators, given the fishery management plans in place. Fisheries are managed based upon inseason run assessment.

5.2.6 Bristol Bay Chinook: Nushagak River

There are five discrete commercial fishing districts in Bristol Bay: the Ugashik, the Egegik, the Naknek-Kvichak, the Nushagak, and the Togiak (Fig. 5-21). Harvests of Chinook salmon predominantly occur in the Nushagak District, because one of the largest runs of Chinook salmon in Alaska spawns in the Nushagak River. However, salmon management in Bristol Bay is primarily directed at the commercially harvested sockeye salmon which are found throughout the Bay.

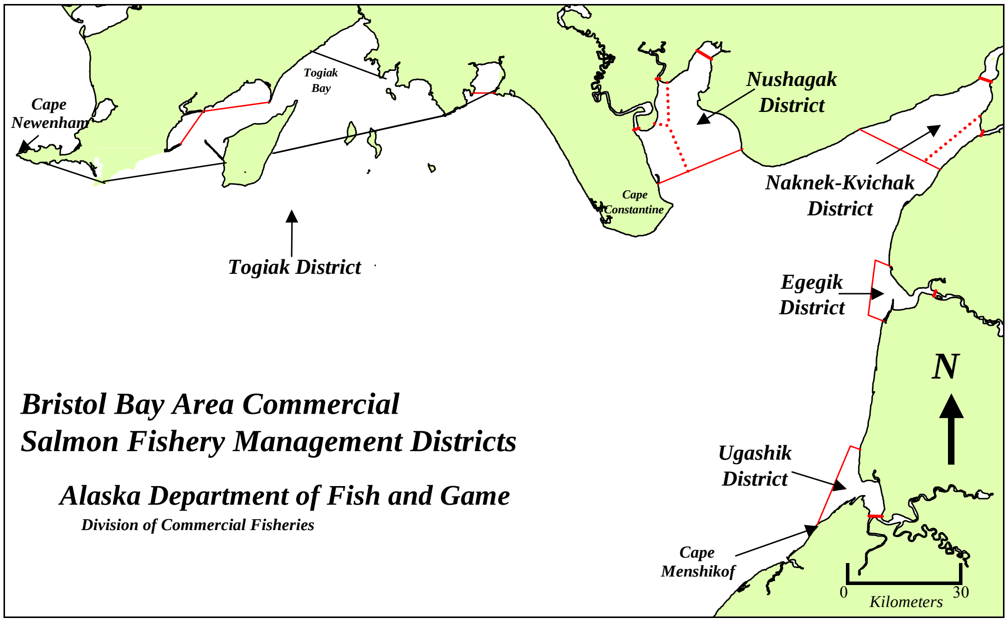


Fig. 5-21 Bristol Bay area commercial salmon fishery management districts.

5.2.6.1 Stock assessment and historical run estimates

Chinook salmon run timing is earlier than the sockeye salmon, and early season fishery management decisions relative to time and area of commercial openings are often based on the status of Chinook salmon runs, particularly in the Nushagak District. The Nushagak River is very large and the water in the lower river is too turbid to visually count salmon from a tower. The River supports large numbers of all five species of salmon. Chinook salmon escapements averaged approximately 100,000 from 1997-2006 (Table 5-15). A side scan sonar-based salmon enumeration program has been used since 1979 to estimate salmon escapements into the Nushagak River near Portage Creek during the summer. Test fishing on site is used to apportion sonar-based counts by species. It is believed that some migration by Chinook salmon takes place further from shore than the sonar beam reaches. Therefore Chinook salmon escapements as estimated by the sonar assessment effort are probably biased low. Inseason information is used on a daily basis to update preseason stock forecasts in an effort to better gauge run strengths and make appropriate decisions regarding openings and closures of the commercial fishery. Postseason assessment involves updating brood tables and determining if management met the stock escapement objectives, while still allowing sufficient fishing opportunity for salmon surplus to escapement needs (Clark et al 2006).

There are three escapement goals for Chinook salmon. A SEG is set for Nushagak River at 40,000-80,000 Chinook salmon counted by sonar. For the Togiak River, a SEG is set at a lower bound of 9,300 and no upper bound. The Naknek River also has a SEG set at a lower bound of 5,000 with no upper bound. Table 5-15 provides a summary of escapement and total run size for Chinook salmon in the Nushagak District, from 1987-2007. Table 5-16 provides the same information for Chinook salmon in the Togiak District. Escapement data is not available for the Naknek River. Data for 2007 is preliminary.

Approximately 63,000 Chinook salmon were harvested in Bristol Bay in 2007, this is 92% of the average harvest for the last 20 years. It is significantly below the preseason expected harvest of 145,000. Chinook salmon harvests in Bristol Bay districts were below average in every district except Nushagak. Directed fishing for Chinook in the Nushagak District in the early part of the season produced approximately 2,100 Chinook until management was switched to sockeye salmon based on the increasing abundance of that species. Several planned directed Chinook openings did not occur because Chinook escapement into the Nushagak River was below desired levels. Catches of Chinook increased in the Nushagak District to the point where a near average harvest was achieved, but this catch was incidental to the directed sockeye fishery. The final Chinook escapement of 60,494 was less than the 75,000 inriver goal established in the Nushagak Mulchatna King Salmon Management Plan, but within the SEG range. Runs of Chinook salmon to all districts were below average and exhibited late run timing (ADF&G 2007b).

Chinook returns to the Nushagak River consist primarily of age 1.2, 1.3, and 1.4 (Table 5-17).

Table 5-15 Chinook salmon harvest, escapement and total runs in the Nushagak District, in numbers of fish, Bristol Bay, 1987–2007 (from Sands et al in prep).

Year	**Total Harvest** (commercial, sport, subsistence)	**Inriver Abundance** [a]	**Spawning Escapement** [b]	**Total Run**
1987	62,608	84,309	75,924	138,532
1988	29,545	56,905	50,945	80,490
1989	29,373	78,302	72,600	101,973
1990	30,705	63,955	55,931	86,636
1991	38,896	104,351	94,733	133,629
1992	65,906	82,848	74,094	140,000
1993	86,585	97,812	86,705	173,290
1994	145,597	95,954	83,102	228,699
1995	98,595	85,622	77,018	175,613
1996	93,343	52,127	42,227	135,570
1997	82,971		82,000	164,971
1998	135,164	117,495	108,037	243,201
1999	25,187	62,331	54,703	79,890
2000	27,542	56,374	47,674	75,216
2001	44,406	99,155	83,272	127,678
2002	54,447	87,141	79,790	134,237
2003	66,891	80,028	68,606	135,497
2004	123,024	116,400	105,442	228,466
2005	83,265	172,559	161,528	244,793
2006	102,325	124,683	116,088	218,413
20-Year Ave.	**71,319**	**90,440**	**81,021**	**152,340**
1987-96 Ave.	**68,115**	**80,219**	**71,328**	**139,443**
1997-06 Ave.	**74,522**	**101,796**	**90,714**	**165,236**
2007	71,365	60,464	50,594	121,959

Note: Blank cells represent no data.
[a]Inriver abundance estimated by sonar below the village of Portage Creek.
[b]Spawning escapement estimated from the following: 1997 comprehensive aerial surveys. 1986–1996, 1998–2005 - Inriver abundance estimated by sonar minus inriver harvests.
[c]Data unavailable at the time of publication. A 5-year average is reported.

Table 5-16 Chinook salmon harvest, escapement and total runs in the Togiak District, in numbers of fish, Bristol Bay, 1987–2007 (from Sands et al in prep).

Year	Total Harvest (Commercial, Sport[a], Subsistence)	Spawning Escapement[b]	Total Run
1987	18,054	11,000	29,054
1988	16,035	10,000	26,035
1989	12,151	10,540	22,691
1990	11,782	9,107	20,889
1991	6,793	12,667	19,460
1992	14,272	10,413	24,685
1993	11,860	16,035	27,895
1994	12,053	19,353	31,406
1995	13,010	16,438	29,448
1996	9,863	11,476	21,339
1997	7,946	11,495	19,441
1998	15,676	11,666	27,342
1999	13,807	12,263	26,070
2000	9,444	16,897	26,341
2001	12,555	15,185	27,740
2002	3,580	14,265	17,845
2003	5,145	5,668 [c]	10,813
2004	11,792	15,990	27,782
2005	13,867	13,521	27,388
2006	18,919	1,670 [c]	20,589
20-Year Ave.	**11,930**	**12,282**	**24,213**
1986-95 Ave.	**12,587**	**12,703**	**25,290**
1996-05 Ave.	**11,273**	**11,862**	**23,135**
2007	9,981	[c]	9,981

[a]Sport fish harvest estimate only includes the Togiak River Section.
[b]Spawning escapement estimated from comprehensive aerial surveys. Estimates for 1987–1988 are rounded to the nearest thousand fish.
[c]Partial survey.
[d]Estimate.

Table 5-17 Nushagak River Chinook spawning escapement and return, by brood year (expressed as a percentage).

Brood Year	Spawning Escapement	Age Group 1.1	1.2	1.3	1.4	1.5	Total %
1986	33,854	0.0	19.8	41.3	37.0	1.6	100
1987	75,891	0.3	21.8	33.0	41.8	3.0	100
1988	50,946	0.3	17.6	30.2	50.8	1.0	100
1989	72,601	1.0	19.1	38.9	39.2	1.7	100
1990	55,931	0.6	33.5	36.2	29.0	0.6	100
1991	94,733	0.8	27.9	39.7	29.5	2.0	100
1992	74,094	0.5	16.6	29.6	52.7	0.4	100
1993	86,706	0.9	22.2	57.3	18.6	1.0	100
1994	83,103	1.3	24.4	30.7	40.1	3.6	100
1995	77,018	1.1	14.4	26.2	54.9	3.1	100
1996	42,228	0.5	16.8	31.2	49.7	1.6	100
1997	82,000	0.3	24.7	40.7	33.2	1.0	100
1998	108,037	0.3	20.4	37.4	40.6	1.2	100
1999	54,703	0.3	15.6	44.9	38.5	0.7	100
2000	47,674	0.2	21.8	43.1	34.6	0.2	100
2001	83,272	0.1	27.9	52.1	20.0	0.0	
2002	79,790	[a]	[a]	[a]	[a]	[a]	
2003	67,993	[a]	[a]	[a]	[a]	[a]	

[a] Incomplete returns from brood year escapement.

Source: Tim Baker, ADF&G.

5.2.6.2 Forecasts and precision of estimates

The 2008 age composition of total run was 1% (929) age-1.1, 27% (35,676) age-1.2, 43% (56,260) age-1.3, 28% (36,534) age-1.4 and 1% (1,384) age-1.5%. Age composition of the forecasted run was <1% (<1,000) age-1.1, 33% (53,000) age-1.2, 35% (56,000) age-1.3, 30% (48,000) age-1.4, and 1% (2,000) age-1.5. The forecast is the sum of individual predictions of five age classes, which were calculated from models based on the relationship between adult returns and spawners or siblings from previous years. The number of age-1.1 (929 vs. 1,000), age-1.3 (56,620 vs. 56,000) and age-1.5 (1,384 vs. 2,000) Chinook salmon were similar to the forecast, while the number of age-1.2 (35,676 vs. 53,000) and age-1.4 (36,534 vs. 48,000) were less than the forecast.

The forecasts have varied widely in the last 5 years (2003-2007). The forecast run differences have ranged from 59% below in 2004 to 41% above in 2007. Overall, there has been a tendency for the forecasts to be biased low and expected harvests to be high. The five previous total run forecasts have averaged 3% below the total run.

Chinook salmon run strength in the Togiak River declined between 1994 and 1997, from a total run of 26,000 fish in 1994 down to 18,000 fish in 1997. For the last 5 years of complete surveys, escapement estimates have averaged over 11,300 Chinook salmon and have all exceeded 9,500, within 5% of the 10,000 fish escapement goal. Adequate yearly Chinook escapement can be attributed to reductions in the weekly fishing schedule during late June.

The 2008 total run of Chinook salmon to the Nushagak River was 130,783. The total run was 29,817 (18%) less than the forecast of 160,000 Chinook salmon, 15% less than the recent 20-year (1988-2007) average of 153,358 and 19% less than the recent 10-year (1998-2007) average of 162,179 (Fig. 5-22).

The spawning escapement in the Nushagak River was 88,452 Chinook salmon which exceeded the sustainable escapement goal (SEG) range of 40,000-80,000. A total of 42,331 Chinook salmon were harvested in the commercial (18,618), subsistence (16,642) and sport (7,071) fisheries in the Nushagak District and River. The commercial harvest of 18,618 Chinook salmon was 67% far below the anticipated harvest of 56,000 Chinook salmon. The anticipated harvest was estimated based on an average exploitation rate of 35% in the Nushagak District commercial salmon fishery from 2003-2007. When management of the commercial fishery shifted from being based on the preseason forecast to inseason escapement data, no further directed openings occurred because of the late run timing and indications that the run was less than forecasted. The actual exploitation rate in 2008 was 14%. The commercial harvest in 2008 was one of smallest harvests of Chinook salmon in the Nushagak District since 1966; only Chinook salmon harvests in 1999 (10,893), 2000 (12,055) and 2001 (11,568) have been smaller.

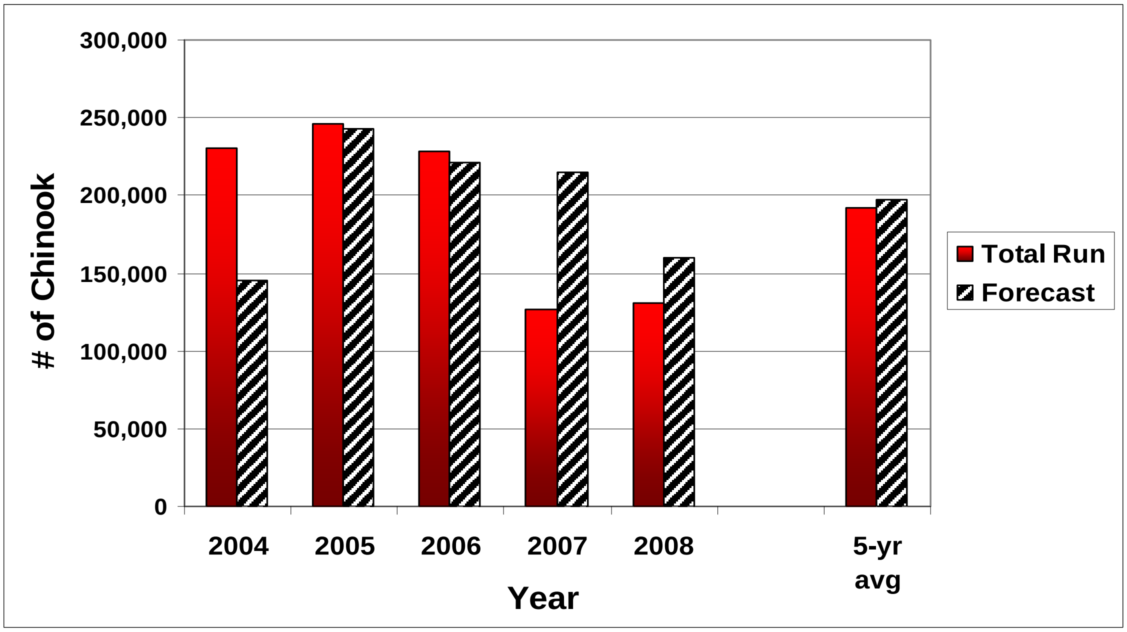


Fig. 5-22 Observed versus forecasted total Chinook salmon runs, Nushagak River, 2004-2008 and 5-year average. 2008 data are preliminary. From ADF&G 2008.

5.2.7 Gulf of Alaska stocks

5.2.7.1 Cook Inlet

The Cook Inlet management area is divided into 2 areas, the Upper Cook Inlet (northern and central districts) and the Lower Cook Inlet (see Fig. 5-23). Inseason management of Cook Inlet commercial salmon fisheries is based upon salmon run abundance and timing indicators. Catch data, catch per effort data, test fish data, catch composition data, and escapement information from a variety of sources is used to assess stock strength on an inseason basis. For Chinook salmon, surveys are made to index escapement abundance (Clark et al 2006).

There are three biological escapement goals (Kenai River early and late runs, Deshka River) and 18 sustainable escapement goals in effect for Chinook salmon spawning in Upper Cook Inlet. After experiencing a significant downturn in the early to mid-1990s, Northern District Chinook salmon stocks trended sharply upward and most escapement goals were being met or exceeded through 2006. For the years 2000-2004, for the 15 Upper Cook Inlet populations with the most complete escapement observations, 97% of observed escapement exceeded the lower end of the escapement goal range (Clark et al 2006). Late-run Kenai River Chinook salmon runs are estimated by sonar, and have been relatively stable.

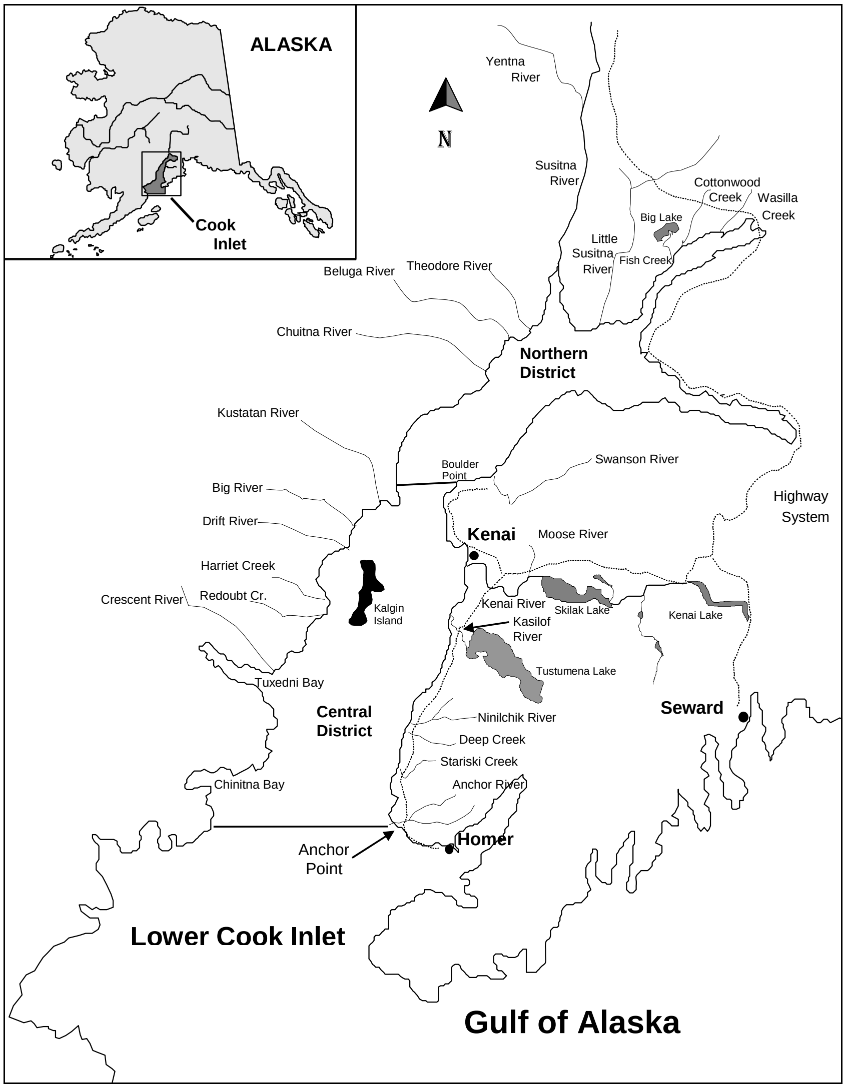


Fig. 5-23 Major Tributaries of the Cook Inlet Basin.

From 2004-2006, there were 5 occurrences when the lower end of the escapement goal was met for the 63 escapement observations (Fair et al 2007). Note this was based on 21 current escapement goals. The South Fork of Eagle River no longer has a Chinook escapement goal. The recent 5-year average commercial harvest was used to forecast the harvest of Chinook salmon in 2008 for the Upper Cook Inlet. The commercial harvest estimate for Chinook salmon is 23,000 fish.

There are 3 SEGs in effect for Chinook in the Lower Cook Inlet. Chinook salmon is not normally a commercially important species in the Lower Cook Inlet. The 2007 harvest totaled just under 500 fish, of which virtually all came from the Halibut Cove Subdistrict (Nelson et al 2008). Very little escapement information is available for this area.

5.2.7.2 Southeast Alaska Stocks

Chinook salmon are known to occur in 34 rivers in the Southeast region of Alaska, or draining into the region from British Colombia or Yukon Territory, Canada (known as transboundary rivers). Harvest in Southeast Alaska occurs under the Pacific Salmon Treaty (described further in chapter 1). Eleven watersheds have been designated to track spawning escapement, and counts of these 11 stocks are used as indicators of relative salmon abundance as part of a coast-wide Chinook model. The Taku, Stikine, and Chilkat rivers together make up over 75% of the summed escapement goals in the region. Escapement on the Taku River remains low relative to the 1990-1999 average, but escapement to the Stikine River has increased greatly since 1999 (Pahlke 2007).

Table 5-18 Escapement goals for large Chinook salmon, Southeast Alaska and transboundary rivers, and total escapement as a percentage of escapement point estimates, averaged by decade (from Pahlke 2007).

River	Biological Escapement Goal	Escapement Point Estimate	Average percent of goal (point estimate) achieved 1977-1979	1980-1989	1990-1999	2000-2004
Alsek	5,500-11,500	8,500	163%	122%	159%	89%
Taku	30,000-55,000	36,000	63%	92%	154%	125%
Stikine	14,000-28,000	17,500	59%	140%	166%	265%
Situk	450-1,050	730	175%	148%	215%	158%
Chilkat	1,750-3,500	2,200			228%	175%
Andrew Creek	650-1,500	800	52%	108%	148%	256%
Unuk	3,250-7,000	4,000	111%	178%	103%	157%
Chickamin	2,325-4,650	2,700	45%	126%	60%	132%
Blossom	1,000-2,000	1,200	27%	153%	53%	57%
Keta	750-1,500	900	93%	174%	79%	100%
King Salmon R	120-240	150	89%	145%	141%	92%
TOTAL	59,796-115	75,945	74%	113%	149%	156%
Expanded region total[a]	66,440-128,826	83,383				

[a] Index escapements are expanded by average expansion factors, except weir counts or mark-recapture estimates are not expanded.

The Chinook salmon quota for Southeast Alaska, all gears, was in 2006 was 329,400. In addition, a harvest sharing agreement with Canada under the treaty allows harvest in the Stikine River; the US allocation in 2006 was 13,350 fish. There was no directed fishery for Chinook salmon on the Taku River in 2006 due to low forecast returns (Nelson et al 2008).

5.2.8 Pacific Northwest Stocks - ESA-listed Chinook stocks

There are currently nine ESA-listed Chinook salmon evolutionary significant units (ESUs) listed under the ESA. Of the nine listed Chinook salmon ESUs, only the Upper Willamette River (UWR) and Lower Columbia River (LCR) ESUs have been recovered in the BSAI groundfish fishery. No fish from the seven other ESA-listed ESUs have ever been recovered in the BSAI groundfish fishery. This section is therefore limited to a review of information related to the status of those two ESUs.

NMFS initiated an ESA section 7 formal consultation on the Alaska groundfish fisheries, including the BSAI pollock fishery, regarding the potential incidental take of ESA-listed salmon in 2006. In January 2007, the NMFS Northwest Region completed a biological opinion on the effects of the Alaska groundfish fisheries on ESA-listed salmon (NMFS 2007a). The biological opinion concluded that the BSAI groundfish fisheries, including the Bering Sea pollock fishery, are not likely to jeopardize the continued existence or adversely modify critical habitat for the UWR and LCR ESA-listed Chinook salmon stocks. The biological opinion provides consultation covering ongoing management of the BSAI groundfish fisheries, including the annual harvest specifications and current fisheries management to reduce salmon bycatch.

The information provided here is from the 2007 supplemental biological opinion on effects of the BSAI groundfish fishery on ESA-listed salmon and steelhead (NMFS 2007a), recent inseason management data on salmon bycatch, and the 2009 Supplemental Biological Opinion. Additional information related to the status of UWR and LCR Chinook is summarized in biological opinions (NMFS 1999 and NMFS 2005a), in updated status reports of listed ESUs (Good et al. 2005 and McElheny et al. 2007), and in the Interim Regional Recovery Plan for Washington management units of the listed ESUs in the LCR (LCFRB 2004). No critical habitat is designated in Alaska waters for the UWR and LCR Chinook salmon ESA-listed stocks.

Because of the high number of Chinook salmon taken in the BSAI groundfish fisheries in 2007, the NMFS Alaska Region consulted with NMFS Northwest region on the 2007 incidental take of Chinook salmon. The incidental take of Chinook salmon in the 2007 BSAI groundfish fisheries was 129,978 fish (NMFS inseason management data 6/13/08). Even though the number of Chinook salmon incidentally taken in 2007 was higher than seen in previous years, no coded-wire tagged (CWT) ESA-listed salmon stocks have been recovered from the samples of bycaught salmon analyzed to date. Analysis of coded-wire tags collected during the 2007 BSAI groundfish fisheries will be completed in late 2008.

NMFS Sustainable Fisheries, Alaska Region, conducted an ESA Section 7 consultation on the proposed action with NMFS Northwest Region for listed salmon. On December 2, 2009, the NMFS Northwest Region issued a Supplemental Biological Opinion that concluded that the proposed action is not likely to jeopardize Upper Willamette Chinook or Lower Columbia River Chinook, and will have no effect on designated critical habitat for these two species (NMFS 2009).

5.2.8.1 Coded Wire Tag information for ESA-listed Chinook salmon stocks

The primary source of information for the stock specific ocean distribution of Chinook salmon is from CWTs, and particularly their intensive use for management in coast wide salmon fisheries over the last twenty to twenty five years. The NMFS Alaska Region, with assistance from the AFSC Auke Bay Laboratory, recently completed a comprehensive review of CWT recoveries in the BSAI and GOA groundfish fisheries (Mecum 2006a). The CWT analysis was recently updated resulting in some minor revisions to the prior estimates (Mecum 2006b and Balsiger 2008).

In the 2007 biological opinion for Chinook salmon, the incidental take statement for the UWR and LCR ESA-listed Chinook salmon stocks taken by the BSAI groundfish fisheries was based on the range of recent observations of Chinook salmon taken in those fisheries and on the coded-wire tag recoveries of these ESA-listed stocks. Between 2001 and 2006, the incidental take of Chinook salmon in the BSAI groundfish fisheries ranged from 40,547 fish to 87,730 fish (NMFS inseason management data, 6/13/08). Coded-wire tag recoveries for the LCR and UWR ESA-listed Chinook salmon stocks taken in the BSAI groundfish fisheries has ranged from 0 to a few fish between 2001 and 2006 **(**Table 5-19**).** Based on coded-wire tag recoveries of salmon taken in the BSAI groundfish fisheries, salmon from the UWR and LCR ESA-listed Chinook stocks are rarely taken in the BSAI groundfish fisheries.

Chinook salmon from the UWR and LCR ESUs are observed more frequently in the Gulf of Alaska (GOA) groundfish fishery than the BSAI groundfish fishery because the GOA is closer to the streams from which these stocks originate. One observed CWT was recovered from the Upper Columbia River Spring Chinook ESU in the GOA in 1998.

Since 1984 there have been ten and nine observed CWT recoveries in the BSAI groundfish fishery of UWR and LCR Chinook, respectively (Mecum 2006b). This time period (1984-present) includes years before these ESUs were listed under ESA (pre-listing) as well as the years after listing. When observed recoveries are expanded for sampling fraction in the fishery and mark rate (the proportion of the release group that is tagged) the total number of estimated recoveries is 70 UWR Chinook and 17 LCR Chinook (Table 5-19). One or more recoveries were observed in eight out of 24 years for UWR Chinook, and five out of 24 years for LCR Chinook. It is worth noting that these estimated recoveries represent the catch of fish from the ESU that are represented by CWT mark groups, generally from hatchery production. There are often other groups of fish in an ESU that are not represented by marked groups, and thus would not necessarily be observed or represented in the fishery by CWTs. The amount of natural production for the UWR and spring component of the LCR Chinook ESUs is limited, on the order of 10-12% of the total production (JCRMS 2006).

Table 5-19 The bycatch of Chinook salmon in the BSAI groundfish fishery, observed CWT recoveries and total estimated contribution, for LCR and UWR Chinook. Bycatch data from (NMFS 1999, Mecum 2006a, Balsiger 2008); CWT recovery data from (Mecum 2006b and Balsiger 2008 and Adrian Celewycz, personal communication 3/28/08).

		LCR Spring Chinook		UWR Chinook	
Year	Chinook Bycatch	Observed CWT Recoveries	Total Estimated Contribution	Observed CWT Recoveries	Total Estimated Contribution
1984		0	0	1	2.7
1985		0	0	0	0
1986		0	0	0	0
1987		0	0	0	0
1988		0	0	0	0
1989		0	0	0	0
1990	13,990	0	0	0	0
1991	48,880	0	0	0	0
1992	41,955	0	0	0	0
1993	46,014	0	0	0	0
1994	44,487	0	0	0	0
1995	23,436	0	0	0	0
1996	63,205	0	0	1	2.6
1997	50,530	0	0	0	0
1998	58,971	0	0	0	0
1999	14,599	0	0	1	2.2
2000	8,223	0	0	1	2.5
2001	40,548	1	2.7	1	2.7
2002	36,385	1	2.0	2	24.3
2003	54,911	0	0.0	0	0
2004	60,146	3	5.6	1	14.9
2005	74,805	3	5.0	2	17.7
2006	82,678	1	1.7	0	0
2007 Preliminary	130,139	0		0	
Total	893,902	9	17.0	10	69.7

The LCR Chinook ESU includes both spring-run and fall-run life history types. All of the recoveries from the LCR ESU are from spring-run populations. UWR Chinook also have a spring-run life history. This suggests that spring-run populations from the LCR (the Willamette River is a tributary that enters the lower Columbia River near Portland, Oregon) are distinct in having the most northerly distribution, at least among the ESA-listed Chinook from the southern U.S.

The probability that an ESA-listed Chinook salmon will be taken in the BSAI groundfish fishery depends on the duration of the time period considered and the cumulative total Chinook salmon bycatch over that time. The longer the period of consideration, the more likely that take will occur. During 1990-2007, the total catch of Chinook salmon in the fishery was 893,902 (Table 5-19). Based on this and the total estimated recoveries of Chinook from the listed ESUs (70 and 17), the expected number of UWR and LCR Chinook caught per 100,000 Chinook in the BSAI fishery is 7.8 and 1.9 fish, respectively.

From Table 5-19, it is also apparent that recoveries of CWTs from listed LCR and UWR Chinook are also a more recent event. All of the recoveries of LCR spring Chinook have occurred since 2001; eight out of ten recoveries from UWR Chinook have occurred since 1999. Reasons for these recent increases in Chinook bycatch and CWT recoveries are unknown. Because of these changes, more recent observation may be a better source for characterizing expected impacts in the future. From 2001-2007, the catch of Chinook salmon in the fishery has ranged from 36,000 to 130,000 fish, totalling 480,000 fish. The estimated number of CWT recoveries in those years has ranged from 0 to 24 per year, and totalled 60 recoveries for UWR Chinook and 17 recoveries for LCR Chinook (Table 5-19). Based on these more recent observations, the expected number of UWR and LCR Chinook caught per 100,000 Chinook in the fishery is 12.5 and 3.5 fish, respectively.

Not all fish caught in the BSAI fisheries would have been expected to survive to return to spawn because of subsequent natural mortality had they not been caught in the fishery. The parameter used to characterize the expected mortality of immature fish is referred to as the adult equivalency rate; this represents the proportion of the fish caught that would be expected to return to spawn absent further fishing. The adult equivalency rate is age specific - about 60% for age-3 fish, and about 85% for age-4 fish (pers. Com. Dell Simmons, Pacific Salmon Treaty, Chinook Technical Committee co-chair, December 12, 2006). The CWT information indicates that half the fish caught in the BSAI fishery are roughly age 3 and half are roughly age 4. So for example, if we estimate that 10 listed fish were caught in the fishery in a given year, the effect on subsequent spawning would be a reduction of 6 to 8 spawning adults depending on the age composition of the fish caught.

5.2.8.2 Upper Willamette River Chinook Salmon

ESU Description

The UWR Chinook salmon ESU includes all naturally spawned populations of spring-run Chinook salmon in the Clackamas River and in the Willamette River, and its tributaries, above Willamette Falls, Oregon (NMFS 2005b). These populations include the Clackamas River, Molalla River, North Fork Santiam River, South Fork Santiam River, Calapooia River, McKenzie River, and Middle Fork Willamette River (Myers et al. 2006). The status of each of these populations is described in Good et al. (2005) and McElheny et al. (2007). Of the independent populations, the Willamette/Lower Columbia Technical Recovery Team (W/LC TRT) designated the Clackamas River, North Santiam River, McKenzie River, and Middle Fork Willamette River populations as core populations. Core populations historically represented substantial portions of the ESU's abundance or contained life-histories specific to the ESU. In addition, due to its genetic integrity, the W/LC TRT designated the McKenzie River population as a genetic legacy population (McElhany et al. 2003). Spawning locations and artificial propagation programs for this ESU are described in NMFS 2007a.

Life History Types

The UWR Chinook salmon ESU exhibits one life history type. As cited in Myers et al. (2006), Chinook salmon native to the UWR are considered to be ocean-type. Ocean-type salmon out-migrate to the ocean during their first year and tend to migrate along the coast. Marine recoveries of CWT marked UWR Chinook salmon occur off the British Columbia and Alaska coasts (Myers et al. 2006). Ocean-type Chinook in the UWR historically returned in February and March, but did not ascend Willamette Falls until April and May. UWR Chinook salmon mature during their fourth and fifth years.

Current Viability

Numbers of spring Chinook salmon in the Willamette River basin are extremely depressed (McElhany *et al*. 2007). Historically, the spring run of Chinook may have exceeded 300,000 fish (Myers *et al*. 2003). The current abundance of wild fish is less than 10,000 fish, and only two populations (McKenzie and Clackamas) have significant natural production. The UWR Chinook have been adversely impacted by the degradation and loss of spawning and rearing habitat (loss of 30 to 40%) associated with hydropower development, and interaction with a large number of natural spawning hatchery fish. Other limiting factors include altered water quality and temperature, lost and degraded floodplain connectivity and lowland stream habitat, and altered streamflow in the tributaries (NMFS 2005c and NMFS 2006). NMFS (2007b) identified degraded flooplain connectivity and function; channel structure and complexity; riparian areas and large wood recruitment; water quality; fish passage; and hatchery impacts as the major factors limiting recovery of this species.

Extinction Risk

In McElhany et al 2007, the scores for abundance and productivity, diversity, and spatial structure criteria were combined to provide a high risk of extinction for UWR Chinook salmon. The Clackamas population exhibited the lowest extinction risk, being most likely in the ‘low’ risk category. Five of the seven populations were clearly in the high risk category. In addition, their ‘high risk’ classification was made with considerable certainty. Overall, these Chinook populations, and therefore the ESU, can be characterized as having a high risk of extinction.

Good et al. (2005) concluded that the Molalla and Calapooia populations were likely extirpated or nearly so, the North Santiam, South Santiam, and Middle Fork Willamette populations were not self sustaining, and that the Clackamas and McKenzie populations had under gone substantial increases in abundance in recent years (NMFS 2007a).

There have been substantial changes in harvest management practices in recent years that affect UWR Chinook resulting in an overall reduction in harvest mortality. Harvest has decreased as a result of reductions in ocean fisheries, particularly as a result of changes made in the Pacific Salmon Treaty in 1999. Greater reductions have occurred in fisheries in the Columbia and Willamette Rivers as a result of efforts to mass mark all hatchery produced fish, and implementation of mark-selective fishery techniques that require the release of all unmarked, and presumably natural origin fish (NMFS 2007a). From 1970-1994 harvest mortality averaged 53%, from 1995-2001 the mortality averaged 28%, and from 2002-2005 when mark-selective fisheries were implemented in the Columbia Basin harvest mortality averaged 18%.

The UWR Chinook ESU is dominated by hatchery production from releases designed to mitigate for the loss of habitat above federal hydroprojects. Recent estimates of the percentage of natural origin fish in the current UWR run are 10-12%, with the majority of the natural production returning to the McKenzie River (JCRMS 2006). This hatchery production is considered a potential risk to the ESU (Good et. al. 2005). However, the status of the habitat is such, particularly given the hyrdoprojects in the basins that production exists in the basins only because of the contribution of hatchery programs.

Limiting Factors

A recent Report to Congress related to the use of Pacific Coastal Salmon Recovery Funds for recovery projects summarizes the status of all of the listed ESUs and the major factors limiting recovery (NMFS 2005c). For UWR Chinook the major limiting factors include:

- Reduced access to spawning/rearing habitat in tributaries
- Altered water quality and temperature in tributaries
- Lost/degraded floodplain connectivity and lowland stream habitat
- Altered streamflow in tributaries

- Hatchery impacts

5.2.8.3 Lower Columbia River Chinook Salmon

ESU Description

The LCR Chinook salmon ESU includes all naturally spawned populations of Chinook salmon from the Columbia River and its tributaries from its mouth at the Pacific Ocean upstream to a transitional point between Washington and Oregon east of the Hood River and the White Salmon River, and includes the Willamette River to Willamette Falls, Oregon (excluding spring Chinook salmon in the Clackamas River) (NMFS 2005b). Tule fall Chinook salmon in the Wind and Little White Salmon rivers are included in this ESU.

Seventeen artificial propagation programs releasing hatchery Chinook salmon are considered part of the LCR Chinook salmon ESU. All of these programs are designed to produce fish for harvest, and three of these programs are also intended to augment naturally spawning populations in the basins where the fish are released. These three programs integrate naturally produced spring Chinook salmon into the broodstock in an attempt to minimize the genetic effects of returning hatchery adults that spawn in the wild (NMFS 2005b).

Life History Types

Only the spring component of the LCR ESU is affected by the BSAI fisheries. All of the observed coded wire tag (CWT) recoveries from ESA-listed ESUs in the BSAI fishery are from the spring-run populations. Spring Chinook salmon on the LCR, like those from coastal stocks, enter fresh water in March and April, well in advance of spawning in August and September. Historically, the spring migration was synchronized with periods of high rainfall or snowmelt to provide access to upper reaches of most tributaries, where spring stocks would hold until spawning. Adult salmon returns of the spring component of the ESU are 4 to 5 years of age fish.

Current Viability

The remaining spring-run Chinook salmon stocks in the LCR Chinook salmon ESU are found in the Sandy River, Oregon, and in the Lewis, Cowlitz, and Kalama rivers, Washington. Despite the substantial influence of fish from hatcheries in the UWR ESU in past years, naturally spawning spring Chinook salmon in the Sandy River are included in the LCR Chinook salmon ESU because they probably contain the remainder of the original genetic legacy for that system. Returns of natural origin fish to the Sandy River averaged about 1,400 from 2000 to 2004. The minimum abundance thresholds for Chinook populations in a medium sized basin like the Sandy is 500-1000 (for persistence category 3) measured as a geometric mean over a long time period (e.g., 20 years). Assessing population viability also requires consideration of productivity, spatial structure and diversity, but the abundance and trend information, at least, indicates that the status of the Sandy population is improving.

On the Washington side, spring Chinook salmon were native to the Cowlitz and Lewis rivers and there is anecdotal evidence that a distinct spring run existed in the Kalama River subbasin. The Lewis River spring run was severely affected by dam construction. During the period between the construction of Merwin Dam in 1932 and Yale Dam in the early 1950s, the Washington Department of Fisheries (WDF) attempted to maintain the run by collecting adults at Ariel/Merwin for hatchery propagation or (in years when returns were in excess of hatchery needs) release to the spawning grounds. As native runs dwindled, Cowlitz spring-run Chinook salmon were reintroduced in an effort to maintain them. In the Kalama River, escapements of less than 100 fish were present until the early 1960s when spring-run hatchery production was initiated with a number of stocks from outside the basin. The number of naturally spawning spring Chinook salmon in the Cowlitz, Kalama, and Lewis rivers averaged 854, 495, and 488 from 2000 to 2005, respectively. However, a large proportion of the natural spawners in each system are believed to be composed of hatchery strays. Natural production is likely quite limited relative to the overall abundance of hatchery-origin fish returning to each basin. Although, the Lewis and Kalama hatchery stocks have been mixed with out-of-basin stocks, they are included in the ESU. The Cowlitz River hatchery stock is largely free of introductions.

The Interim Regional Recovery Plan identifies each of the existing spring Chinook populations as high priorities for recovery (LCFRB 2004). Most of Washington's spring Chinook populations occurred historically in habitats upstream of current hydrosystem projects. Recovery will therefore rely on reintroduction efforts. Reintroduction programs have been initiated on the Cowlitz while those on the Lewis River have not yet begun. The best spring Chinook salmon habitat on the Kalama was historically located above Kalama Falls. However, some natural spawning currently occurs, and a hatchery program in the basin provides an opportunity for conservation-based efforts. The LCFRB (2004) highlights the need for better integration of natural spawners into the broodstock as part of a near term recovery effort.

Because of the importance of the hatchery stocks as genetic reserves for each of Washington's spring Chinook populations, it is important that the hatchery stock be maintained and managed to meet current and evolving hatchery production needs designed to meet recovery efforts. As a consequence, fisheries are managed for the time being to ensure that hatchery escapement goals are met. The harvest mortality on spring Chinook has been reduced significantly in recent years in large part due to implementation of mark-selective fisheries. Hatchery escapement goals for these stocks are routinely met.

Harvest estimates for LCR spring Chinook differ between populations, but all have benefited from harvest reductions in recent years. From 1985 to 1995, exploitation rates on the Washington spring Chinook populations ranged from 39% to 62%; in recent years, exploitation rates ranged from 29% to 40%.

Extinction Risk

In McElheny et al. (2007), the abundance and productivity, diversity, and spatial structure criteria scores were combined for all the populations of LCR Chinook salmon, and the results indicated that the risk of extinction for LCR Chinook salmon in Oregon's portion of the ESU is high (NMFS 2007a). On a population by population basis, a most probable classification of moderate was obtained for only two populations, the Sandy River Spring and Sandy River Late Fall populations. Ten of the populations were clearly in the high risk category. In addition, their 'high risk' classification was made with considerable certainty. Overall, these Chinook salmon populations can be characterized as having a high risk of extinction.

Although a final ESU score is not possible without an assessment of Washington Chinook salmon populations using the same methodology, McElheny et al. (2007) expect that the overall finding would be similar to results for the Oregon populations. In all likelihood the extinction risk for the combined LCR Chinook salmon ESU is high.

Limiting Factors

The status of all of the listed ESUs and the major factors limiting recovery is summarized in the recent Report to Congress related to the use of Pacific Coastal Salmon Recovery Funds for recovery projects (NMFS 2005c). For LCR Chinook, the major limiting factors include:

- Reduced access to spawning/rearing habitat in tributaries,
- Hatchery impacts,
- Loss of habitat diversity and channel stability in tributaries,
- Excessive sediment in spawning gravel,
- Elevated water temperatures in tributaries, and

- Harvest impacts to fall Chinook

5.3 Impacts on Chinook salmon

In order to evaluate the impacts of the alternative caps, the analysis looks retrospectively at fleetwide and sector-specific catch levels in 2003-2007. The methodology is described in detail in Chapter 3. Data are compiled in tables to indicate when each cap would have been reached, and how many Chinook would have been 'saved' had the cap been in place. The pollock catch that would have been forgone, had the cap been in place, is summarized separately in the RIR.

The approach used to evaluate the impacts of hard cap alternatives and options, for both Chinook salmon and pollock, was to apply the various alternatives to the recent past, from 2003 to 2007. That way the alternatives could be easily compared to Alternative 1, status quo (no hard cap).

As presented in Chapter 3, the treatment of the data involved finding the date when, under the different cap options, salmon bycatch levels would have been reached. With this date, the remaining salmon caught by the fleet (or sector specific levels depending upon the option under investigation) was computed as the sum from that date until the end of the year. For example, to compute the expected number of Chinook that would have been caught given a cap in a given year:

1. Evaluate the cumulative daily bycatch records of Chinook and find the date that the cap was exceeded (e.g., Sept 15);
2. Compute the number of pollock and Chinook that the fleet (or sector) caught from Sept 16 till the end of the season.

Tables indicating the fleet-wide and sector specific amount of salmon saved (in absolute numbers of salmon) were constructed. Corresponding levels of pollock that was forgone under these scenarios is presented in the RIR. The impact of the forgone pollock on the pollock population is discussed in Chapter 4.

For evaluating impacts, it is necessary to translate how different catch restrictions may affect salmon stocks. For these analyses, the adult-equivalency (AEQ) of the bycatch was estimated. This is distinguished from the annual bycatch numbers that are recorded by observers and tallied in each year for management purposes. Not all Chinook that is caught as bycatch would otherwise have survived to return as an adult to its spawning stream. The AEQ methodology applies the extensive observer datasets on the length frequencies of Chinook salmon caught in the pollock fishery and convert these to ages, appropriately accounting for the time of year that catch occurred. The age data is coupled with information on the proportion of salmon that return to different river systems at various ages, and the bycatch-at-age data is used to pro-rate how any given year of bycatch affects future potential spawning runs of salmon.

Evaluating impacts to specific stocks was done by using historical scale-pattern analysis (Myers et al.1984, Myers and Rogers 1988, Myers et al. 2003) and preliminary genetics studies from samples collected in 2005-2007 (Seeb et al. 2008, further details are provided in Chapter 3). While sample collection issues exist and different methodologies were employed (scale pattern analyses and genetic analyses), these stock estimates nonetheless provide similar overall proportions of between 54-60% for western Alaska. The consistency of these results from these different methodologies lends credibility to this general estimate. Where possible, historical run sizes were contrasted with AEQ mortality arising from the observed pollock fishery Chinook bycatch to river of origin.

The alternative hard caps and options for season and sector splits affect the anticipated takes of pollock within seasons and areas. This fact was illustrated by analyzing historical fishing patterns (among sectors and by area) with respect to the proposed sector-specific caps. To illustrate this effect, tables were constructed that show how the percentage of bycatch within each of the strata (season, area and sector) would change.

Impacts of Alternatives 2, 4, and 5 are discussed in section 5.3.2 through 5.3.5, and particular attention is devoted to comparing and contrasting impacts between Alternative 4, 5 and the range of options analyzed under Alternative 2. Following the comprehensive discussion of Alternatives 1, 2, 4 and 5, a separate section (section 5.3.6) summarizes impacts of Alternative 3 (triggered closures).

5.3.1 Pollock fishery bycatch of Chinook salmon under Alternative 1

Annual bycatch of Chinook salmon in the BSAI groundfish fisheries from 1992–2007 has increased substantially in recent years (Fig. 5-24) with 2007 representing the highest time series with 129,000 Chinook bycatch estimated from all groundfish fisheries. The majority of bycatch of Chinook in BSAI trawl fisheries occurs primarily in the Bering Sea pollock trawl fishery. Bycatch in the pollock fishery has comprised between 64% (in 1994) to 95% (in 2006) of the total Chinook taken in all groundfish fisheries.

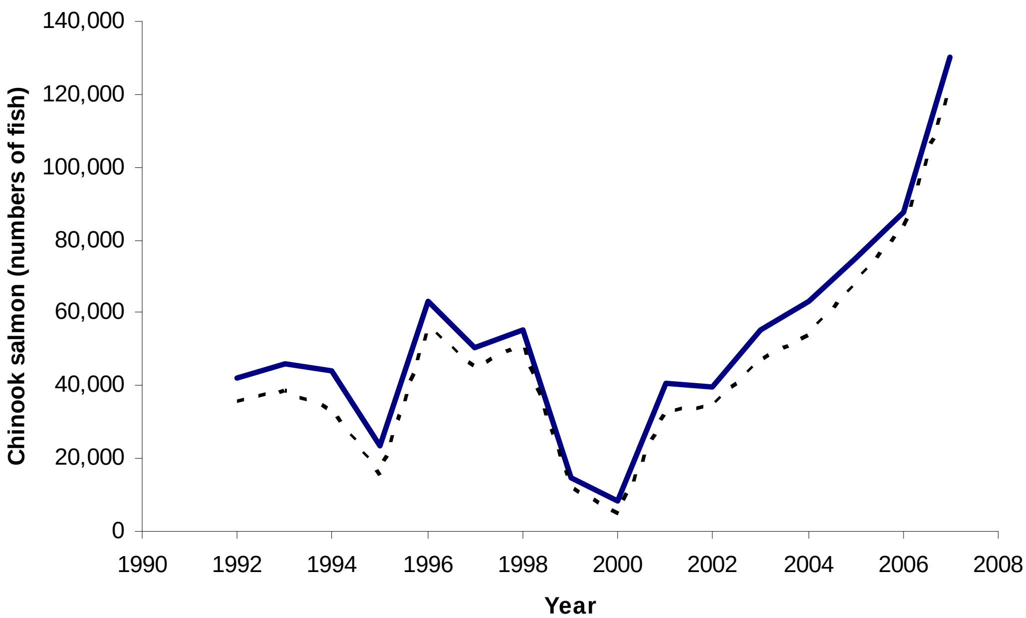


Fig. 5-24 Annual Chinook salmon catch in all BSAI groundfish fisheries (solid line) and pollock trawl fishery only (dotted line) 1992-2007.

Chinook bycatch is taken in both A and B seasons in the pollock fishery. Total catch of Chinook bycatch in the pollock fishery reached an historic high in 2007 at 121,638 fish (Fig. 5-25, Table 5-20). The A season catch in 2007 was the highest historical A season catch at 69,542, while the B season catch was also at an historical high at 52,367 (Table 5-21). Bycatch in 2008 and 2009 was lower than any year since 2000 (Fig. 5-25, Table 5-21). Fig. 5-25 shows the seasonal distribution of bycatch. Specifically, there are years where A season bycatch was low (1997, 1998, 2004, 2005) and B season bycatch of Chinook still led to increased levels from previous years (notably in 1998, 2004, 2005).

Table 5-20 Chinook salmon catch (numbers of fish) in the Bering Sea pollock trawl fishery (all sectors) 1991-2009, CDQ is indicated separately and by season where available. Data retrieval from 3/19/09. 'na' indicates that data were not available in that year.[32]

Year	Annual with CDQ	Annual without CDQ	Annual CDQ only	A season	B season	A season	B season	A season	B season
				With CDQ		Without CDQ		CDQ only	
1991	na	40,906	na	na	na	38,791	2,114	na	na
1992	35,950	na	na	25,691	10,259	na	na	na	na
1993	38,516	na	na	17,264	21,252	na	na	na	na
1994	33,136	30,593	2,543	28,451	4,686	26,871	3,722	1,580	963
1995	14,984	12,978	2,006	10,579	4,405	9,924	3,053	655	1,351
1996	55,623	53,220	2,402	36,068	19,554	34,780	18,441	1,289	1,114
1997	44,909	42,437	2,472	10,935	33,973	9,449	32,989	1,487	985
1998	51,322	46,205	5,118	15,193	36,130	14,253	31,951	939	4,179
1999	11,978	10,381	1,597	6,352	5,627	5,768	4,614	584	1,013
2000	4,961	4,242	719	3,422	1,539	2,992	1,250	430	289
2001	33,444	30,937	2,507	18,484	14,961	16,711	14,227	1,773	734
2002	34,495	32,402	2,093	21,794	12,701	20,378	12,024	1,416	677
2003	46,993	44,428	2,565	33,808	13,185	32,115	12,313	1,693	872
2004	51,696	48,733	2,963	23,093	28,603	21,964	26,769	1,129	1,834
2005	67,363	65,447	1,916	27,346	40,017	26,047	39,400	1,299	617
2006	82,647	80,906	1,741	58,391	24,256	56,806	24,100	1,585	156
2007	121,638	116,009	5,629	69,408	52,230	66,307	49,702	3,101	2,528
2008	19,928	19,288	640	15,162	4,766	14,558	4,730	604	36
2009	9,527	9,213	314	9,527		9,213		314	

[32] Chinook salmon bycatch is estimated using the NMFS Catch Accounting System (CAS). The CAS continually revises past bycatch estimates based on new information. Therefore, these numbers change slightly depending on when the analyst retrieved the data from the CAS. NMFS periodically revises the bycatch estimates and posts the most recent estimates on the NMFS Alaska Region webpage at: http://www.fakr.noaa.gov/sustainablefisheries/inseason/chinook_salmon_mortality.pdf. EIS Chapter 3 provides more detailed information on the CAS.

Table 5-21 Chinook bycatch by sector for the Bering Sea pollock fleet, 1991-2007

	A-season			A	B-season			B	Annual
YEAR	M	P	S	Total	M	P	S	Total	Total
1991	9,001	17,645	10,192	36,838	152	397	1,667	2,216	39,054
1992	4,057	12,631	6,725	23,413	1,766	6,889	1,604	10,259	33,672
1993	3,529	8,869	3,017	15,415	6,657	11,932	2,615	21,204	36,619
1994	1,790	17,149	8,346	27,285	572	2,826	1,207	4,605	31,890
1995	971	5,971	2,040	8,982	667	2,973	781	4,421	13,403
1996	5,481	15,276	15,228	35,985	6,322	3,222	9,944	19,488	55,472
1997	1,561	3,832	4,954	10,347	5,702	5,721	22,550	33,973	44,320
1998	4,284	6,500	4,334	15,118	6,361	2,547	27,218	36,127	51,244
1999	554	2,694	3,103	6,352	374	2,590	2,662	5,627	11,978
2000	19	2,525	878	3,422	253	568	717	1,539	4,961
2001	1,664	8,264	8,555	18,484	1,319	9,863	3,779	14,961	33,444
2002	1,976	9,481	10,336	21,794	1,755	1,386	9,560	12,701	34,495
2003	2,892	14,428	16,488	33,808	1,940	4,044	7,202	13,185	46,993
2004	2,092	9,492	12,376	23,961	2,076	4,289	23,701	30,067	54,028
2005	2,111	11,421	14,097	27,630	888	4,343	34,986	40,217	67,847
2006	5,408	17,306	36,039	58,753	200	1,551	22,654	24,405	83,159
2007	5,860	27,943	35,458	69,261	3,544	7,148	41,751	52,443	121,704

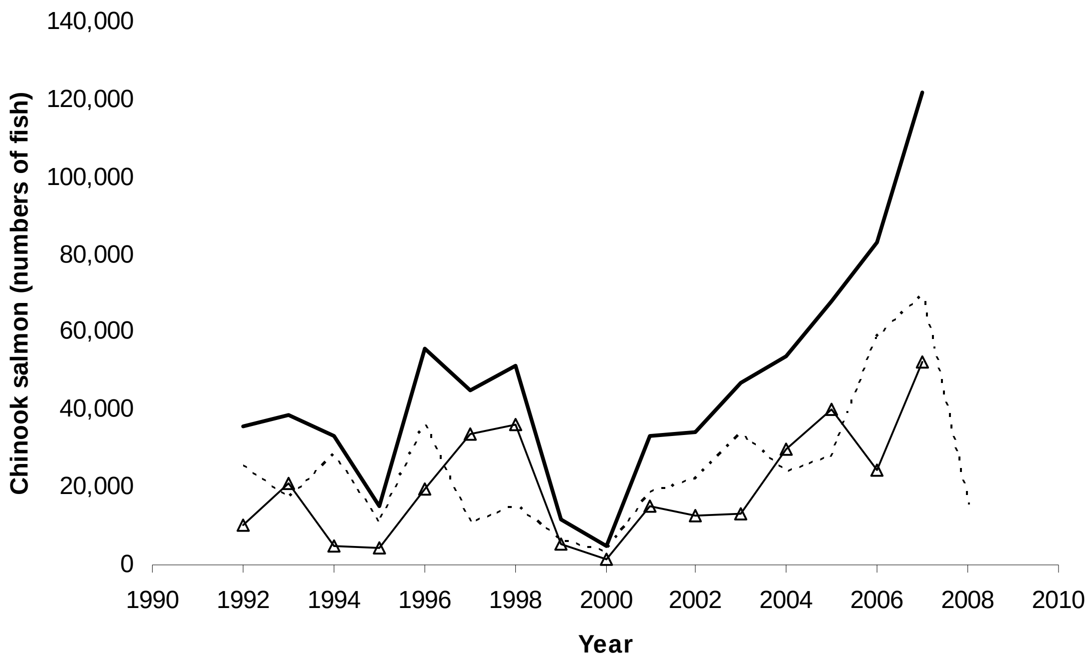


Fig. 5-25 Chinook salmon catch in pollock trawl fishery: annually 1992-2007 (solid line), A season 1992-2008 (dotted line), and B season 1992-2007 (triangles).

Spatially bycatch varies by season and year. For example, from 2005-2007 the pattern of Chinook bycatch shows how quickly hot-spots can be occur and how irregular they are in both time and space (Fig. 5-26 through Fig. 5-29). The pattern for B-season Chinook bycatch rates as a whole is shown in Fig.

5-30. Within years, the seasonal patterns of bycatch rates are highest later in the B-season while for the A-season, the rates are generally lower and show no particular trend early or late in the season (Fig. 5-31)

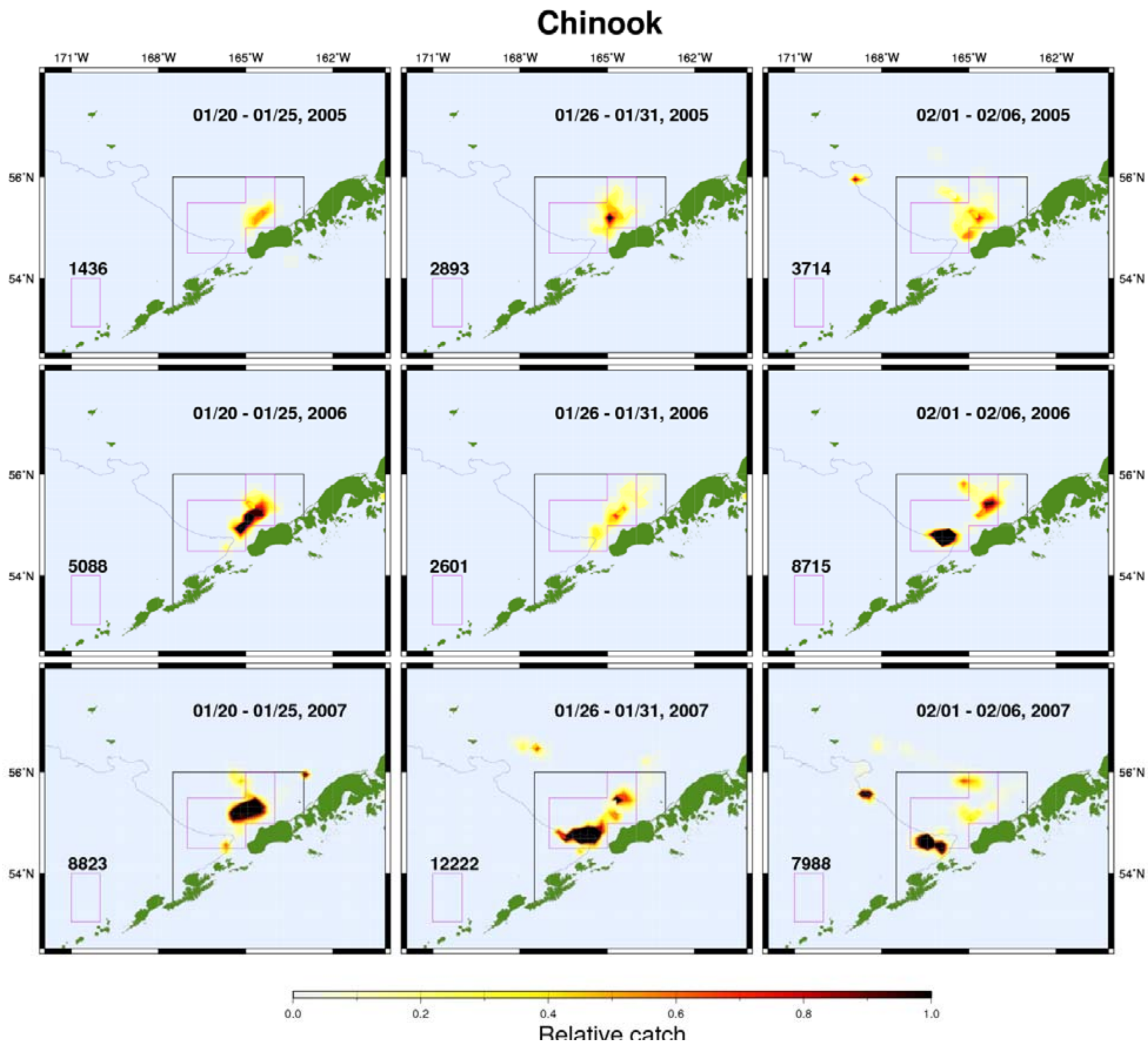


Fig. 5-26 Chinook salmon bycatch in the EBS pollock fishery for 2005-2007 (rows) from three sets of 5-day windows starting Jan 20th. Numbers in lower left side of panel indicate observed numbers of Chinook caught in that period.

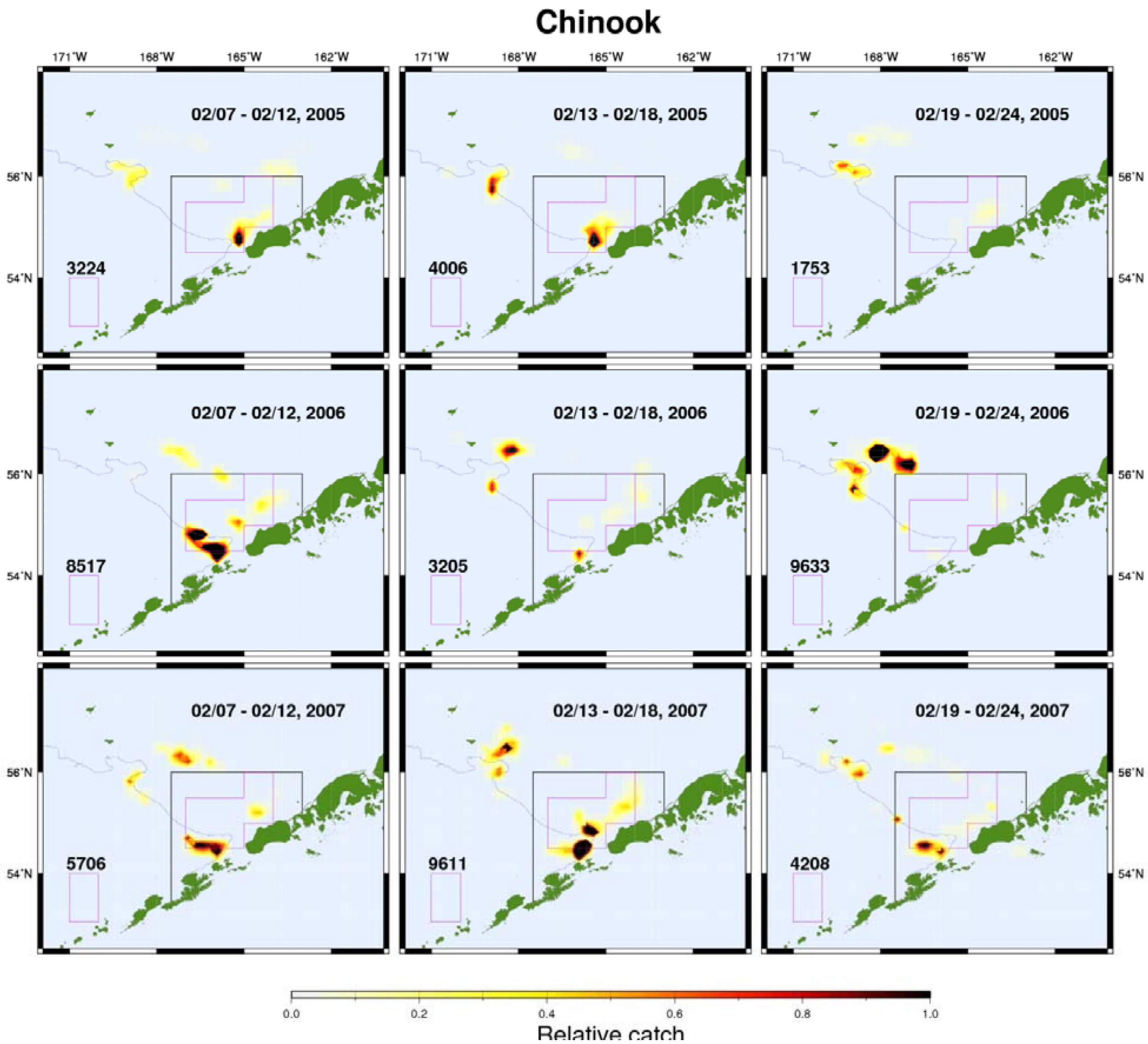


Fig. 5-27 Chinook salmon bycatch in the EBS pollock fishery for 2005-2007 (rows) from three sets of 5-day windows starting Feb 7th. Numbers in lower left side of panel indicate observed numbers of Chinook caught in that period.

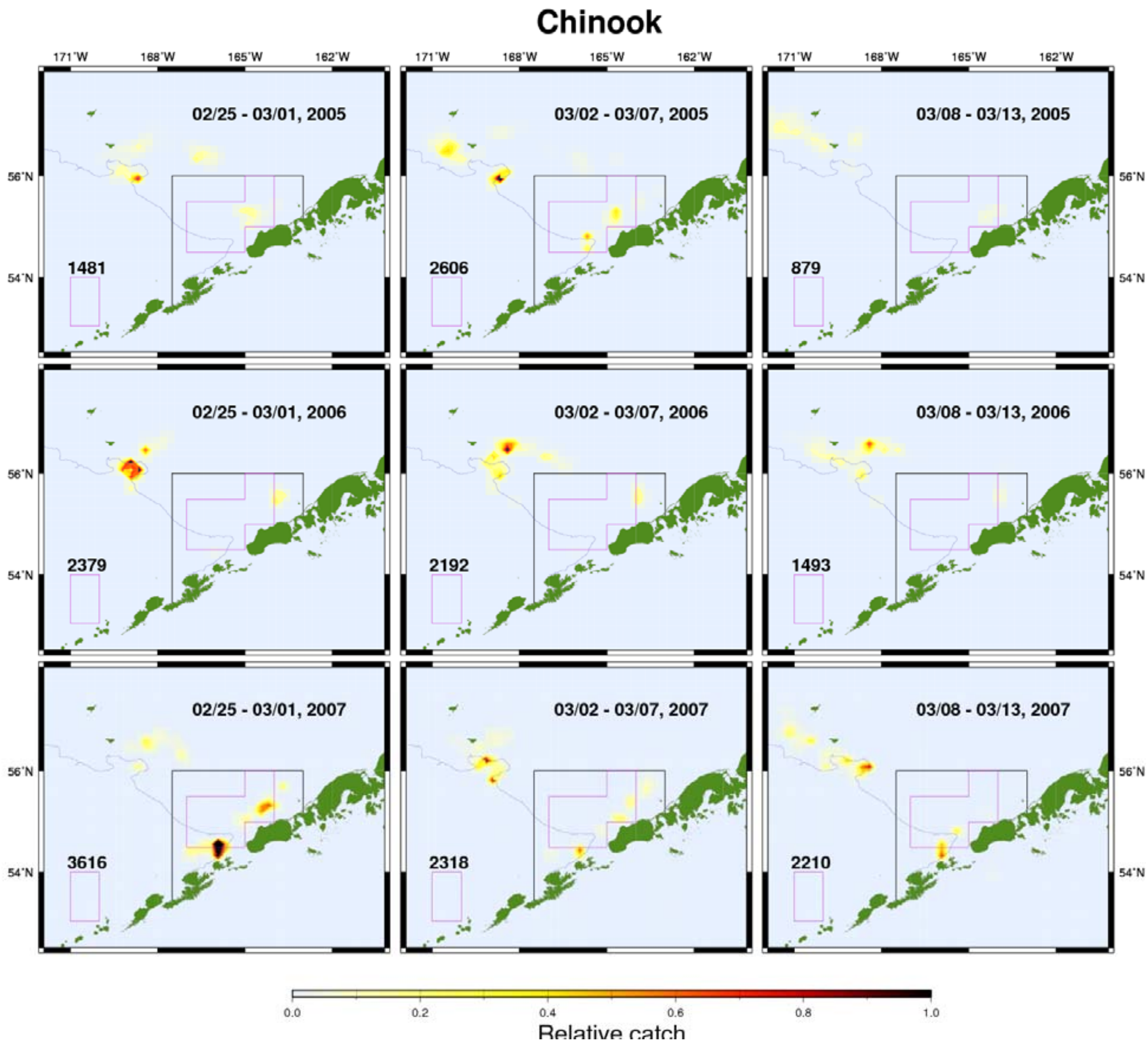


Fig. 5-28 Chinook salmon bycatch in the EBS pollock fishery for 2005-2007 (rows) from three sets of 5-day windows starting Feb 25th. Numbers in lower left side of panel indicate observed numbers of Chinook caught in that period.

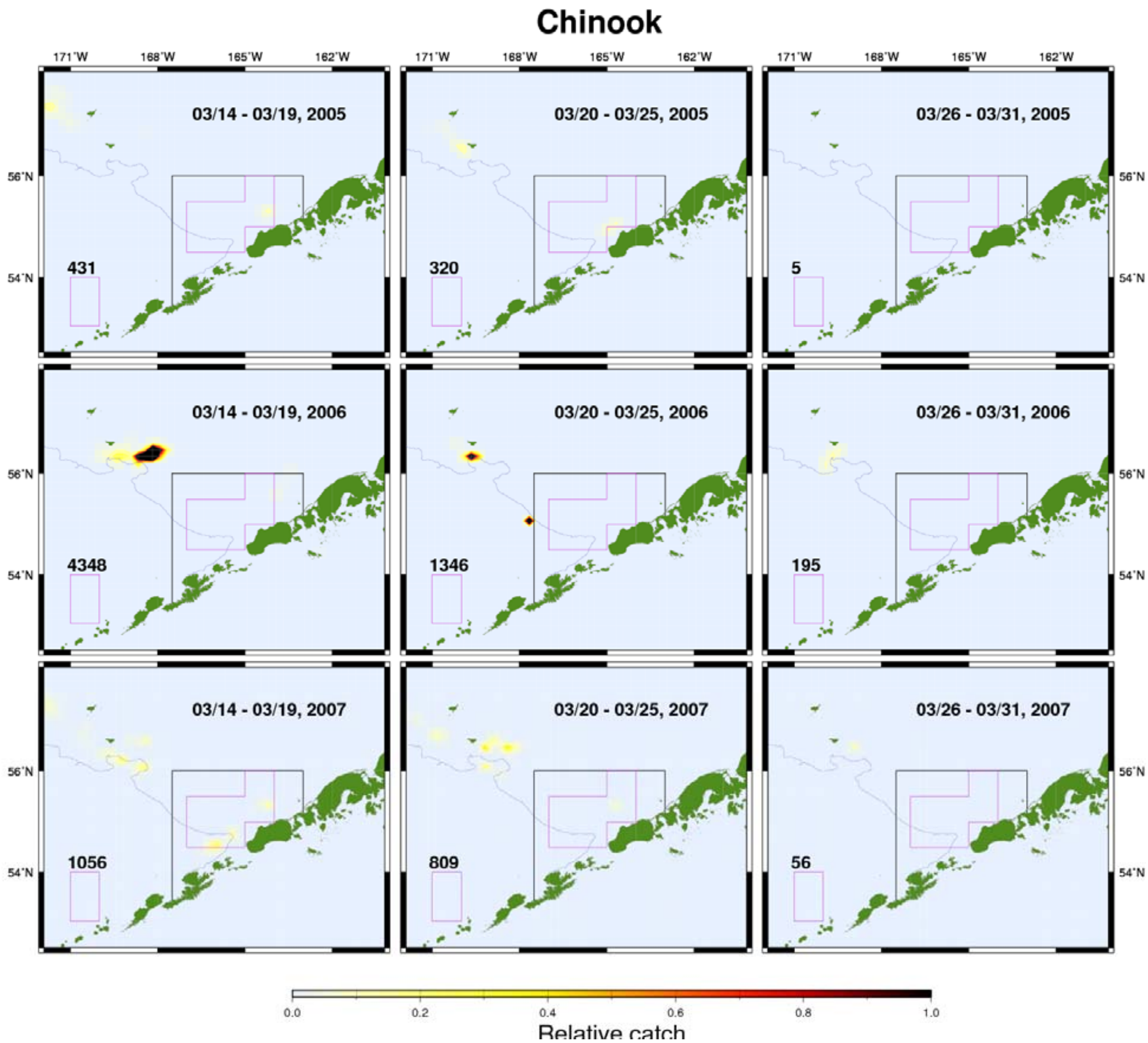


Fig. 5-29 Chinook salmon bycatch in the EBS pollock fishery for 2005-2007 (rows) from three sets of 5-day windows starting March 14th. Numbers in lower left side of panel indicate observed numbers of Chinook caught in that period.

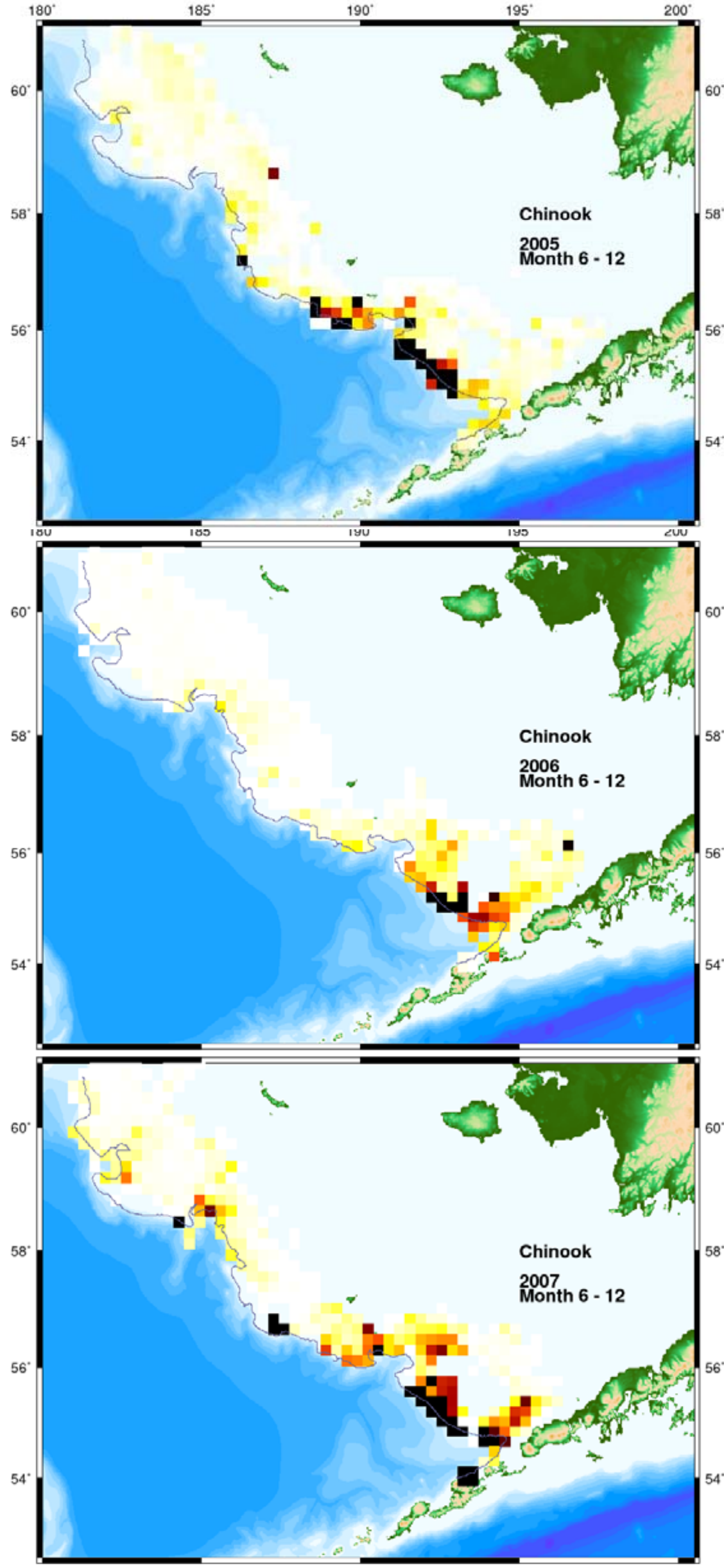


Fig. 5-30 Chinook salmon bycatch rates (darker colors mean higher numbers of Chinook / t of pollock) in the EBS pollock fishery for 2005-2007 B-season.

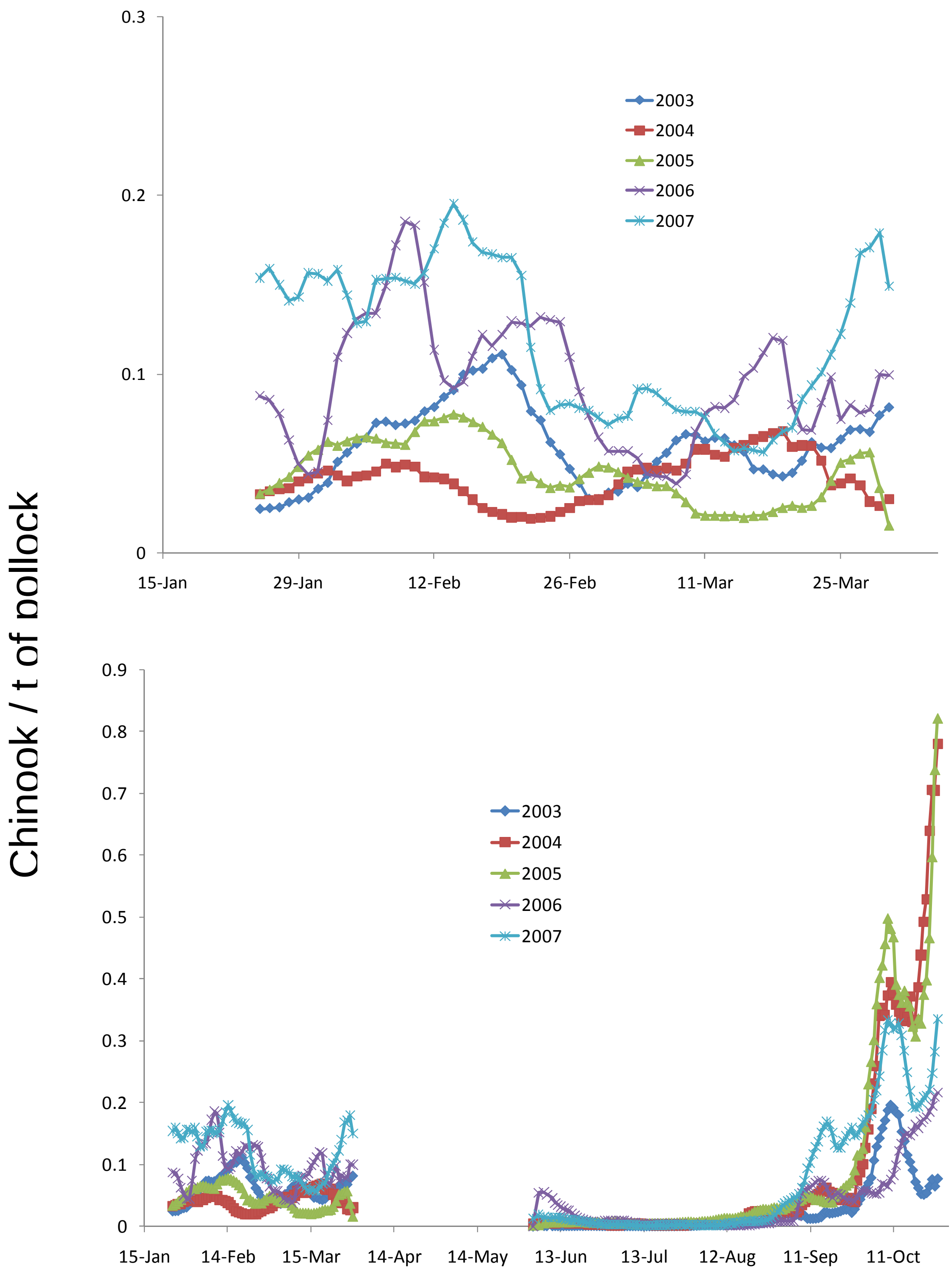


Fig. 5-31 Seasonal trends in Chinook bycatch rates (number / t) for the A-season (top) and for the entire year (bottom) 2003-2007.

To better characterize why bycatch levels vary, it is important to consider patterns in the level of fishing effort. Based on NMFS observer data where tow-duration is considered reliably recorded for the pollock fleet, a measure of total hours towed increased by about 20% in 2006 and 2007. This compares with a nearly three-fold increase in the levels of Chinook bycatch (Fig. 5-32). This suggests that other factors may also be affecting the bycatch levels. Alternative factors may include increased numbers of Chinook found on the pollock fishing grounds due to run-sizes or environmental conditions. Changes in fishing gear depth were examined to be similar through this period. Anecdotally, trawl gear (dimensions, net material etc) has changed over time but information on this is unavailable for analysis. Seasonally, for the period 1991-2007 February averages to be the highest month of bycatch in the pollock fishery even though the average tow duration is relative low whereas October tends to be the second-highest month when bycatch occurs and is also when the average tow duration is the highest (Fig. 5-33). Over time, tow duration in October has steadily increased (Fig. 5-34).

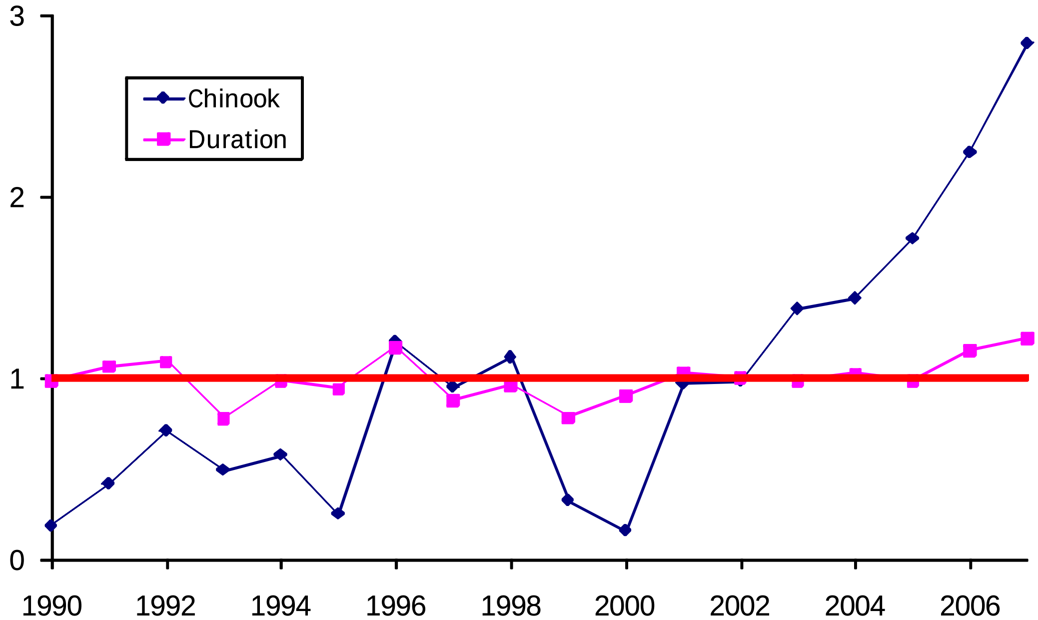


Fig. 5-32 Standardized (to have mean values of 1) relative Chinook catch and pollock fishing effort (annual total hours spent towing).

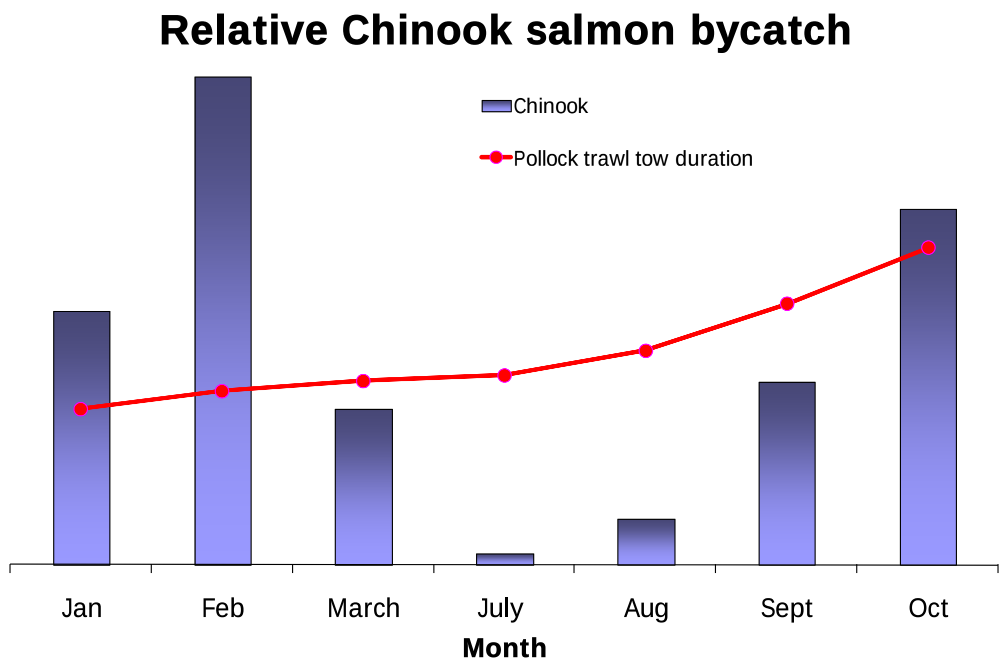


Fig. 5-33 Average relative Chinook bycatch (columns) and tow duration (marked line) by month based on NMFS observer data, 1991-2007.

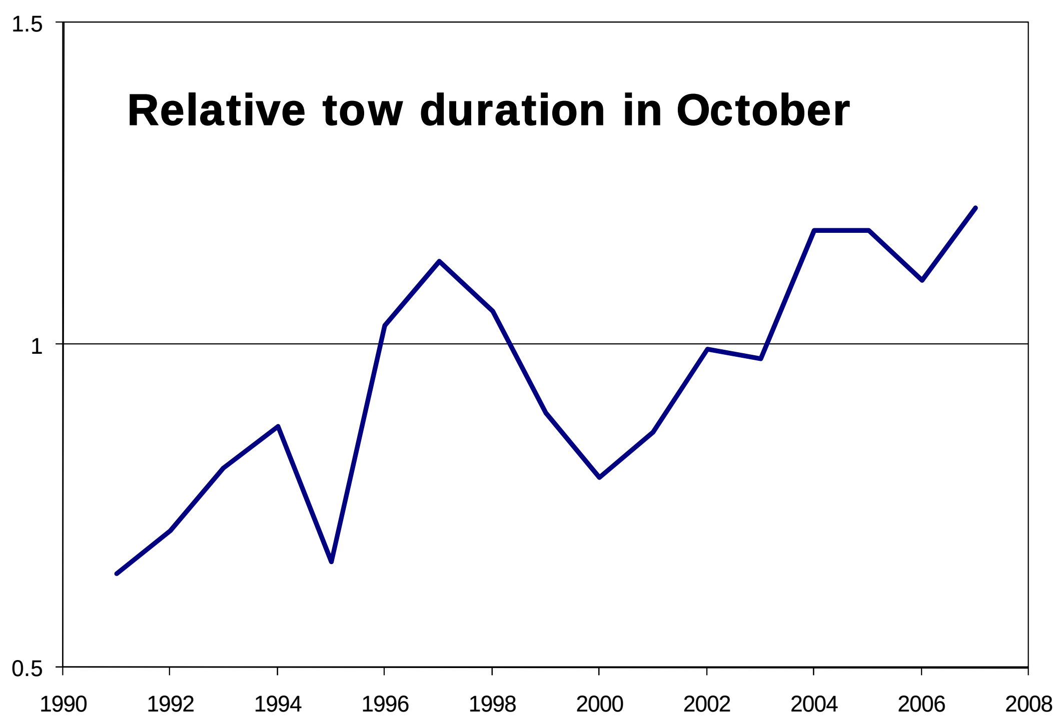


Fig. 5-34 Average relative tow duration (scaled to have mean value of 1.0) for October based on NMFS observer data, 1991-2007.

5.3.1.1 Pollock fishery bycatch of Chinook by sector

Bycatch of Chinook varies seasonally by season and by sector (Fig. 5-36 and Fig. 5-37; Table 5-22). Since 2002 the inshore CV fleet has consistently had the highest bycatch by sector in the A season, but prior to that offshore catcher processor catch was higher on a seasonal basis (Fig. 5-36). Catch by the mothership sector in the A season has always been lower than the other two sectors. Mean Chinook rates (number per 1,000 t of pollock) were presented for summary purposes and shows higher rates during the A-season compared to the B season except for 2005 where the average rates in both seasons were similar (though varied by sector; bottom panel of Table 5-22).

In the B season the inshore CV fleet has had the highest bycatch by sector since 1996 (except for 2001), followed by the offshore CP fleet (Fig. 5-37). As with the A season, historically the mothership fleet sector catch compared to the total has been low.

In recent years, rates for the inshore catcher vessel fleet have been consistently higher than for the other fleets (Fig. 5-38). To illustrate the relative difference between sectors, Table 5-23 shows the contrast of bycatch sector-specific patterns within aggregate season and annual mean levels. This shows a fair degree of inter-annual variability in the relative rates by sectors. The total catch for the mothership fleet was lower than the CP fleet in 2006, their relative rate was higher (Fig. 5-38). In the B season, the inshore fleet has the highest bycatch rates followed consistently in almost all years by the mothership fleet (Fig. 5-39).

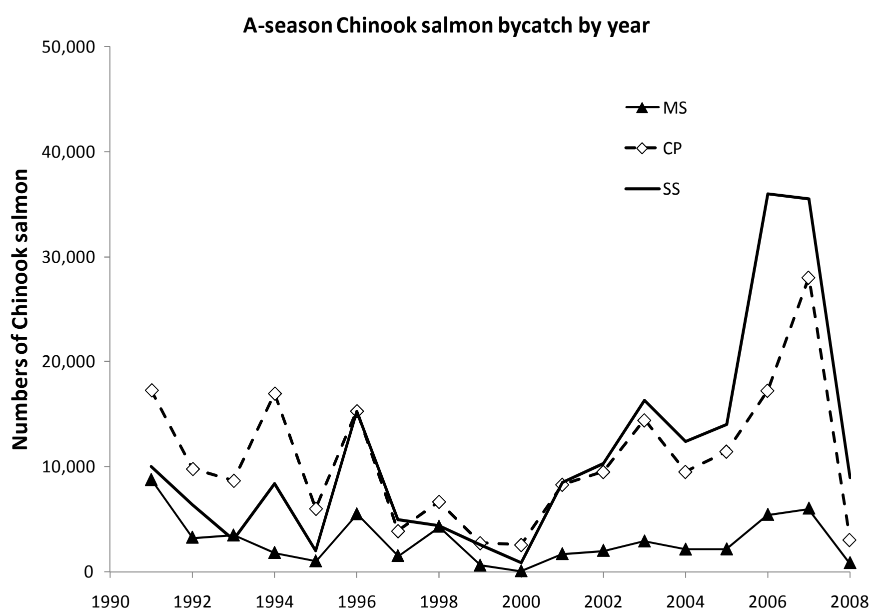


Fig. 5-36 Chinook salmon catch by sector in pollock fishery A season 1991-2008. Data are shown by inshore catcher vessel sector (solid line), offshore catcher processor (dotted line with diamonds) and mothership sector (solid line with triangles).

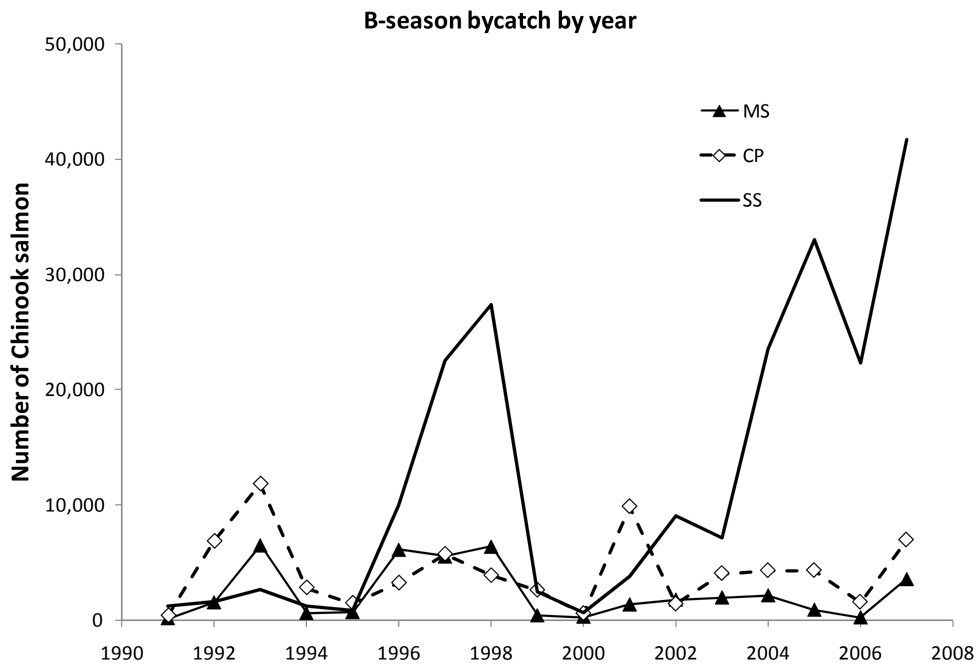


Fig. 5-37 Chinook salmon catch by sector in pollock fishery B season 1991-2007. Data are shown by inshore catcher vessel sector (solid line), offshore catcher processor (dotted line with diamonds) and mothership sector (solid line with triangles).

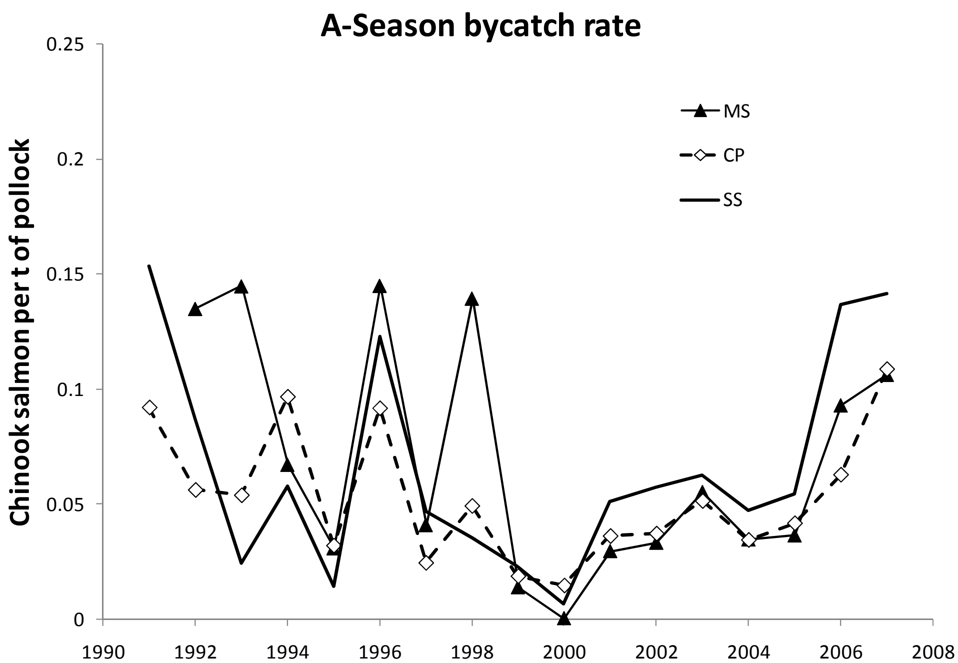


Fig. 5-38 Chinook salmon A season bycatch rates by sector (Chinook per t pollock). Inshore catcher vessel (solid line), offshore catcher processor (dashed line with diamonds) and mothership sector (solid line with filled triangles), 1991-2007.

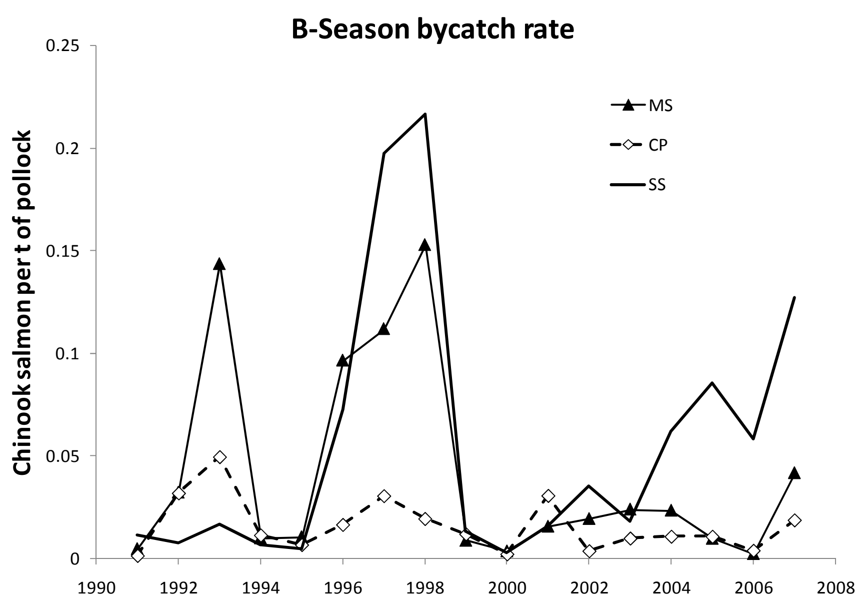


Fig. 5-39 Chinook salmon B season bycatch rates by sector (Chinook per t pollock). Inshore catcher vessel (solid line), offshore catcher processor (dashed line with diamonds) and mothership sector (solid line with filled triangles), 1991-2007.

Table 5-22 Catch of pollock and Chinook salmon along with Chinook rate (per 1,000 t of pollock) by sector and season, 2003-2007. Catches from CDQ are included. M=Mothership sector, P=catcher processor sector, and S=shoreside catcher-vessel sector.

Pollock (t)

Season	Sector	Year 2003	2004	2005	2006	2007
A	M	51,811	60,222	57,802	58,134	56,526
	P	280,505	275,625	273,977	274,279	257,647
	S	260,212	262,570	259,002	262,997	250,726
A	Sub-total	592,528	598,417	590,780	595,410	564,899
B	M	80,817	90,736	89,225	89,303	84,978
	P	413,512	401,570	403,537	405,586	372,737
	S	393,550	378,855	386,473	381,981	327,962
B	Sub-total	887,879	871,160	879,236	876,870	785,677
	Annual Total	1,480,408	1,469,577	1,470,016	1,472,280	1,350,576

Chinook bycatch

	Sector	Year 2003	2004	2005	2006	2007
A	M	2,892	2,092	2,111	5,408	5,860
	P	14,428	9,492	11,421	17,306	27,943
	S	16,488	12,376	14,097	36,039	35,458
A	Sub-total	33,808	23,961	27,630	58,753	69,261
B	M	1,940	2,076	888	200	3,544
	P	4,044	4,289	4,343	1,551	7,148
	S	7,202	23,701	34,986	22,654	41,751
B	Sub-total	13,185	30,067	40,217	24,405	52,443
	Annual Total	46,993	54,028	67,847	83,159	121,704

Chinook / 1,000 t of pollock

	Sector	Year 2003	2004	2005	2006	2007	Mean
A	M	56	35	37	93	104	65
	P	51	34	42	63	108	59
	S	63	47	54	137	141	88
	A-season average	57	40	47	99	123	73
B	M	24	23	10	2	42	20
	P	10	11	11	4	19	11
	S	18	63	91	59	127	70
	B-season average	15	35	46	28	67	37
	Average	32	37	46	56	90	52

Table 5-23 Sector and season specific bycatch rate (Chinook / t of pollock) relative to the mean value for the A and B seasons (first 6 rows) and for the entire year (last three rows), 2003-2007. M=Mothership sector, P=catcher processor sector, and S=shoreside catcher-vessel sector.

Season	Sector	Year 2003	2004	2005	2006	2007
A	M	98%	87%	78%	94%	85%
	P	90%	86%	89%	64%	88%
	S	111%	118%	116%	139%	115%
B	M	162%	66%	22%	8%	62%
	P	66%	31%	24%	14%	29%
	S	123%	181%	198%	213%	191%
A+B	M	115%	75%	44%	67%	74%
	P	84%	55%	50%	49%	62%
	S	114%	153%	165%	161%	148%

5.3.2 Impacts of Alternative 2 on bycatch levels

5.3.2.1 Fleetwide cap

Alternative 2 contains a wide range of options for prescribing various allocations of salmon bycatch (fleet-wide or by various sector-specific options). As described in Chapter 2, unless the Council chooses sector-specific allocation of the salmon bycatch cap, the cap would be fleetwide and thus divided between the CDQ fleet and the remaining sectors aggregated together. To examine the impact of a fleetwide cap, using the subset range of caps for analysis, constraint tables are provided which indicate hypothetical closure dates by year and season for the range of cap levels and seasonal allocations (Table 5-24). Here a rollover from A to B season of unused salmon was not evaluated thus the constraint in seasonal allocation such as 70/30 is more pronounced than if a rollover were included.

The 70/30 seasonal distribution is more constraining than other seasonal distribution options in the B season, both at the fleet-level as well as when subdivided and applied at the sector level. The combination of seasonal plus sector splits exerts a combined effect to magnify many sector-specific impacts. For instance, while the CDQ seasonal distribution options alone do not generally constrain the CDQ sector, seasonal distribution options combined with sector allocation options have an impact on the CDQ fleet even at the highest cap. For example, Option 2a sector split for CDQ (3%) combined with either a 50/50 A/B split or 58/42 A/B split constrains the CDQ fleet in the A season in 3 of the 5 years considered.

Table 5-24 Hypothetical closure dates by year and season under Alternative 2 Chinook bycatch cap options for fleet-wide caps (CDQ receives 7.5% of the Chinook cap)

Fleet-wide caps			A season					B season				
A/B Split	Cap	Sect	2003	2004	2005	2006	2007	2003	2004	2005	2006	2007
50/50	87,500	CDQ	---	---	---	---	---	---	---	---	---	---
		NonCDQ	---	---	---	22-Feb	9-Feb	---	---	---	---	25-Oct
	68,100	CDQ	---	---	---	---	5-Mar	---	---	---	---	---
		NonCDQ	26-Mar	---	---	14-Feb	2-Feb	---	---	21-Oct	---	18-Oct
	48,700	CDQ	---	---	---	---	22-Feb	---	---	---	---	17-Oct
		NonCDQ	23-Feb	24-Mar	2-Mar	7-Feb	28-Jan	---	20-Oct	6-Oct	25-Oct	8-Oct
	29,300	CDQ	1-Mar	17-Mar	5-Mar	3-Mar	15-Feb	---	19-Sep	---	---	10-Oct
		NonCDQ	12-Feb	28-Feb	11-Feb	3-Feb	24-Jan	---	30-Sep	23-Sep	6-Oct	26-Sep
58/42	87,500	CDQ	---	---	---	---	---	---	---	---	---	---
		NonCDQ	---	---	---	28-Feb	14-Feb	---	---	24-Oct	---	20-Oct
	68,100	CDQ	---	---	---	---	14-Mar	---	---	---	---	19-Oct
		NonCDQ	---	---	---	19-Feb	6-Feb	---	27-Oct	10-Oct	---	12-Oct
	48,700	CDQ	---	---	---	---	26-Feb	---	29-Sep	---	---	15-Oct
		NonCDQ	7-Mar	---	22-Mar	9-Feb	30-Jan	---	12-Oct	2-Oct	17-Oct	4-Oct
	29,300	CDQ	5-Mar	---	15-Mar	8-Mar	16-Feb	---	15-Sep	---	---	8-Oct
		NonCDQ	15-Feb	4-Mar	15-Feb	4-Feb	25-Jan	13-Oct	25-Sep	16-Sep	30-Sep	19-Sep
70/30	87,500	CDQ	---	---	---	---	---	---	---	---	---	18-Oct
		NonCDQ	---	---	---	22-Mar	25-Feb	---	24-Oct	8-Oct	---	10-Oct
	68,100	CDQ	---	---	---	---	---	---	29-Sep	---	---	15-Oct
		NonCDQ	---	---	---	24-Feb	12-Feb	---	12-Oct	2-Oct	17-Oct	4-Oct
	48,700	CDQ	---	---	---	---	5-Mar	---	19-Sep	---	---	10-Oct
		NonCDQ	26-Mar	---	---	14-Feb	2-Feb	---	30-Sep	23-Sep	6-Oct	26-Sep
	29,300	CDQ	15-Mar	---	---	17-Mar	19-Feb	19-Sep	9-Sep	---	---	2-Oct
		NonCDQ	18-Feb	12-Mar	21-Feb	6-Feb	26-Jan	4-Oct	11-Sep	3-Sep	18-Sep	12-Sep

For the non-CDQ fleet, the fleet would have been constrained in 2006 and 2007 regardless of seasonal distribution of the cap, but the magnitude of the impact varies greatly depending upon when in the A season the fleet is constrained. Table 5-25 projects what Chinook bycatch would have been under the range of caps and seasonal allocations under consideration. For example, in 2006 under the 70/30 allocation, the non-CDQ fleet would have been constrained on March 22nd with forgone pollock of 1,079 mt, whereas with a 50/50 A/B split on the same cap (87,500), the fleet would have been constrained February 22nd, resulting in forgone pollock of 176,014 mt (Table 5-25; RIR).

For overall catches of Chinook, 2007 illustrates the importance of the seasonal allocation option. The non-CDQ fleet is constrained under every seasonal split in both A and B seasons, and the CDQ fleet is constrained in the B season under a 70/30 split. Under the 87,500 cap, projected catches of Chinook in that year would have ranged from 70,367 (50/50 split) to 80,251 (70/30 split). In all cases, projected catch of Chinook under the various seasonal allocation scenarios would have been less than the cap level, because of the relative seasonal constraints on the fleet (Table 5-25).

Table 5-25 Hypothetical Chinook catches, in numbers of fish, from 2003-2007 for fleet wide (with 7.5% designated to CDQ) had different Alternative 2 hard caps been in place.

Seas	Cap	Sector	2003			2004			2005			2006			2007		
			50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30
A	87,500	CDQ	1,693	1,693	1,693	1,140	1,140	1,140	1,296	1,296	1,296	1,580	1,580	1,580	3,091	3,091	3,091
		NonCDQ	32,115	32,115	32,115	22,821	22,821	22,821	26,377	26,377	26,377	34,356	45,019	55,427	31,618	41,159	55,903
	87,500 Total		33,808	33,808	33,808	23,961	23,961	23,961	27,673	27,673	27,673	35,936	46,599	57,007	34,709	44,250	58,994
	68,100	CDQ	1,693	1,693	1,693	1,140	1,140	1,140	1,296	1,296	1,296	1,580	1,580	1,580	2,414	2,879	3,091
		NonCDQ	30,226	32,115	32,115	22,821	22,821	22,821	26,377	26,377	26,377	29,090	34,356	34,356	20,939	31,618	41,159
	68,100 Total		31,919	33,808	33,808	23,961	23,961	23,961	27,673	27,673	27,673	30,670	35,936	35,936	23,353	34,497	44,250
	48,700	CDQ	1,693	1,693	1,693	1,140	1,140	1,140	1,296	1,296	1,296	1,580	1,580	1,580	1,309	1,926	2,414
		NonCDQ	21,874	24,434	30,226	22,027	22,821	22,821	20,680	25,913	26,377	14,248	14,248	29,090	20,939	20,939	20,939
	48,700 Total		23,567	26,127	31,919	23,167	23,961	23,961	21,976	27,209	27,673	15,828	15,828	30,670	22,248	22,865	23,353
	29,300	CDQ	1,098	1,098	1,537	1,033	1,140	1,140	1,096	1,246	1,296	653	1,129	1,340	502	502	1,309
		NonCDQ	10,188	15,445	15,445	13,195	13,195	16,558	9,160	13,655	18,218	8,446	14,248	14,248	1,492	1,492	1,492
	29,300 Total		11,286	16,543	16,982	14,228	14,335	17,698	10,256	14,901	19,514	9,099	15,377	15,588	1,994	1,994	2,801
B	87,500	CDQ	872	872	872	1,826	1,826	1,826	637	637	637	157	157	157	2,529	2,529	1,235
		NonCDQ	12,313	12,313	12,313	28,241	28,241	23,133	39,580	31,531	23,771	24,248	24,248	24,248	33,134	33,134	20,022
	87,500 Total		13,185	13,185	13,185	30,067	30,067	24,959	40,217	32,168	24,408	24,405	24,405	24,405	35,663	35,663	21,257
	68,100	CDQ	872	872	872	1,826	1,826	1,294	637	637	637	157	157	157	2,529	1,235	1,235
		NonCDQ	12,313	12,313	12,313	28,241	23,133	16,979	30,136	23,771	17,082	24,248	24,248	16,873	27,361	20,022	14,178
	68,100 Total		13,185	13,185	13,185	30,067	24,959	18,273	30,773	24,408	17,719	24,405	24,405	17,030	29,890	21,257	15,413
	48,700	CDQ	872	872	872	1,826	1,294	1,041	637	637	637	157	157	157	1,235	1,235	777
		NonCDQ	12,313	12,313	12,313	21,007	16,979	11,347	17,082	17,082	11,389	20,632	16,873	11,206	20,022	14,178	12,337
	48,700 Total		13,185	13,185	13,185	22,833	18,273	12,388	17,719	17,719	12,026	20,789	17,030	11,363	21,257	15,413	13,114
	29,300	CDQ	872	872	494	1,041	721	392	637	637	637	157	157	157	777	777	527
		NonCDQ	12,313	10,845	7,699	11,347	11,347	7,843	11,389	9,618	7,889	11,206	11,206	7,152	12,337	9,486	5,261
	29,300 Total		13,185	11,717	8,193	12,388	12,068	8,235	12,026	10,255	8,526	11,363	11,363	7,309	13,114	10,263	5,788

5.3.2.2 Sector-specific bycatch levels

Chapter 4, Table 4-1 through Table 4-3 present the relative closure dates for all sector allocation options examined under Alternative 2. Following the estimation of closure dates, the annual amount of bycatch by sector, under each option, is tabulated as well as the relative salmon “saved” by virtue of the sector being closed out of fishing at that time to the remainder of the season (Table 5-26 to Table 5-30). The latter is presented as a percentage reduction in bycatch compared to actual catch in those years.

Overall, for the years examined (2003-2007), the inshore CV sector is most impacted by sector split constraints in general, and particularly in the A season. Under the Alternatives 4 and 5 in high bycatch years (2006 and 2007), Mothership, C/P and CV sectors are all constrained in the A season. Of the three sectors, the Mothership and CV sectors tend to reach their caps sooner in the A season than the C/P fleet under these alternatives. For the other alternative scenarios examined under Alternative 2, the offshore C/P fleet experiences the next most significant constraint by sector after CVs, under all options. For the inshore CV fleet, Option 2a sector split (CV allocation is 70%) provides the greatest relief in most years, but still results in a constraint in recent years (2006, 2007) depending upon the seasonal allocation. Under the 70/30 A/B split and the Option 2a allocation. the inshore CV fleet is unconstrained in the A season except in 2007, but constrained in 4 of 5 years in the B season (Table 4-1 through Table 4-3).

For the CP fleet, Option 1 provides the highest allocation (36% CP allocation) with Option 2d providing the next highest at 28.5%. Option 2a is the most constraining for the fleet, constraining in 3 out of 5 years in the A season even in years of low bycatch, particularly when the seasonal allocation is established as 50/50 A/B distribution (Table 4-1 through Table 4-3).

For the mothership fleet and CDQ fleets, Option 2a is the most constraining sector split option. This provides allocations of 6% to the mothership sector and 3% to the CDQ Program. The mothership sector would have been constrained in the A season in 2006 and 2007 even at the highest cap level (Table 4-1 through Table 4-3). In this instance, the sector allocations themselves are the driving aspect for impacts, with the seasonal distributions playing a less important role.

While year to year variability is evident, and individual years are at times inconsistent with general trends, the relative degree of impact of the cap level is more pronounced for all sectors when moving from a cap threshold of 68,100 to 48,700. This is particularly true in evaluating the differences in constraint between cap levels under annual scenarios 1 and 2 under Alternatives 4 and 5. These scenarios are evaluated in Section 5.3.3.

Table 5-26 Hypothetical Chinook bycatch levels and relative reduction from observed Chinook bycatch under different options for sector and season specific caps for 2003. Chinook salmon bycatch provided in numbers of fish.

2003			**opt1 (AFA)**			**opt2a**			**opt2d**			**opt1(AFA)**			**opt2a**			**opt2d**		
Seas	Cap	Sect	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30
A	87,500	CDQ	1,693	1,693	1,693	1,098	1,362	1,693	1,693	1,693	1,693	---	---	---	35%	20%	---	---	---	---
		M	2,578	2,578	2,578	2,578	2,578	2,578	2,578	2,578	2,578	---	---	---	---	---	---	---	---	---
		P	13,049	13,049	13,049	6,731	10,184	12,164	12,164	13,049	13,049	---	---	---	48%	22%	7%	7%	---	---
		S	16,488	16,488	16,488	16,488	16,488	16,488	16,488	16,488	16,488	---	---	---	---	---	---	---	---	---
	87,500 Total		33,808	33,808	33,808	26,894	30,612	32,923	32,923	33,808	33,808	---	---	---	20%	9%	3%	3%	---	---
	68,100	CDQ	1,693	1,693	1,693	964	1,098	1,362	1,693	1,693	1,693	---	---	---	43%	35%	20%	---	---	---
		M	2,578	2,578	2,578	1,976	2,175	2,578	2,377	2,578	2,578	---	---	---	23%	16%	---	8%	---	---
		P	12,164	13,049	13,049	6,731	6,731	6,731	6,731	10,184	13,049	7%	---	---	48%	48%	48%	48%	22%	---
		S	14,985	16,488	16,488	16,488	16,488	16,488	16,488	16,488	16,488	9%	---	---	---	---	---	---	---	---
	68,100 Total		31,421	33,808	33,808	26,158	26,491	27,158	27,288	30,943	33,808	7%	---	---	23%	22%	20%	19%	8%	---
	48,700	CDQ	1,693	1,693	1,693	475	475	964	1,537	1,693	1,693	---	---	---	72%	72%	43%	9%	---	---
		M	2,175	2,377	2,578	1,412	1,412	1,976	1,737	2,069	2,377	16%	8%	---	45%	45%	23%	33%	20%	8%
		P	6,731	6,731	12,164	4,136	4,136	6,731	6,731	6,731	6,731	48%	48%	7%	68%	68%	48%	48%	48%	48%
		S	9,952	12,669	14,985	16,488	16,488	16,488	13,574	14,985	16,488	40%	23%	9%	---	---	---	18%	9%	---
	48,700 Total		20,551	23,470	31,421	22,510	22,510	26,158	23,579	25,478	27,288	39%	31%	7%	33%	33%	23%	30%	25%	19%
	29,300	CDQ	1,362	1,693	1,693	236	475	475	862	1,098	1,098	20%	---	---	86%	72%	72%	49%	35%	35%
		M	969	1,412	1,737	666	969	969	969	969	1,412	62%	45%	33%	74%	62%	62%	62%	62%	45%
		P	4,136	4,136	6,731	2,104	2,104	4,136	4,136	4,136	4,136	68%	68%	48%	84%	84%	68%	68%	68%	68%
		S	5,083	7,303	7,303	9,952	11,197	13,574	7,303	7,303	11,197	69%	56%	56%	40%	32%	18%	56%	56%	32%
	29,300 Total		11,550	14,544	17,464	12,959	14,745	19,154	13,270	13,506	17,843	66%	57%	48%	62%	56%	43%	61%	60%	47%
B	87,500	CDQ	872	872	872	872	872	777	872	872	872	---	---	---	---	---	11%	---	---	---
		M	1,829	1,829	1,829	1,829	1,829	1,502	1,829	1,829	1,829	---	---	---	---	---	18%	---	---	---
		P	3,283	3,283	3,283	3,283	3,283	3,283	3,283	3,283	3,283	---	---	---	---	---	---	---	---	---
		S	7,202	7,202	7,202	7,202	7,202	7,202	7,202	7,202	7,202	---	---	---	---	---	---	---	---	---
	87,500 Total		13,185	13,185	13,185	13,185	13,185	12,763	13,185	13,185	13,185	---	---	---	---	---	3%	---	---	---
	68,100	CDQ	872	872	872	872	815	494	872	872	872	---	---	---	---	7%	43%	---	---	---
		M	1,829	1,829	1,829	1,829	1,502	790	1,829	1,829	1,502	---	---	---	---	18%	57%	---	---	18%
		P	3,283	3,283	3,283	3,283	3,283	3,283	3,283	3,283	3,283	---	---	---	---	---	---	---	---	---
		S	7,202	7,202	7,202	7,202	7,202	7,202	7,202	7,202	7,202	---	---	---	---	---	---	---	---	---
	68,100 Total		13,185	13,185	13,185	13,185	12,801	11,768	13,185	13,185	12,858	---	---	---	---	3%	11%	---	---	2%
	48,700	CDQ	872	872	872	685	494	77	872	872	872	---	---	---	21%	43%	91%	---	---	---
		M	1,829	1,829	790	790	790	790	1,733	1,502	790	---	---	57%	57%	57%	57%	5%	18%	57%
		P	3,283	3,283	3,283	3,283	3,283	2,836	3,283	3,283	3,283	---	---	---	---	---	14%	---	---	---
		S	7,202	7,202	6,139	7,202	7,202	7,202	7,202	7,202	7,202	---	---	15%	---	---	---	---	---	---
	48,700 Total		13,185	13,185	11,084	11,959	11,768	10,904	13,089	12,858	12,146	---	---	16%	9%	11%	17%	1%	2%	8%
	29,300	CDQ	872	872	872	77	77	77	872	777	494	---	---	---	91%	91%	91%	---	11%	43%
		M	790	790	790	790	499	499	790	790	499	57%	57%	57%	57%	73%	73%	57%	57%	73%
		P	3,283	3,283	2,836	2,836	2,386	1,809	3,283	3,283	2,386	---	---	14%	14%	27%	45%	---	---	27%
		S	6,139	4,073	2,206	7,202	7,202	6,139	7,202	6,139	4,073	15%	43%	69%	---	---	15%	---	15%	43%
	29,300 Total		11,084	9,018	6,704	10,904	10,163	8,524	12,146	10,989	7,452	16%	32%	49%	17%	23%	35%	8%	17%	43%

Table 5-27 Hypothetical Chinook bycatch levels and relative reduction from observed Chinook bycatch under different options for sector and season specific caps for 2004. Chinook salmon bycatch provided in numbers of fish.

2004			opt1(AFA)			opt2a			opt2d			opt1(AFA)			opt2a			opt2d		
Seas	Cap	Sect	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30
A	87,500	CDQ	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	1,140	---	---	---	---	---	---	---	---	---
		M	1,846	1,846	1,846	1,846	1,846	1,846	1,846	1,846	1,846	---	---	---	---	---	---	---	---	---
		P	8,598	8,598	8,598	8,598	8,598	8,598	8,598	8,598	8,598	---	---	---	---	---	---	---	---	---
		S	12,376	12,376	12,376	12,376	12,376	12,376	12,376	12,376	12,376	---	---	---	---	---	---	---	---	---
	87,500 Total		23,961	23,961	23,961	23,961	23,961	23,961	23,961	23,961	23,961	---	---	---	---	---	---	---	---	---
	68,100	CDQ	1,140	1,140	1,140	779	1,140	1,140	1,140	1,140	1,140	---	---	---	32%	---	---	---	---	---
		M	1,846	1,846	1,846	1,846	1,846	1,846	1,846	1,846	1,846	---	---	---	---	---	---	---	---	---
		P	8,598	8,598	8,598	6,252	7,633	8,598	8,598	8,598	8,598	---	---	---	27%	11%	---	---	---	---
		S	12,376	12,376	12,376	12,376	12,376	12,376	12,376	12,376	12,376	---	---	---	---	---	---	---	---	---
	68,100 Total		23,961	23,961	23,961	21,254	22,996	23,961	23,961	23,961	23,961	---	---	---	11%	4%	---	---	---	---
	48,700	CDQ	1,140	1,140	1,140	596	779	779	1,140	1,140	1,140	---	---	---	48%	32%	32%	---	---	---
		M	1,846	1,846	1,846	1,349	1,649	1,846	1,822	1,846	1,846	---	---	---	27%	11%	---	1%	---	---
		P	8,598	8,598	8,598	4,829	4,829	6,252	6,252	7,633	8,598	---	---	---	44%	44%	27%	27%	11%	---
		S	9,685	12,376	12,376	12,376	12,376	12,376	12,376	12,376	12,376	22%	---	---	---	---	---	---	---	---
	48,700 Total		21,270	23,961	23,961	19,150	19,633	21,254	21,591	22,996	23,961	11%	---	---	20%	18%	11%	10%	4%	---
	29,300	CDQ	1,140	1,140	1,140	415	415	596	779	1,033	1,140	---	---	---	64%	64%	48%	32%	9%	---
		M	1,195	1,349	1,837	515	948	1,195	948	1,195	1,349	35%	27%	---	72%	49%	35%	49%	35%	27%
		P	4,829	4,829	6,252	2,458	2,458	3,998	3,998	4,829	4,829	44%	44%	27%	71%	71%	54%	54%	44%	44%
		S	6,217	7,017	8,657	9,685	11,666	12,376	7,017	9,685	11,666	50%	43%	30%	22%	6%	---	43%	22%	6%
	29,300 Total		13,380	14,335	17,886	13,073	15,486	18,165	12,741	16,742	18,983	44%	40%	25%	45%	35%	24%	47%	30%	21%
B	87,500	CDQ	1,826	1,826	1,826	1,294	1,041	721	1,826	1,826	1,294	---	---	---	29%	43%	61%	---	---	29%
		M	1,869	1,869	1,869	1,869	1,869	1,279	1,869	1,869	1,869	---	---	---	---	---	32%	---	---	---
		P	2,670	2,670	2,670	2,670	2,670	2,670	2,670	2,670	2,670	---	---	---	---	---	---	---	---	---
		S	19,183	13,331	10,566	23,701	23,701	17,216	23,701	19,183	13,331	19%	44%	55%	---	---	27%	---	19%	44%
	87,500 Total		25,549	19,696	16,932	29,535	29,282	21,886	30,067	25,549	19,164	15%	34%	44%	2%	3%	27%	---	15%	36%
	68,100	CDQ	1,826	1,826	1,826	721	721	392	1,826	1,826	1,294	---	---	---	61%	61%	79%	---	---	29%
		M	1,869	1,869	1,700	1,869	1,700	1,120	1,869	1,869	1,279	---	---	9%	---	9%	40%	---	---	32%
		P	2,670	2,670	2,670	2,670	2,670	2,670	2,670	2,670	2,670	---	---	---	---	---	---	---	---	---
		S	13,331	10,566	8,035	23,701	19,183	13,331	19,183	13,331	10,566	44%	55%	66%	---	19%	44%	19%	44%	55%
	68,100 Total		19,696	16,932	14,231	28,962	24,275	17,513	25,549	19,696	15,810	34%	44%	53%	4%	19%	42%	15%	34%	47%
	48,700	CDQ	1,826	1,826	1,294	721	392	392	1,294	1,294	721	---	---	29%	61%	79%	79%	29%	29%	61%
		M	1,869	1,700	1,279	1,279	1,120	723	1,700	1,279	978	---	9%	32%	32%	40%	61%	9%	32%	48%
		P	2,670	2,670	2,670	2,670	2,670	2,670	2,670	2,670	2,670	---	---	---	---	---	---	---	---	---
		S	10,566	8,035	5,269	13,331	13,331	8,035	13,331	10,566	8,035	55%	66%	78%	44%	44%	66%	44%	55%	66%
	48,700 Total		16,932	14,231	10,512	18,001	17,513	11,820	18,995	15,810	12,404	44%	53%	65%	40%	42%	61%	37%	47%	59%
	29,300	CDQ	1,294	1,041	721	392	151	151	721	721	392	29%	43%	61%	79%	92%	92%	61%	61%	79%
		M	1,279	978	723	723	723	479	978	723	542	32%	48%	61%	61%	61%	74%	48%	61%	71%
		P	2,670	2,670	2,670	2,670	2,515	1,625	2,670	2,670	2,095	---	---	---	---	6%	39%	---	---	22%
		S	5,269	5,269	3,312	8,035	8,035	5,269	8,035	7,000	3,312	78%	78%	86%	66%	66%	78%	66%	70%	86%
	29300 Total		10,512	9,958	7,426	11,820	11,424	7,524	12,404	11,115	6,341	65%	67%	75%	61%	62%	75%	59%	63%	79%

Table 5-28 Hypothetical Chinook bycatch levels and relative reduction from observed Chinook bycatch under different options for sector and season specific caps for 2005. Chinook salmon bycatch provided in numbers of fish.

2005			opt1(AFA)			opt2a			opt2d			opt1(AFA)			opt2a			opt2d		
Seas	Cap	Sect	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30
A	87,500	CDQ	1,296	1,296	1,296	1,296	1,296	1,296	1,296	1,296	1,296	---	---	---	---	---	---	---	---	---
		M	1,869	1,869	1,869	1,869	1,869	1,869	1,869	1,869	1,869	---	---	---	---	---	---	---	---	---
		P	10,410	10,410	10,410	7,995	10,410	10,410	10,410	10,410	10,410	---	---	---	23%	---	---	---	---	---
		S	14,097	14,097	14,097	14,097	14,097	14,097	14,097	14,097	14,097	---	---	---	---	---	---	---	---	---
	87,500 Total		27,673	27,673	27,673	25,257	27,673	27,673	27,673	27,673	27,673	---	---	---	9%	---	---	---	---	---
	68,100	CDQ	1,296	1,296	1,296	964	1,096	1,296	1,296	1,296	1,296	---	---	---	26%	15%	---	---	---	---
		M	1,869	1,869	1,869	1,869	1,869	1,869	1,869	1,869	1,869	---	---	---	---	---	---	---	---	---
		P	10,410	10,410	10,410	6,969	7,995	9,574	9,574	10,410	10,410	---	---	---	33%	23%	8%	8%	---	---
		S	14,097	14,097	14,097	14,097	14,097	14,097	14,097	14,097	14,097	---	---	---	---	---	---	---	---	---
	68,100 Total		27,673	27,673	27,673	23,899	25,057	26,836	26,836	27,673	27,673	---	---	---	14%	9%	3%	3%	---	---
	48,700	CDQ	1,296	1,296	1,296	459	459	964	1,296	1,296	1,296	---	---	---	65%	65%	26%	---	---	---
		M	1,869	1,869	1,869	1,362	1,537	1,869	1,759	1,869	1,869	---	---	---	27%	18%	---	6%	---	---
		P	7,995	10,068	10,410	3,961	5,309	6,969	5,309	7,995	9,574	23%	3%	---	62%	49%	33%	49%	23%	8%
		S	9,888	12,546	14,097	14,097	14,097	14,097	13,694	14,097	14,097	30%	11%	---	---	---	---	3%	---	---
	48,700 Total		21,048	25,780	27,673	19,880	21,402	23,899	22,058	25,257	26,836	24%	7%	---	28%	23%	14%	20%	9%	3%
	29,300	CDQ	1,296	1,296	1,296	338	459	459	459	1,096	1,296	---	---	---	74%	65%	65%	65%	15%	---
		M	1,128	1,362	1,759	477	952	1,128	952	1,128	1,537	40%	27%	6%	74%	49%	40%	49%	40%	18%
		P	3,961	5,309	6,969	1,844	1,844	3,961	3,961	3,961	5,309	62%	49%	33%	82%	82%	62%	62%	62%	49%
		S	4,246	7,218	7,218	9,888	11,148	14,097	7,218	7,218	11,148	70%	49%	49%	30%	21%	---	49%	49%	21%
	29,300 Total		10,632	15,185	17,242	12,547	14,403	19,646	12,591	13,404	19,290	62%	45%	38%	55%	48%	29%	55%	52%	30%
B	87,500	CDQ	637	637	637	637	637	637	637	637	637	---	---	---	---	---	---	---	---	---
		M	690	690	690	690	690	690	690	690	690	---	---	---	---	---	---	---	---	---
		P	3,904	3,904	3,904	3,904	3,904	3,904	3,904	3,904	3,904	---	---	---	---	---	---	---	---	---
		S	19,272	12,630	9,618	26,937	25,550	12,630	19,272	19,272	12,630	45%	64%	73%	23%	27%	64%	45%	45%	64%
	87,500 Total		24,503	17,862	14,849	32,168	30,781	17,862	24,503	24,503	17,862	39%	56%	63%	20%	23%	56%	39%	39%	56%
	68,100	CDQ	637	637	637	637	637	520	637	637	637	---	---	---	---	---	18%	---	---	---
		M	690	690	690	690	690	690	690	690	690	---	---	---	---	---	---	---	---	---
		P	3,904	3,904	3,904	3,904	3,904	3,904	3,904	3,904	3,904	---	---	---	---	---	---	---	---	---
		S	12,630	12,630	7,537	19,272	19,272	12,630	19,272	12,630	9,618	64%	64%	78%	45%	45%	64%	45%	64%	73%
	68,100 Total		17,862	17,862	12,769	24,503	24,503	17,745	24,503	17,862	14,849	56%	56%	68%	39%	39%	56%	39%	56%	63%
	48,700	CDQ	637	637	637	637	520	419	637	637	637	---	---	---	---	18%	34%	---	---	---
		M	690	690	690	690	690	690	690	690	690	---	---	---	---	---	---	---	---	---
		P	3,904	3,904	3,904	3,904	3,904	2,743	3,904	3,904	3,904	---	---	---	---	---	30%	---	---	---
		S	9,618	7,537	6,455	12,630	12,630	9,618	12,630	9,618	7,537	73%	78%	82%	64%	64%	73%	64%	73%	78%
	48,700 Total		14,849	12,769	11,687	17,862	17,745	13,470	17,862	14,849	12,769	63%	68%	71%	56%	56%	67%	56%	63%	68%
	29,300	CDQ	637	637	637	419	324	260	637	637	520	---	---	---	34%	49%	59%	---	---	18%
		M	690	690	690	690	690	470	690	690	595	---	---	---	---	---	32%	---	---	14%
		P	3,904	3,904	2,743	2,743	1,908	1,633	3,904	3,382	1,908	---	---	30%	30%	51%	58%	---	13%	51%
		S	6,455	4,724	3,531	9,618	7,537	5,753	7,537	6,455	4,724	82%	86%	90%	73%	78%	84%	78%	82%	86%
	29,300 Total		11,687	9,955	7,602	13,470	10,459	8,116	12,769	11,164	7,747	71%	75%	81%	67%	74%	80%	68%	72%	81%

Table 5-29 Hypothetical Chinook bycatch levels and relative reduction from observed Chinook bycatch under different options for sector and season specific caps for 2006. Chinook salmon bycatch provided in numbers of fish.

2006			opt1(AFA)			opt2a			opt2d			opt1(AFA)			opt2a			opt2d		
Seas	Cap	Sect	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30
A	87,500	CDQ	1,580	1,580	1,580	1,129	1,340	1,580	1,580	1,580	1,580	---	---	---	29%	15%	---	---	---	---
		M	2,873	4,331	4,877	2,620	2,873	2,873	2,873	2,873	4,331	41%	11%	---	46%	41%	41%	41%	41%	11%
		P	15,281	16,257	16,257	7,939	9,665	12,222	12,222	12,222	16,257	6%	---	---	51%	41%	25%	25%	25%	---
		S	9,410	20,123	23,544	23,544	35,284	36,138	23,544	23,544	33,542	74%	44%	35%	35%	2%	---	35%	35%	7%
	87,500 Total		29,144	42,291	46,257	35,232	49,162	52,813	40,218	40,218	55,709	50%	28%	21%	40%	16%	10%	32%	32%	5%
	68,100	CDQ	1,580	1,580	1,580	653	1,129	1,340	1,580	1,580	1,580	---	---	---	59%	29%	15%	---	---	---
		M	2,873	2,873	2,873	1,323	1,323	2,620	1,323	2,873	2,873	41%	41%	41%	73%	73%	46%	73%	41%	41%
		P	12,222	12,222	16,257	6,347	7,939	9,665	9,665	9,665	12,222	25%	25%	---	61%	51%	41%	41%	41%	25%
		S	9,410	9,410	20,123	23,544	23,544	32,290	9,410	20,123	23,544	74%	74%	44%	35%	35%	11%	74%	44%	35%
	68,100 Total		26,085	26,085	40,833	31,866	33,935	45,916	21,979	34,242	40,218	56%	56%	31%	46%	42%	22%	63%	42%	32%
	48,700	CDQ	1,580	1,580	1,580	653	653	653	1,580	1,580	1,580	---	---	---	59%	59%	59%	---	---	---
		M	1,323	1,323	2,873	1,323	1,323	1,323	1,323	1,323	1,323	73%	73%	41%	73%	73%	73%	73%	73%	73%
		P	7,939	9,665	12,222	3,515	3,515	6,347	6,347	7,939	9,665	51%	41%	25%	78%	78%	61%	61%	51%	41%
		S	9,410	9,410	9,410	9,410	9,410	23,544	9,410	9,410	9,410	74%	74%	74%	74%	74%	35%	74%	74%	74%
	48,700 Total		20,253	21,979	26,085	14,901	14,901	31,866	18,660	20,253	21,979	66%	63%	56%	75%	75%	46%	68%	66%	63%
	29,300	CDQ	1,340	1,580	1,580	400	400	400	653	653	1,129	15%	---	---	75%	75%	75%	59%	59%	29%
		M	933	1,323	1,323	200	933	933	933	933	1,323	81%	73%	73%	96%	81%	81%	81%	81%	73%
		P	3,515	3,515	6,347	2,860	3,515	3,515	3,515	3,515	3,515	78%	78%	61%	82%	78%	78%	78%	78%	78%
		S	4,653	4,653	4,653	9,410	9,410	9,410	4,653	9,410	9,410	87%	87%	87%	74%	74%	74%	87%	74%	74%
	29,300 Total		10,441	11,071	13,903	12,870	14,258	14,258	9,754	14,511	15,377	82%	81%	76%	78%	76%	76%	83%	75%	74%
B	87,500	CDQ	157	157	157	157	157	157	157	157	157	---	---	---	---	---	---	---	---	---
		M	159	159	159	159	159	159	159	159	159	---	---	---	---	---	---	---	---	---
		P	1,435	1,435	1,435	1,435	1,435	1,435	1,435	1,435	1,435	---	---	---	---	---	---	---	---	---
		S	19,076	15,499	10,093	22,654	22,654	15,499	22,654	19,076	12,297	16%	32%	55%	---	---	32%	---	16%	46%
	87,500 Total		20,828	17,250	11,844	24,405	24,405	17,250	24,405	20,828	14,048	15%	29%	51%	---	---	29%	---	15%	42%
	68,100	CDQ	157	157	157	157	157	157	157	157	157	---	---	---	---	---	---	---	---	---
		M	159	159	159	159	159	159	159	159	159	---	---	---	---	---	---	---	---	---
		P	1,435	1,435	1,435	1,435	1,435	1,435	1,435	1,435	1,435	---	---	---	---	---	---	---	---	---
		S	12,297	12,297	8,509	22,654	19,076	12,297	19,076	15,499	10,093	46%	46%	62%	---	16%	46%	16%	32%	55%
	68,100 Total		14,048	14,048	10,261	24,405	20,828	14,048	20,828	17,250	11,844	42%	42%	58%	---	15%	42%	15%	29%	51%
	48,700	CDQ	157	157	157	157	157	157	157	157	157	---	---	---	---	---	---	---	---	---
		M	159	159	159	159	159	159	159	159	159	---	---	---	---	---	---	---	---	---
		P	1,435	1,435	1,435	1,435	1,435	1,435	1,435	1,435	1,435	---	---	---	---	---	---	---	---	---
		S	10,093	8,509	6,220	15,499	12,297	10,093	12,297	10,093	6,220	55%	62%	73%	32%	46%	55%	46%	55%	73%
	48,700 Total		11,844	10,261	7,971	17,250	14,048	11,844	14,048	11,844	7,971	51%	58%	67%	29%	42%	51%	42%	51%	67%
	29,300	CDQ	157	157	157	157	157	157	157	157	157	---	---	---	---	---	---	---	---	---
		M	159	159	159	159	159	159	159	159	159	---	---	---	---	---	---	---	---	---
		P	1,435	1,435	1,435	1,435	1,435	1,435	1,435	1,435	1,435	---	---	---	---	---	---	---	---	---
		S	6,220	4,025	3,668	10,093	8,509	4,025	6,220	6,220	4,025	73%	82%	84%	55%	62%	82%	73%	73%	82%
	29,300 Total		7,971	5,777	5,420	11,844	10,261	5,777	7,971	7,971	5,777	67%	76%	78%	51%	58%	76%	67%	67%	76%

Table 5-30 Hypothetical Chinook bycatch levels and relative reduction from observed Chinook bycatch under different options for sector and season specific caps for 2007. Chinook salmon bycatch provided in numbers of fish.

2007			opt1(AFA)			opt2a			opt2d			opt1(AFA)			opt2a			opt2d		
Seas	Cap	Sect	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30
A	87,500	CDQ	3,091	3,091	3,091	1,309	1,309	1,309	2,414	3,091	3,091	---	---	---	58%	58%	58%	22%	---	---
		M	3,547	4,417	4,817	1,985	1,985	3,547	3,172	3,547	4,417	26%	8%	---	59%	59%	26%	34%	26%	8%
		P	13,332	17,680	20,290	7,688	7,688	7,688	7,688	13,332	13,332	49%	32%	22%	70%	70%	70%	70%	49%	49%
		S	13,083	20,757	24,280	29,432	34,202	35,714	24,280	24,280	34,202	63%	42%	32%	18%	4%	---	32%	32%	4%
	87,500 Total		33,053	45,945	52,478	40,415	45,185	48,259	37,554	44,250	55,042	52%	34%	25%	42%	35%	31%	46%	36%	21%
	68,100	CDQ	3,091	3,091	3,091	502	502	1,309	1,926	2,414	3,091	---	---	---	84%	84%	58%	38%	22%	---
		M	1,985	3,547	4,029	1,985	1,985	1,985	1,985	1,985	3,547	59%	26%	16%	59%	59%	59%	59%	59%	26%
		P	7,688	13,332	13,332	5,871	7,688	7,688	7,688	7,688	13,332	70%	49%	49%	77%	70%	70%	70%	70%	49%
		S	13,083	13,083	20,757	20,757	24,280	33,028	13,083	20,757	24,280	63%	63%	42%	42%	32%	8%	63%	42%	32%
	68,100 Total		25,847	33,053	41,209	29,115	34,455	44,011	24,682	32,845	44,250	63%	52%	41%	58%	50%	37%	64%	53%	36%
	48,700	CDQ	2,414	2,414	3,091	502	502	502	1,309	1,309	1,926	22%	22%	---	84%	84%	84%	58%	58%	38%
		M	1,985	1,985	1,985	59	59	1,985	59	1,985	1,985	59%	59%	59%	99%	99%	59%	99%	59%	59%
		P	7,688	7,688	7,688	182	5,871	5,871	5,871	7,688	7,688	70%	70%	70%	99%	77%	77%	77%	70%	70%
		S	1,250	1,250	13,083	13,083	13,083	20,757	13,083	13,083	13,083	96%	96%	63%	63%	63%	42%	63%	63%	63%
	48,700 Total		13,338	13,338	25,847	13,826	19,514	29,115	20,321	24,065	24,682	81%	81%	63%	80%	72%	58%	71%	65%	64%
	29,300	CDQ	1,309	1,309	1,926	246	502	502	502	502	1,309	58%	58%	38%	92%	84%	84%	84%	84%	58%
		M	59	59	59	59	59	59	59	59	59	99%	99%	99%	99%	99%	99%	99%	99%	99%
		P	182	5,871	5,871	182	182	182	182	182	182	99%	77%	77%	99%	99%	99%	99%	99%	99%
		S	1,250	1,250	1,250	1,250	1,250	13,083	1,250	1,250	1,250	96%	96%	96%	96%	96%	63%	96%	96%	96%
	29,300 Total		2,801	8,489	9,106	1,738	1,994	13,826	1,994	1,994	2,801	96%	88%	87%	98%	97%	80%	97%	97%	96%
B	87,500	CDQ	2,529	2,529	2,529	1,235	777	777	2,529	2,206	1,235	---	---	---	51%	69%	69%	---	13%	51%
		M	1,956	1,956	1,956	1,956	1,956	1,398	1,956	1,956	1,956	---	---	---	---	---	29%	---	---	---
		P	6,317	6,317	6,317	6,317	6,317	4,526	6,317	6,317	6,317	---	---	---	---	---	28%	---	---	---
		S	15,674	15,674	10,680	27,320	22,278	15,674	22,278	15,674	10,680	62%	62%	74%	34%	47%	62%	47%	62%	74%
	87,500 Total		26,476	26,476	21,482	36,828	31,327	22,375	33,079	26,153	20,188	50%	50%	59%	30%	40%	57%	37%	50%	62%
	68,100	CDQ	2,529	2,529	1,235	777	777	527	2,206	1,235	1,235	---	---	51%	69%	69%	79%	13%	51%	51%
		M	1,956	1,956	1,398	1,956	1,398	1,086	1,956	1,956	1,398	---	---	29%	---	29%	44%	---	---	29%
		P	6,317	6,317	6,317	6,317	5,979	4,108	6,317	6,317	4,526	---	---	---	---	5%	35%	---	---	28%
		S	10,680	10,680	6,800	22,278	15,674	10,680	15,674	15,674	10,680	74%	74%	84%	47%	62%	74%	62%	62%	74%
	68,100 Total		21,482	21,482	15,750	31,327	23,828	16,400	26,153	25,182	17,838	59%	59%	70%	40%	55%	69%	50%	52%	66%
	48,700	CDQ	2,206	1,235	1,235	527	527	354	1,235	1,235	777	13%	51%	51%	79%	79%	86%	51%	51%	69%
		M	1,956	1,398	1,086	1,398	1,086	850	1,398	1,398	1,086	---	29%	44%	29%	44%	57%	29%	29%	44%
		P	6,317	6,317	4,526	4,526	4,108	2,758	6,317	4,526	4,108	---	---	28%	28%	35%	56%	---	28%	35%
		S	10,680	6,800	3,023	15,674	10,680	9,311	10,680	10,680	6,800	74%	84%	93%	62%	74%	78%	74%	74%	84%
	48,700 Total		21,159	15,750	9,869	22,125	16,400	13,272	19,630	17,838	12,771	60%	70%	81%	58%	69%	75%	63%	66%	76%
	29,300	CDQ	1,235	777	777	354	354	178	777	777	527	51%	69%	69%	86%	86%	93%	69%	69%	79%
		M	1,086	1,086	715	850	715	420	1,086	850	586	44%	44%	63%	57%	63%	79%	44%	57%	70%
		P	4,526	4,108	2,758	2,758	2,422	1,763	4,108	3,504	2,422	28%	35%	56%	56%	62%	72%	35%	45%	62%
		S	3,023	3,023	3,023	9,311	6,800	3,023	6,800	6,800	3,023	93%	93%	93%	78%	84%	93%	84%	84%	93%
	29,300 Total		9,869	8,993	7,272	13,272	10,291	5,383	12,771	11,931	6,557	81%	83%	86%	75%	80%	90%	76%	77%	88%

5.3.3 Alternative 4 and 5 bycatch levels and comparison of options

Alternatives 4 and 5 prescribe specific combinations of options, as described in Section 2.4 and Section 2.5. In analyzing these alternatives, the retrospective analysis evaluated the prescribed set of options, as well as some variants on these options, as described below. The variation of different options (e.g., percent rollover, transferability) was evaluated to both compare and contrast Alternative 5 against alternative combinations in Alternative 2 and 4 as well as to indicate which options are driving the observed impacts under Alternatives 4 and 5.

Tables showing the relative constraints by sector and the relative salmon caught by sector are shown in Table 5-31, Table 5-32 and Table 5-35 through Table 5-39. All tables have a similar format and structure. The first column indicates the annual scenario; the second transferability. Scenarios with A season transferability ('Yes') indicates that fishing sectors that have met their pollock allocation can transfer remaining salmon bycatch allowances. Transferability is the default assumption for the B season. The subsequent columns provide A season information for the sectors, and then the 'A-B Rollover' column describes what percentage of the remaining bycatch cap, by sector, may be rolled over to the B season. Fig. 5-40 provides a key for understanding the construction of the tables for evaluating the alternatives and the impact of the different rollover provisions, given these assumptions and perturbations.

Alternative (4 or 5). Annual scenario AS1 or AS2

If assume perfect transferability in A season then 'yes'. Otherwise no transferability

Amount rollover to B season from A season remainder. Default under Alt 4 is 80%. For contrast 0 and 100% are analyzed. Alt 5 is 100%.

All B season bycatch assumed perfect transferability

Alt 4 AS	A-season Transfer-Ability	Year	A-Season CDQ	M	P	S	A total	A-B Roll over	B-Season CDQ	M	P	S	B total	Annual Total
1	No	2003	1,910	2,494	12,867	16,307	**33,578**	0%	889	1,832	3,259	7,132	**13,113**	**46,691**
		2004	1,167	1,843	8,573	12,372	**23,955**		1,180	1,402	2,611	14,490	**19,683**	**43,639**
		2005	1,294	1,858	10,381	14,079	**27,612**		560	689	3,922	14,947	**20,119**	**47,730**
		2006	1,804	3,809	15,048	23,158	**43,819**		157	164	1,431	18,172	**19,923**	**63,742**
		2007	3,634	3,801	15,137	23,557	**46,130**		1,109	1,406	3,568	13,772	**19,855**	**65,986**
	Yes	2003	1,910	2,494	12,867	16,307	**33,578**		Note numbers under 'yes' scenario in B season are always equivalent to B season numbers under 'no' scenario (above).				**13,113**	**46,691**
		2004	1,167	1,843	8,573	12,372	**23,955**						**19,683**	**43,639**
		2005	1,294	1,858	10,381	14,079	**27,612**						**20,119**	**47,730**
		2006	1,804	3,992	16,194	24,943	**46,932**						**19,923**	**66,855**
		2007	3,634	3,860	15,137	23,557	**46,189**						**19,855**	**66,045**
2	No	2003	1,910	2,494	10,808	16,307	**31,520**		889	1,690	3,259	7,132	**12,971**	**44,491**
		2004	1,167	1,843	8,573	12,372	**23,955**		743	983	2,551	9,811	**14,088**	**38,043**
		2005	1,294	1,858	10,381	14,079	**27,612**		560	689	2,608	10,040	**13,897**	**41,509**
		2006	1,804	2,658	10,819	16,451	**31,732**		157	164	1,431	12,277	**14,028**	**45,760**
		2007	3,058	2,556	10,911	15,650	**32,175**		768	1,029	2,538	9,833	**14,168**	**46,343**
	Yes	2003	1,910	2,494	12,437	16,307	**33,149**		Note numbers under 'yes' scenario in B season are always equivalent to B season numbers under 'no' scenario (above).				**12,971**	**46,120**
		2004	1,167	1,843	8,573	12,372	**23,955**						**14,088**	**38,043**
		2005	1,294	1,858	10,381	14,079	**27,612**						**13,897**	**41,509**
		2006	1,804	2,658	11,388	17,021	**32,871**						**14,028**	**46,899**
		2007	3,058	2,556	10,911	15,650	**32,175**						**14,168**	**46,343**

Fig. 5-40 Schematic guide for the layout of Alternative 4 and 5 impact tables.

Table 5-31 Dates of closures under Alternative 4 AS1 and AS2, with an 80% A-B season rollover provision.

Alt 4 AS	A-season Transfer-Ability	Year	A-Season CDQ	M	P	S	A-B Rollover	B-Season CDQ	M	P	S
1	No	2003	--	--	--	--	80%	--	--	--	--
		2004	--	--	--	--		--	--	--	--
		2005	--	--	--	--		--	--	--	29-Oct
		2006	--	23-Feb	18-Mar	19-Feb		--	--	--	22-Oct
		2007	--	19-Feb	15-Feb	15-Feb		15-Oct	25-Oct	10-Oct	7-Oct
	Yes	2003	--	--	--	--		--	--	--	--
		2004	--	--	--	--		--	--	--	--
		2005	--	--	--	--		--	--	--	29-Oct
		2006	--	27-Feb	--	20-Feb		--	--	--	22-Oct
		2007	--	22-Feb	15-Feb	15-Feb		15-Oct	25-Oct	10-Oct	7-Oct
2	No	2003	--	--	8-Mar	--		--	--	--	--
		2004	--	--	--	--		--	--	--	11-Oct
		2005	--	--	--	--		--	--	25-Sep	5-Oct
		2006	--	18-Feb	5-Mar	9-Feb		--	--	--	10-Oct
		2007	7-Mar	2-Feb	6-Feb	5-Feb		7-Oct	17-Oct	29-Sep	26-Sep
	Yes	2003	--	--	21-Mar	--		--	16-Oct	--	--
		2004	--	--	--	--		--	--	--	11-Oct
		2005	--	--	--	--		--	--	25-Sep	5-Oct
		2006	--	18-Feb	9-Mar	10-Feb		--	--	--	10-Oct
		2007	7-Mar	2-Feb	6-Feb	5-Feb		7-Oct	17-Oct	29-Sep	26-Sep

Note: 'No' in the 'A-season Transferability' column assumes no transferability, 'yes' assumes perfect transferability. In all cases, perfect transferability in the B season is assumed.

Table 5-32 Dates of closures under Alternative 4 AS1 and AS2, with 0 and 100% A-B season rollover provisions

Alt 4 AS	A-season Transfer-Ability	Year	A-Season CDQ	M	P	S	A-B Rollover	B-Season CDQ	M	P	S
1	No	2003	--	--	--	--	0%	--	--	--	--
		2004	--	--	--	--		23-Sep	29-Oct	--	11-Oct
		2005	--	--	--	--		--	--	--	6-Oct
		2006	--	23-Feb	18-Mar	19-Feb		--	--	--	21-Oct
		2007	--	19-Feb	15-Feb	15-Feb		11-Oct	25-Oct	8-Oct	7-Oct
	Yes	2003	--	--	--	--		--	--	--	--
		2004	--	--	--	--		23-Sep	29-Oct	--	11-Oct
		2005	--	--	--	--		--	--	--	6-Oct
		2006	--	27-Feb	--	20-Feb		--	--	--	21-Oct
		2007	--	22-Feb	15-Feb	15-Feb		11-Oct	25-Oct	8-Oct	7-Oct
2	No	2003	--	--	8-Mar	--		--	16-Oct	--	--
		2004	--	--	--	--		12-Sep	13-Oct	30-Sep	2-Oct
		2005	--	--	--	--		--	--	10-Sep	1-Oct
		2006	--	18-Feb	5-Mar	9-Feb		--	--	--	10-Oct
		2007	7-Mar	2-Feb	6-Feb	5-Feb		7-Oct	16-Oct	29-Sep	26-Sep
	Yes	2003	--	--	21-Mar	--		--	16-Oct	--	--
		2004	--	--	--	--		12-Sep	13-Oct	30-Sep	2-Oct
		2005	--	--	--	--		--	--	10-Sep	1-Oct
		2006	--	18-Feb	9-Mar	10-Feb		--	--	--	10-Oct
		2007	7-Mar	2-Feb	6-Feb	5-Feb		7-Oct	16-Oct	29-Sep	26-Sep
1	No	2003	--	--	--	--	100%	--	--	--	--
		2004	--	--	--	--		--	--	--	--
		2005	--	--	--	--		--	--	--	--
		2006	--	23-Feb	18-Mar	19-Feb		--	--	--	23-Oct
		2007	--	19-Feb	15-Feb	15-Feb		15-Oct	25-Oct	11-Oct	7-Oct
	Yes	2003	--	--	--	--		--	--	--	--
		2004	--	--	--	--		--	--	--	--
		2005	--	--	--	--		--	--	--	--
		2006	--	27-Feb	--	20-Feb		--	--	--	23-Oct
		2007	--	22-Feb	15-Feb	15-Feb		15-Oct	25-Oct	11-Oct	7-Oct
2	No	2003	--	--	8-Mar	--		--	--	--	--
		2004	--	--	--	--		--	--	--	13-Oct
		2005	--	--	--	--		--	--	30-Sep	6-Oct
		2006	--	18-Feb	5-Mar	9-Feb		--	--	--	11-Oct
		2007	7-Mar	2-Feb	6-Feb	5-Feb		7-Oct	17-Oct	29-Sep	26-Sep
	Yes	2003	--	--	21-Mar	--		--	--	--	--
		2004	--	--	--	--		--	--	--	13-Oct
		2005	--	--	--	--		--	--	30-Sep	6-Oct
		2006	--	18-Feb	9-Mar	10-Feb		--	--	--	11-Oct
		2007	7-Mar	2-Feb	6-Feb	5-Feb		7-Oct	17-Oct	29-Sep	26-Sep

Note: 'No' in the 'A-season Transferability' column assumes no transferability, 'yes' assumes perfect transferability. In all cases, perfect transferability in the B season is assumed.

Table 5-33 Dates of pollock fishery closures under Alternative 5, with and without A-season transferability.

		A-Season				B-Season			
Transferability	Year	CDQ	M	P	S	CDQ	M	P	S
No	2003	---	---	---	---	---	---	---	---
	2004	---	---	---	---	---	---	---	---
	2005	---	---	---	---	---	---	---	26-Oct
	2006	---	21-Feb	13-Mar	15-Feb	---	---	---	19-Oct
	2007	---	12-Feb	12-Feb	11-Feb	8-Oct	21-Oct	6-Oct	5-Oct
Yes	2003	---	---	---	---	---	---	---	---
	2004	---	---	---	---	---	---	---	---
	2005	---	---	---	---	---	---	---	26-Oct
	2006	---	21-Feb	14-Mar	17-Feb	---	---	---	19-Oct
	2007	---	13-Feb	12-Feb	11-Feb	8-Oct	21-Oct	6-Oct	5-Oct

Cap level

Two cap levels are evaluated under each alternative (Alternatives 4 and 5) based upon the two annual scenarios, as described in Section 2.4 and Section 2.5. This analysis assumes that the entire fleet is operating under either the high cap (annual scenario 1) of 68,392 (Alternative 4), 60,000 (Alternative 5) or the lower cap of 47,591 (annual scenario 2 for both Alternatives 4 and 5). A separate section below discusses the implications of 'opting out' of the ICA or IPA under annual scenario 1, and the associated Chinook bycatch and impacts thereof. For purposes of the main impact analysis however, the assumption is that the entire fleet is operating under the same cap, with the prescribed seasonal and sector allocation as detailed in Section 2.4 and Section 2.5).

Seasonal allocation and sector split

The annual scenarios under both Alternatives 4 and 5 include a seasonal allocation of 70/30 A/B season, and the following prescribed sector split by season:

A season: CDQ 9.3%; inshore CV fleet 49.8%; mothership fleet 8.0%; offshore CP fleet 32.9%
B season: CDQ 5.5%; inshore CV fleet 69.3%; mothership fleet 7.3%; offshore CP fleet 17.9%

The sector split options under Alternative 2 do not include this specific seasonal sector allocations prescribed in Alternatives 4 and 5. However, for purposes of comparison, Alternative 2 Option 2d with a 70/30 seasonal split has the following sector allocations:

CDQ 6.5%; inshore CV fleet 57.5%; mothership fleet 7.5%; offshore CP fleet 28.5%

In all tables, for comparative purposes, cap levels 68,100 and 48,700 for Alternative 2 Option 2d, 70/30 seasonal split have been shaded to compare the impacts of the change in sector split between similar cap and seasonal thresholds. Notably, however, only Alternatives 4 and 5 consider a rollover of any portion of the remaining A season cap to be used in the B season. The relative impact of the rollover is described below.

Rollover

Alternative 4 includes a prescribed rollover of 80% from A to B season, which means that each sector receives 80% of remaining salmon at the end of the A season to add to their B season cap. Alternative 5 includes a prescribed rollover of 100% from A to B season. Given that Alternative 2 options were analyzed without such a provision, some comparative information was computed for Alternative 4 (only) to evaluate rollover impacts of 0% (no rollover from A to B) and 100% (all remaining bycatch rolls over from A to B by sector). This comparative information serves to illustrate the impact of these assumptions. For clarity and to limit the number and sizes of tables presented, the assessment of different rollover provisions was provided for the Alternative 4 scenarios. For the reasons described below, results for Alternative 4 AS2 are used throughout to characterize the impacts of Alternative 5 AS2.

In general, the retrospective impact between a 100% rollover and the 80% default rollover level was small for all sectors except for inshore CVs. The inshore CVs were able to avoid being closed under 100% rollover in 2004 and were able to generally stay open a few days longer in 2005-2007. As expected, the contrast between no rollover (0%) and the 80% level was greater with all sectors suffering shorter season lengths in the B-season (compare Table 5-31 with Table 5-32). Table 5-34 summarizes more detailed impacts by sector on the impacts of different rollover levels. Clearly, allowing more flexibility in rolling over Chinook salmon bycatch allowances between seasons provides the fishery with mechanisms to be less restricted while still staying below the overall cap as specified.

Table 5-35 and Table 5-36 detail the hypothetical Chinook bycatch levels under the Alternative 4 annual scenarios, assuming 80%, 0%, 100% rollover scenarios. Table 5-38 and Table 5-39 describe the hypothetical number of salmon that would have been saved, had the Alternative 4 annual scenario caps been in place, and assuming 80%, 0%, 100% rollover scenarios.

Table 5-34 Summary of sector-specific impacts for different rollover allowances (100% and 0%) compared to the 80% seasonal rollover levels.

Sector	100% rollover compared to 80%	No rollover compared to default 80% rollover
CDQ	No change	In 2004 closures would have occurred under Alt 4 AS1 (September 23) and Alt 4 AS2 (September 12). These earlier closures would have saved an additional 675 salmon (Alt 4 AS1) and 1,112 (Alt 4 AS2) at the expense of forgone pollock of 15,995 t (Alt 4 AS1) and 37,452 t (Alt 4 AS2).
Mothership	No change	2004? B season closure on October 16 (Alt 4 AS2). 142 salmon saved and 1,447 t of forgone pollock. In 2004, closure on October 29 (Alt 4 AS1) and October 13 (Alt 4 AS2) resulting in 547 and 966 salmon saved, respectively with corresponding forgone pollock levels of 1,152 t and 3,187 t.
Catcher Processor	There would have been a 5 day delay in closure in 2005 and a one day delay in the closure in 2007. Chinook salmon bycatch levels would have increased by 154 fish in 2005 (and allow forgone pollock to decrease by 6,840 t)	Additional closures in 2004 and 2005 (Alt 4 AS2) and earlier closure in 2007 (Alt 4 AS1). 204 fewer salmon caught (2007 Alt 4 AS1) and 60 and 1,314 fewer salmon under Alt 4 AS2. Forgone pollock increases by 1,008 t (2004) 37,999 t (2005), and 1,983 t (2007).
Inshore CV	No closure in 2005 (Alt 4 AS1) and delayed closures by 1-3 days in 2004 and 2006 (Alt 4 AS2). Chinook salmon bycatch levels would have increased by 1,949, 1,621, and 674 more salmon in 2004-2006, respectively, with corresponding decreases in forgone pollock of 4,397 t (2004), 1,498 t (2005) and 1,828 t (2006) for 100% rollover scenario, compared to 80% rollover	Additional closure in 2004 (October 11) and earlier closures in 2005 and 2006.

Table 5-35 Hypothetical Chinook salmon bycatch levels by sector for Alternative 4 AS1 and AS2, assuming **80%** allowable rollover from A to B season.

Alt 4 AS	**A-season Transfer-Ability**	**Year**	**A-Season** **CDQ**	**M**	**P**	**S**	**A total**	**A-B Roll over**	**B-Season** **CDQ**	**M**	**P**	**S**	**B total**	**Annual Total**
1	No	2003	1,910	2,494	12,867	16,307	33,578	0%	889	1,832	3,259	7,132	13,113	46,691
		2004	1,167	1,843	8,573	12,372	23,955		1,180	1,402	2,611	14,490	19,683	43,639
		2005	1,294	1,858	10,381	14,079	27,612		560	689	3,922	14,947	20,119	47,730
		2006	1,804	3,809	15,048	23,158	43,819		157	164	1,431	18,172	19,923	63,742
		2007	3,634	3,801	15,137	23,557	46,130		1,109	1,406	3,568	13,772	19,855	65,986
	Yes	2003	1,910	2,494	12,867	16,307	33,578		889	1,832	3,259	7,132	13,113	46,691
		2004	1,167	1,843	8,573	12,372	23,955		1,180	1,402	2,611	14,490	19,683	43,639
		2005	1,294	1,858	10,381	14,079	27,612		560	689	3,922	14,947	20,119	47,730
		2006	1,804	3,992	16,194	24,943	46,932		157	164	1,431	18,172	19,923	66,855
		2007	3,634	3,860	15,137	23,557	46,189		1,109	1,406	3,568	13,772	19,855	66,045
2	No	2003	1,910	2,494	10,808	16,307	31,520		889	1,690	3,259	7,132	12,971	44,491
		2004	1,167	1,843	8,573	12,372	23,955		743	983	2,551	9,811	14,088	38,043
		2005	1,294	1,858	10,381	14,079	27,612		560	689	2,608	10,040	13,897	41,509
		2006	1,804	2,658	10,819	16,451	31,732		157	164	1,431	12,277	14,028	45,760
		2007	3,058	2,556	10,911	15,650	32,175		768	1,029	2,538	9,833	14,168	46,343
	Yes	2003	1,910	2,494	12,437	16,307	33,149		889	1,690	3,259	7,132	12,971	46,120
		2004	1,167	1,843	8,573	12,372	23,955		743	983	2,551	9,811	14,088	38,043
		2005	1,294	1,858	10,381	14,079	27,612		560	689	2,608	10,040	13,897	41,509
		2006	1,804	2,658	11,388	17,021	32,871		157	164	1,431	12,277	14,028	46,899
		2007	3,058	2,556	10,911	15,650	32,175		768	1,029	2,538	9,833	14,168	46,343
1	No	2003	1,910	2,494	12,867	16,307	**33,578**	100%	889	1,832	3,259	7,132	**13,113**	**46,691**
		2004	1,167	1,843	8,573	12,372	**23,955**		1,855	1,949	2,611	23,575	**29,990**	**53,946**
		2005	1,294	1,858	10,381	14,079	**27,612**		560	689	3,922	33,023	**38,194**	**65,806**
		2006	1,804	3,809	15,048	23,158	**43,819**		157	164	1,431	19,127	**20,878**	**64,697**
		2007	3,634	3,801	15,137	23,557	**46,130**		1,242	1,406	3,805	13,772	**20,226**	**66,356**
	Yes	2003	1,910	2,494	12,867	16,307	**33,578**		889	1,832	3,259	7,132	**13,113**	**46,691**
		2004	1,167	1,843	8,573	12,372	**23,955**		1,855	1,949	2,611	23,575	**29,990**	**53,946**
		2005	1,294	1,858	10,381	14,079	**27,612**		560	689	3,922	33,023	**38,194**	**65,806**
		2006	1,804	3,992	16,194	24,943	**46,932**		157	164	1,431	19,127	**20,878**	**67,810**
		2007	3,634	3,860	15,137	23,557	**46,189**		1,242	1,406	3,805	13,772	**20,226**	**66,415**
2	No	2003	1,910	2,494	10,808	16,307	**31,520**		889	1,832	3,259	7,132	**13,113**	**44,633**
		2004	1,167	1,843	8,573	12,372	**23,955**		1,855	1,949	2,611	16,439	**22,854**	**46,810**
		2005	1,294	1,858	10,381	14,079	**27,612**		560	689	3,677	14,947	**19,874**	**47,485**
		2006	1,804	2,658	10,819	16,451	**31,732**		157	164	1,431	12,952	**14,703**	**46,435**
		2007	3,058	2,556	10,911	15,650	**32,175**		768	1,069	2,538	9,833	**14,208**	**46,383**
	Yes	2003	1,910	2,494	12,437	16,307	**33,149**		889	1,832	3,259	7,132	**13,113**	**46,261**
		2004	1,167	1,843	8,573	12,372	**23,955**		1,855	1,949	2,611	16,439	**22,854**	**46,810**
		2005	1,294	1,858	10,381	14,079	**27,612**		560	689	3,677	14,947	**19,874**	**47,485**
		2006	1,804	2,658	11,388	17,021	**32,871**		157	164	1,431	12,952	**14,703**	**47,574**
		2007	3,058	2,556	10,911	15,650	**32,175**		768	1,069	2,538	9,833	**14,208**	**46,383**

Table 5-36 Hypothetical Chinook salmon bycatch levels by sector for Alternative 4 AS1 and AS2, assuming 0% and 100% allowable rollover from A to B season.

Alt 4 AS	A-season Transfer-Ability	A-Season Year	CDQ	M	P	S	A total	A-B Roll over	B-Season CDQ	M	P	S	B total	Annual Total
1	No	2003	1,910	2,494	12,867	16,307	33,578	0%	889	1,832	3,259	7,132	13,113	46,691
		2004	1,167	1,843	8,573	12,372	23,955		1,180	1,402	2,611	14,490	19,683	43,639
		2005	1,294	1,858	10,381	14,079	27,612		560	689	3,922	14,947	20,119	47,730
		2006	1,804	3,809	15,048	23,158	43,819		157	164	1,431	18,172	19,923	63,742
		2007	3,634	3,801	15,137	23,557	46,130		1,109	1,406	3,568	13,772	19,855	65,986
	Yes	2003	1,910	2,494	12,867	16,307	33,578		889	1,832	3,259	7,132	13,113	46,691
		2004	1,167	1,843	8,573	12,372	23,955		1,180	1,402	2,611	14,490	19,683	43,639
		2005	1,294	1,858	10,381	14,079	27,612		560	689	3,922	14,947	20,119	47,730
		2006	1,804	3,992	16,194	24,943	46,932		157	164	1,431	18,172	19,923	66,855
		2007	3,634	3,860	15,137	23,557	46,189		1,109	1,406	3,568	13,772	19,855	66,045
2	No	2003	1,910	2,494	10,808	16,307	31,520		889	1,690	3,259	7,132	12,971	44,491
		2004	1,167	1,843	8,573	12,372	23,955		743	983	2,551	9,811	14,088	38,043
		2005	1,294	1,858	10,381	14,079	27,612		560	689	2,608	10,040	13,897	41,509
		2006	1,804	2,658	10,819	16,451	31,732		157	164	1,431	12,277	14,028	45,760
		2007	3,058	2,556	10,911	15,650	32,175		768	1,029	2,538	9,833	14,168	46,343
	Yes	2003	1,910	2,494	12,437	16,307	33,149		889	1,690	3,259	7,132	12,971	46,120
		2004	1,167	1,843	8,573	12,372	23,955		743	983	2,551	9,811	14,088	38,043
		2005	1,294	1,858	10,381	14,079	27,612		560	689	2,608	10,040	13,897	41,509
		2006	1,804	2,658	11,388	17,021	32,871		157	164	1,431	12,277	14,028	46,899
		2007	3,058	2,556	10,911	15,650	32,175		768	1,029	2,538	9,833	14,168	46,343
1	No	2003	1,910	2,494	12,867	16,307	**33,578**	100%	889	1,832	3,259	7,132	**13,113**	**46,691**
		2004	1,167	1,843	8,573	12,372	**23,955**		1,855	1,949	2,611	23,575	**29,990**	**53,946**
		2005	1,294	1,858	10,381	14,079	**27,612**		560	689	3,922	33,023	**38,194**	**65,806**
		2006	1,804	3,809	15,048	23,158	**43,819**		157	164	1,431	19,127	**20,878**	**64,697**
		2007	3,634	3,801	15,137	23,557	**46,130**		1,242	1,406	3,805	13,772	**20,226**	**66,356**
	Yes	2003	1,910	2,494	12,867	16,307	**33,578**		889	1,832	3,259	7,132	**13,113**	**46,691**
		2004	1,167	1,843	8,573	12,372	**23,955**		1,855	1,949	2,611	23,575	**29,990**	**53,946**
		2005	1,294	1,858	10,381	14,079	**27,612**		560	689	3,922	33,023	**38,194**	**65,806**
		2006	1,804	3,992	16,194	24,943	**46,932**		157	164	1,431	19,127	**20,878**	**67,810**
		2007	3,634	3,860	15,137	23,557	**46,189**		1,242	1,406	3,805	13,772	**20,226**	**66,415**
2	No	2003	1,910	2,494	10,808	16,307	**31,520**		889	1,832	3,259	7,132	**13,113**	**44,633**
		2004	1,167	1,843	8,573	12,372	**23,955**		1,855	1,949	2,611	16,439	**22,854**	**46,810**
		2005	1,294	1,858	10,381	14,079	**27,612**		560	689	3,677	14,947	**19,874**	**47,485**
		2006	1,804	2,658	10,819	16,451	**31,732**		157	164	1,431	12,952	**14,703**	**46,435**
		2007	3,058	2,556	10,911	15,650	**32,175**		768	1,069	2,538	9,833	**14,208**	**46,383**
	Yes	2003	1,910	2,494	12,437	16,307	**33,149**		889	1,832	3,259	7,132	**13,113**	**46,261**
		2004	1,167	1,843	8,573	12,372	**23,955**		1,855	1,949	2,611	16,439	**22,854**	**46,810**
		2005	1,294	1,858	10,381	14,079	**27,612**		560	689	3,677	14,947	**19,874**	**47,485**
		2006	1,804	2,658	11,388	17,021	**32,871**		157	164	1,431	12,952	**14,703**	**47,574**
		2007	3,058	2,556	10,911	15,650	**32,175**		768	1,069	2,538	9,833	**14,208**	**46,383**

Table 5-37 Hypothetical Chinook salmon bycatch levels by sector for Alternative 5 AS1. Note that estimated salmon bycatch levels under Alt 5 AS2 are considered equivalent to those under Alt 4 AS2.

	A-Season					B-Season					Annual
Year	CDQ	M	P	S	A-total	CDQ	M	P	S	B-total	Total
2003	1,910	2,494	12,867	16,307	33,578	889	1,832	3,259	7,132	13,113	46,691
2004	1,167	1,843	8,573	12,372	23,955	1,855	1,949	2,611	23,575	29,990	53,946
2005	1,294	1,858	10,381	14,079	27,612	560	689	3,922	26,817	31,988	59,600
2006	1,804	3,285	14,354	21,612	41,056	157	164	1,431	17,119	18,871	59,927
2007	3,634	3,382	13,264	20,437	40,718	965	1,283	3,289	12,146	17,683	58,401

Table 5-38 Hypothetical Chinook salmon saved (relative to estimated mortalities) by sector for Alternative 4 AS1 and AS2, assuming **80% allowable** rollover from A to B seasons.

Alt 4 AS	A-season Transfer-Ability	Year	A-Season CDQ	M	P	S	A **total**	B-Season CDQ	M	P	S	B **total**	Annual **Total**
1	No	2003	0	0	0	0	**0**	0	0	0	0	**0**	**0**
		2004	0	0	0	0	**0**	0	0	0	0	**0**	**0**
		2005	0	0	0	0	**0**	0	0	0	2,231	**2,231**	**2,231**
		2006	0	829	1,145	12,822	**14,796**	0	0	0	3,482	**3,482**	**18,278**
		2007	0	824	10,617	11,901	**23,341**	1,268	457	2,358	27,942	**32,025**	**55,366**
	Yes	2003	0	0	0	0	**0**	0	0	0	0	**0**	**0**
		2004	0	0	0	0	**0**	0	0	0	0	**0**	**0**
		2005	0	0	0	0	**0**	0	0	0	2,231	**2,231**	**2,231**
		2006	0	646	0	11,038	**11,683**	0	0	0	3,482	**3,482**	**15,165**
		2007	0	764	10,617	11,901	**23,282**	1,268	457	2,358	27,942	**32,025**	**55,307**
2	No	2003	0	0	2,059	0	**2,059**	0	0	0	0	s	**2,059**
		2004	0	0	0	0	**0**	0	0	0	9,085	**9,085**	**9,085**
		2005	0	0	0	0	**0**	0	0	399	19,697	**20,096**	**20,096**
		2006	0	1,980	5,375	19,529	**26,883**	0	0	0	10,004	**10,004**	**36,887**
		2007	576	2,069	14,843	19,808	**37,296**	1,743	794	3,593	31,881	**38,010**	**75,306**
	Yes	2003	0	0	430	0	**430**	0	142	0	0	**142**	**571**
		2004	0	0	0	0	**0**	0	0	0	9,085	**9,085**	**9,085**
		2005	0	0	0	0	**0**	0	0	399	19,697	**20,096**	**20,096**
		2006	0	1,980	4,806	18,959	**25,744**	0	0	0	10,004	**10,004**	**35,749**
		2007	576	2,069	14,843	19,808	**37,296**	1,743	794	3,593	31,881	**38,010**	**75,306**

Table 5-39 Hypothetical Chinook salmon saved (relative to estimated mortalities) by sector for Alt 4 AS1 and AS2, assuming **0% and 100% allowable** rollover from A to B seasons.

Alt 4 AS	A-season Transfer-Ability	Year	A-Season CDQ	M	P	S	A **total**	A-B Roll over	B-Season CDQ	M	P	S	B **total**	Annual **Total**
1	No	2003	0	0	0	0	**0**	0%	0	0	0	0	**0**	**0**
		2004	0	0	0	0	**0**		675	547	0	9,085	**10,307**	**10,307**
		2005	0	0	0	0	**0**		0	0	0	18,076	**18,076**	**18,076**
		2006	0	829	1,145	12,822	**14,796**		0	0	0	4,109	**4,109**	**18,906**
		2007	0	824	10,617	11,901	**23,341**		1,401	457	2,562	27,942	**32,362**	**55,704**
	Yes	2003	0	0	0	0	**0**		0	0	0	0	**0**	**0**
		2004	0	0	0	0	**0**		675	547	0	9,085	**10,307**	**10,307**
		2005	0	0	0	0	**0**		0	0	0	18,076	**18,076**	**18,076**
		2006	0	646	0	11,038	**11,683**		0	0	0	4,109	**4,109**	**15,793**
		2007	0	764	10,617	11,901	**23,282**		1,401	457	2,562	27,942	**32,362**	**55,644**
2	No	2003	0	0	2,059	0	**2,059**		0	142	0	0	**142**	**2,200**
		2004	0	0	0	0	**0**		1,112	966	60	13,764	**15,902**	**15,902**
		2005	0	0	0	0	**0**		0	0	1,314	22,983	**24,297**	**24,297**
		2006	0	1,980	5,375	19,529	**26,883**		0	0	0	10,004	**10,004**	**36,887**
		2007	576	2,069	14,843	19,808	**37,296**		1,743	834	3,593	31,881	**38,050**	**75,346**
	Yes	2003	0	0	430	0	**430**		0	142	0	0	**142**	**571**
		2004	0	0	0	0	**0**		1,112	966	60	13,764	**15,902**	**15,902**
		2005	0	0	0	0	**0**		0	0	1,314	22,983	**24,297**	**24,297**
		2006	0	1,980	4,806	18,959	**25,744**		0	0	0	10,004	**10,004**	**35,749**
		2007	576	2,069	14,843	19,808	**37,296**		1,743	834	3,593	31,881	**38,050**	**75,346**
1	No	2003	0	0	0	0	**0**	100%	0	0	0	0	**0**	**0**
		2004	0	0	0	0	**0**		0	0	0	0	**0**	**0**
		2005	0	0	0	0	**0**		0	0	0	0	**0**	**0**
		2006	0	829	1,145	12,822	**14,796**		0	0	0	3,155	**3,155**	**17,951**
		2007	0	824	10,617	11,901	**23,341**		1,268	457	2,325	27,942	**31,992**	**55,334**
	Yes	2003	0	0	0	0	**0**		0	0	0	0	**0**	**0**
		2004	0	0	0	0	**0**		0	0	0	0	**0**	**0**
		2005	0	0	0	0	**0**		0	0	0	0	**0**	**0**
		2006	0	646	0	11,038	**11,683**		0	0	0	3,155	**3,155**	**14,838**
		2007	0	764	10,617	11,901	**23,282**		1,268	457	2,325	27,942	**31,992**	**55,274**
2	No	2003	0	0	2,059	0	**2,059**		0	0	0	0	**0**	**2,059**
		2004	0	0	0	0	**0**		0	0	0	7,136	**7,136**	**7,136**
		2005	0	0	0	0	**0**		0	0	245	18,076	**18,321**	**18,321**
		2006	0	1,980	5,375	19,529	**26,883**		0	0	0	9,330	**9,330**	**36,213**
		2007	576	2,069	14,843	19,808	**37,296**		1,743	794	3,593	31,881	**38,010**	**75,306**
	Yes	2003	0	0	430	0	**430**		0	0	0	0	**0**	**430**
		2004	0	0	0	0	**0**		0	0	0	7,136	**7,136**	**7,136**
		2005	0	0	0	0	**0**		0	0	245	18,076	**18,321**	**18,321**
		2006	0	1,980	4,806	18,959	**25,744**		0	0	0	9,330	**9,330**	**35,074**
		2007	576	2,069	14,843	19,808	**37,296**		1,743	794	3,593	31,881	**38,010**	**75,306**

Table 5-40 Hypothetical Chinook salmon saved (relative to estimated mortalities) by sector for Alternative 5 AS1. Note that for comparative purposes Alt 5 AS2 are considered equivalent to those under Alt 4 AS2.

	A-Season					B-Season					Annual
Year	CDQ	M	P	S	A-total	CDQ	M	P	S	B-total	Total
2003	0	0	0	0	0	0	0	0	0	0	0
2004	0	0	0	0	0	0	0	0	0	0	0
2005	0	0	0	0	0	0	0	0	6,206	6,206	6,206
2006	0	1,352	1,840	14,368	17,559	0	0	0	5,163	5,162	22,721
2007	0	1,243	12,491	15,021	28,753	1,546	580	2,842	29,568	34,535	63,288

Transferability

Transferable bycatch quotas were included under both annual scenarios of Alternatives 4 and 5. The value of having transferable quotas within each season was evaluated by making two different fleet behavior assumptions in the A season: to operate under either perfect transferability or no transferability. This provided two contrasting sets of results for A season catch. In the B season it was assumed that the fleet would have perfect transferability.

Results show that A season transferability affects the number of Chinook salmon saved. The closure dates by sector and relative bycatch levels in 2006 and 2007 differ depending on transferability for both high and low cap levels. For example in 2006, the A-season bycatch for Alternative 4 AS1 with transferability was higher for all non-CDQ sectors compared to what would have occurred without transferability (Table 5-35; compare the “No” transferability rows with the analogous “Yes” rows). Over 3,000 more Chinook salmon would have been taken in 2006 with transferable bycatch quotas and allowed the fleet to come close to the 68,000 Chinook fleetwide salmon cap. For the CP sector, differences are more pronounced, particularly under the lower Alternative 4 (or 5) AS2 cap level, where in 2003, the closure absent transferability would have been 13 days earlier (March 8 rather than March 21; Table 5-31), resulting in a difference of approximately 1,600 fish (Table 5-35). In the Mothership sector, no change is estimated at the lower cap level, while a 3 day earlier closure (Table 5-31) is estimated at the higher cap level in 2006 and results in a difference of approximately 190 fish (Table 5-35).

5.3.4 Comparison of impacts: Alternatives 1, 2, 4 and 5

Information used to compare the impacts of Alternative 1, Alternative 4’s AS1 and AS2, Alternative 5’s AS1 and AS2, and those of Alternative 2’s components and options, is shown in Table 5-41 and Table 5-43. As noted above, the impact estimates for Alternative 5 AS2 were considered to be adequately covered based on results from Alternative 4 AS2. The difference in rollover provision (80% to 100%) between the two was demonstrated to have very minor impact on salmon saved (and only for the CV fleet).

In Table 5-41, the estimated impacts from the highest (2007) and lowest (2003) bycatch years are shown. The table indicates the projected fleetwide bycatch, by season and annually, for Alternative 5 AS1, Alternative 5 AS2 and the highest and lowest bycatch combinations of sector and seasonal splits under Alternative 2, for each year. The table compares these projected bycatch totals to the actual bycatch in that year, which is expressed as the percentage reduction from the actual 2007 or 2003 bycatch (under the Alternative 1, Status Quo “No hard cap” scenario).

Table 5-41 Projected fleetwide salmon bycatch, by season and annually, under Alternative 5 (annual scenarios AS 1 and AS 2), and the lowest and highest bycatch sector and season combinations for Alternative 2, for highest (2007) and lowest (2003) bycatch years[33].

Bycatch year	Alternative	Bycatch cap level	Projected salmon bycatch			Reduction from actual bycatch in that year
			A season	B season	Annual Total	
2007	Alt 5 AS1	60,000	40,718	17,683	58,401	52%
	Alt 5 AS2	47,591	32,175	14,208	46,383	62%
Actual	Lowest 2007 bycatch alternative[34]	29,300	2,801	6,557	9,358	92%
bycatch: 121,638	Highest 2007 bycatch alternative[35]	87,500	40,415	36,828	77,243	37%
2003	Alt 5 AS1	60,000	33,578	13,113	46,691	0%
	Alt 5 AS2	47,591	31,520	13,113	44,633	5%
Actual	Lowest 2003 bycatch alternative[36]	29,300	11,550	11,084	22,634	52%
bycatch: 46,691	Highest 2003 bycatch alternative[37]	87,500	33,808	13,185	46,993	0

In 2007, the highest bycatch year analyzed (and the year of highest historical bycatch of Chinook), Alternative 5 AS1 would have resulted in a 52% reduction overall in Chinook bycatch, from the actual amount caught. Alternative 5 AS2, with a lower cap but the same sector and seasonal partitions, would have resulted in a 62% reduction from the actual amount. For comparison against other scenarios analyzed under the components and options of Alternative 2, a high of 92% reduction would have been estimated under the most restrictive cap of 29,300 (with seasonal split of 70/30 and a sector split as noted in option 2d), while the least restrictive cap of 87,500 (with seasonal split of 50/50 and sector split of option 2a) would have resulted in a 37% reduction from actual bycatch in that year. Note, these are based on actual numbers of salmon taken in bycatch per year and do not take into account adult equivalents.

In low bycatch years, the majority of caps under consideration have minimal impact on actual bycatch levels, as estimated annually. In 2003, the lowest bycatch year analyzed, neither Alternative 5 AS1 or AS2 results in large reductions from the actual bycatch in that year (1-5 % reduction, respectively), while under the highest cap under consideration (87,500), no change is evident from Alternative 1. The lowest cap under consideration of 29,300 (split seasonally 50/50 with a sector split under option 1) provides a 52% reduction from the status quo.

Table 5-42 and Table 5-43 compare the alternatives by examining the relative returns of adult equivalents to the river systems, compared to actual 2007 bycatch (see Chapter 3 for methodology and section 5.3.5 for detailed impacts by river system). Alternative 5 AS1 and AS2 are compared against results from Alternative 4 as well as Alternative 2, using the Option 2d sector split for the highest and lowest cap levels (87,500 and 29,300). The seasonal split used is 70/30 for all scenarios. Table 5-42 summarizes total salmon savings in bycatch numbers and adult equivalents, under the scenarios. Table 5-43 indicates the distribution of adult equivalent salmon to selected river systems. Additional scenarios for different

[33] The analysis was based on bycatch data from 2003-2007, retrieved from the CAS in 2008.
[34] Option 2d sector split, 70/30 seasonal split
[35] Option 2a sector split, 50/50 seasonal split
[36] Option 1 sector split, 50/50 seasonal split
[37] The following sector and seasonal splits all produced similar results: Option 1 sector split [all seasonal splits equivalent]; Option 2a, [58/42]; Option 2d, [58/42, 70/30]

cap, seasonal and sector splits, as compared against Alternatives 4 and 5 annual scenarios, are included in Sections 5.3.4.1 and 5.3.2.2.

Table 5-42 Total projected reduction of Chinook salmon bycatch levels, and adult equivalent salmon bycatch. Compares Alternative 5 annual scenarios 1 and 2, Alternative 4 annual scenarios 1 and 2, and the highest and lowest caps of comparable seasonal and sector combinations of Alternative 2, using 2007 results.

	Alt 5 AS1	Alt 5 AS2	Alt 4 AS1 (note Alt 4 AS2 results identical to Alt 5 AS2)	Alt2 cap 87,500 Opt2d 70/30	Alt2 cap 29,300 Opt2d 70/30
Number of salmon bycatch saved	63,288	75,306	55,307	46,766	112,280
Adult equivalent salmon saved	27,119	40,843	26,928	22,417	65,476

Table 5-43 Projected reduction of adult equivalent salmon bycatch, in number of salmon, by region of origin (based on genetic aggregations). Compares Alternative 5 annual scenarios 1 and 2, Alternative 4 annual scenarios 1and 2, and the highest and lowest caps of comparable seasonal and sector combinations of Alternative 2, using 2007 results. Higher numbers indicate a greater salmon "savings", compared to Alternative 1.

Stocks of Origin[38]	Alt 5 AS1	Alt 5 AS2	Alt 4 AS1 (note Alt 4 AS2 results identical to Alt 5 AS2)	Alt2 cap 87,500 Opt2d 70/30	Alt2 cap 29,300 Opt2d 70/30
Yukon	5,396	8,840	5,228	3,299	14,938
Kuskokwim	3,507	5,746	3,398	2,144	9,710
Bristol Bay	4,586	7,514	4,443	2,804	12,697
Pacific Northwest aggregate stocks (PNW)	8,444	11,135	8,489	9,581	15,507
Cook Inlet stocks	912	1,202	1,042	1,010	1,284
Transboundary aggregate stocks (TBR)	617	821	699	670	909
North Alaska Peninsula stocks (N.AK)	2,882	4,389	2,318	2,264	8,594
Aggregate 'other' stocks	592	865	534	549	1,495

Alternative 5 AS1 provides neither the highest nor lowest reduction in adult equivalents to individual river systems, based on the range of caps under consideration. Relative impacts to individual river system are highly dependent upon where the fleet fished in a given year, as a river system's proportional contribution to bycatch varies spatially. Thus, comparative results for the same caps and rivers of origin will be highly variable by year. See Section 5.3.5 for additional results by year and stock of origin.

[38] For specific information on stocks included in each stock of origin grouping, see Table 3-7 in Chapter 3.

5.3.4.1 Comparison of 2007 projected bycatch levels under Alternatives 2, 4, and 5

As an indication of the relative amount of Chinook bycatch on an annual basis under each option and seasonal distribution, the annual totals for a single year (2007) are shown by cap level, sector, and season options, for Alternative 2 (Table 5-44) compared with Alternative 4 (Table 5-45) and Alternative 5 (Table 5-46). For each sector split option, and seasonal distribution option, the hypothetical catch realized, due to the combination of seasonal constraints by sector, is less than the annual cap specified under each cap scenario.

Table 5-44 Annual totals of hypothetical Chinook salmon bycatch levels, in numbers of fish, under different Alternative 2 options for sector and season specific caps for **2007**.

	2007		opt1(AFA)			opt2a			opt2d		
	Cap	Sect	50/50	58/42	70/30	50/50	58/42	70/30	50/50	58/42	70/30
	87,500	CDQ	5,620	5,620	5,620	2,544	2,086	2,086	4,943	5,297	4,326
		M	5,503	6,373	6,773	3,941	3,941	4,945	5,128	5,503	6,373
		P	19,648	23,996	26,606	14,005	14,005	12,214	14,005	19,648	19,648
		S	28,757	36,431	34,960	56,753	56,480	51,388	46,557	39,954	44,882
	87,500 Total		59,529	72,421	73,960	77,243	76,512	70,633	70,634	70,403	75,230
	68,100	CDQ	5,620	5,620	4,326	1,279	1,279	1,836	4,132	3,649	4,326
		M	3,941	5,503	5,427	3,941	3,383	3,071	3,941	3,941	4,945
		P	14,005	19,648	19,648	12,187	13,667	11,796	14,005	14,005	17,857
		S	23,763	23,763	27,557	43,035	39,954	43,708	28,757	36,431	34,960
Annual Total	68,100 Total		47,329	54,534	56,959	60,442	58,283	60,411	50,835	58,027	62,088
	48,700	CDQ	4,620	3,649	4,326	1,029	1,029	856	2,544	2,544	2,703
		M	3,941	3,383	3,071	1,457	1,145	2,835	1,457	3,383	3,071
		P	14,005	14,005	12,214	4,708	9,978	8,628	12,187	12,214	11,796
		S	11,930	8,051	16,105	28,757	23,763	30,068	23,763	23,763	19,883
	48,700 Total		34,497	29,088	35,717	35,951	35,915	42,388	39,951	41,904	37,453
	29,300	CDQ	2,544	2,086	2,703	600	856	680	1,279	1,279	1,836
		M	1,145	1,145	774	909	774	479	1,145	909	645
		P	4,708	9,978	8,628	2,940	2,604	1,945	4,290	3,686	2,604
		S	4,273	4,273	4,273	10,561	8,051	16,105	8,051	8,051	4,273
	29,300 Total		12,670	17,482	16,378	15,010	12,285	19,209	14,765	13,925	9,358

Table 5-45 Annual totals of hypothetical Chinook salmon bycatch levels, in numbers of fish, under Alternative 4 AS 1 and 2 scenarios for sector and season specific caps for 2007.

Alt 4 Annual Scenario	Transferability	Sector	Annual total
1	No	CDQ	4,876
		M	5,207
		P	18,910
		S	37,329
		Total	**66,322**
	Yes	CDQ	4,876
		M	5,266
		P	18,910
		S	37,329
		Total	**66,381**
2	No	CDQ	3,826
		M	3,625
		P	13,449
		S	25,483
		Total	**46,383**
	Yes	CDQ	3,826
		M	3,625
		P	13,449
		S	25,483
		Total	**46,383**

Table 5-46 Annual totals of hypothetical Chinook salmon bycatch levels, in numbers of fish, under Alternative 5 for sector and season specific caps for 2007. Note salmon bycatch results were not analyzed for the 'no' transferability assumption for Alternative 5 as explained in section 5.3.3.

Alt 5 Annual Scenario	Transferability	Sector	Annual total
1	No	CDQ	N/A
		M	N/A
		P	N/A
		S	N/A
		Total	N/A
	Yes	CDQ	5,363
		M	25,016
		P	126,811
		S	193,871
		Total	351,061
2	No	CDQ	3,826
		M	3,625
		P	13,449
		S	25,483
		Total	**46,383**
	Yes	CDQ	3,826
		M	3,625
		P	13,449
		S	25,483
		Total	**46,383**

5.3.4.2 Comparison of Impacts for 2008 and 2009

The primary analytical timeframe for impacts analysis is 2003-2007. However, given updated catch information it is possible to estimate some of the potential for fleet impacts in 2008 and 2009. Table 5-47 compares actual catch by sector and season in 2008 and 2009 with the cap levels by season and sector of the 47,591 Chinook salmon cap in Alternatives 4 and 5 and the lowest cap under consideration, the Alternative 2 cap of 29,300 Chinook salmon with the 70:30 seasonal and option 2d sector allocations. Note that under Alternative 5, 47,591 Chinook salmon is also the performance standard. While NMFS will annually calculate each sector's annual performance threshold, that threshold will be similar to that sector's annual allocation of 47,591 Chinook salmon.

Under Alternatives 4 and 5, none of the sectors would have exceeded their seasonal and sector-specific cap allocation in 2008 or 2009, or the annual cap over in either 2008 or 2009. The low cap is used as a basis for considering whether any of the sectors would have been constrained under the alternatives in the more recent years. None of the caps that would have been imposed under the most restrictive cap level would have been reached in either season by any of the sectors.

Table 5-47 Sector and seasonal caps, in numbers of Chinook salmon, for the Alternative 5 and Alternative 4 cap of 47,591 Chinook salmon and Alternative 2 cap of 29,300 Chinook salmon compared to actual bycatch by sector and season in 2008 and 2009.

	A-season				B-season				Total		
Sector	Sector/ Season allocation of 29,300 cap	Sector/ Season allocation of 47,591 cap	2008 actual bycatch	2009 actual bycatch	Sector/ Season allocation of 29,300 cap	Sector/ Season allocation of 47,591 cap	2008 acual bycatch	2009 actual bycatch	Annual Sector allocation of 47,591 cap	2008 Annual total bycatch	2009 Annual total bycatch
C/P	5,845	10,960	4,091	2,738	2,505	2,556	377	310	13,516	4,468	3,048
Mothership	1,538	2,665	1,125	547	659	1,042	175	86	3,707	1,300	633
CV	11,793	16,590	9,815	6,030	5,054	9,894	4,271	2,252	26,484	14,086	8,282
CDQ	1,333	3,098	604	358	571	785	36	89	3,883	640	447
Total	20,510	33,314	15,635	9,673	8,790	14,277	4,859	2,737	47,591	20,494	12,410

AEQ levels are not estimated for 2008 and 2009. The AEQ for each year considers both removals in that year as well as the lagged impact of age-specific removals in previous years. While bycatch levels in 2008 and 2009 are much lower than previous years, the AEQ estimate for those years would likely be higher than the actual bycatch due to the lagged impacts of the high removals in previous years, particularly the highest year in 2007. This is shown graphically in Fig. 5-43. As noted in these sections, while this impact analysis does not predict impacts past 2007, the authors acknowledge that bycatch during the years 2003-2007 will continue to influence adult equivalent salmon returning to river systems for several years into the future.

5.3.4.3 Comparison of Alternatives 2, 4, and 5 for Chinook salmon saved and forgone pollock

Selection of the final preferred alternative involved explicit consideration of trade-offs between the potential salmon saved and the forgone pollock catch (see Section 2.5). In this section, summary information is provided to indicate the range of Alternative cap levels and their estimated salmon saved and the forgone pollock over the highest bycatch year analyzed (2007) and the lowest bycatch year analyzed (2003) (Table 5-48). Alternative 2 cap levels (with explicit seasonal and sector splits as noted) are compared with the Alternative 4 and Alternative 5 annual scenarios (AS1 and AS2). In a high bycatch year (2007) the greatest reduction in salmon would have occurred under the cap level of 29,300 (with the sector and seasonal splits as noted), with a 92% reduction in salmon. However this would be achieved at a cost of 46% of the annual total pollock catch forgone. The highest cap under consideration (87,500) would have reduced overall salmon bycatch levels by an estimated 37%, but with a much lower reduction in pollock catch of 22%. The Council's preferred alternative (Alternative 5) falls between these high and low levels, as indicated. The Council's Alternative 5 AS1 would indicate a higher percentage of salmon bycatch reduction than the 87,500 cap for a slightly higher (3% increase) reduction in pollock catch. However in a lower bycatch year (such as 2003), Alternative 5 AS1 results in limited reduction in salmon bycatch and corresponding reduced pollock catch. In low bycatch years, only the lowest cap considered (29,300) is estimated to achieve substantial bycatch reduction.

Table 5-48 Annual salmon saved compared with annual pollock forgone for the range of caps under consideration (comparison of 2003 and 2007 results).

Year	Bycatch Cap level (results for specific sector and seasonal allocations)	Reduction from actual bycatch in that year	Forgone Pollock catch in that year
2007 (highest)	87,500[39]	37%	22%
	68,392 (Alt 4 AS1)	46%	23%
Actual bycatch= 121,638	60,000 (Alt 5 AS1) Council Pref. Alt (high)	52%	26%
	47,591 (Alt 5 AS 2) Council Pref. Alt (low)	62%	32%
	29,300[40]	92%	46%
2003 (lowest)	87,500[41]	0%	0%
	68,392 (Alt 4 AS1)	0%	0%
Actual bycatch= 46,691	60,000 (Alt 5 AS1) Council Pref. Alt (high)	0%	0%
	47,591 (Alt 5 AS2) Council Pref. Alt (low)	5%	4%
	29,300[42]	52%	22%

The combination of sector and seasonal allocations, as presented under Alternatives 2, 4, and 5 show that the impact of the alternative options on total bycatch numbers and numbers forgone pollock vary by year (Fig. 5-41). Selection of the preferred alternative (as described in Section 2.5) considered the tradeoffs between salmon saved and pollock forgone under this range of sector and seasonal allocations, understanding that impacts are variable by year. Fig. 5-41 plots the results for the subset of Alternative 2 options that are analyzed, in comparison with the Alternative 4 and 5 annual scenarios, for the period 2003-2007. The Alternative 2 options are illustrated by open circles, open squares, and open diamonds. Alternative 4 AS1 is illustrated by closed circles, Alternative 4 (and Alternative 5) AS2 by closed triangles and Alternative 5 AS1 by stars. The figure illustrates the interannual variability: the same option can have very different results in terms of forgone pollock and Chinook saved, on an annual basis.

[39] Option 2a sector split, 50/50 seasonal split
[40] Option 2d sector split, 70/30 seasonal split
[41] The following sector and seasonal splits all produced similar results: Option 1 sector split [all seasonal splits]; Option 2a [58/42]; Option 2d, [58/42, 70/30]
[42] Option 1 sector split, 50/50 seasonal split

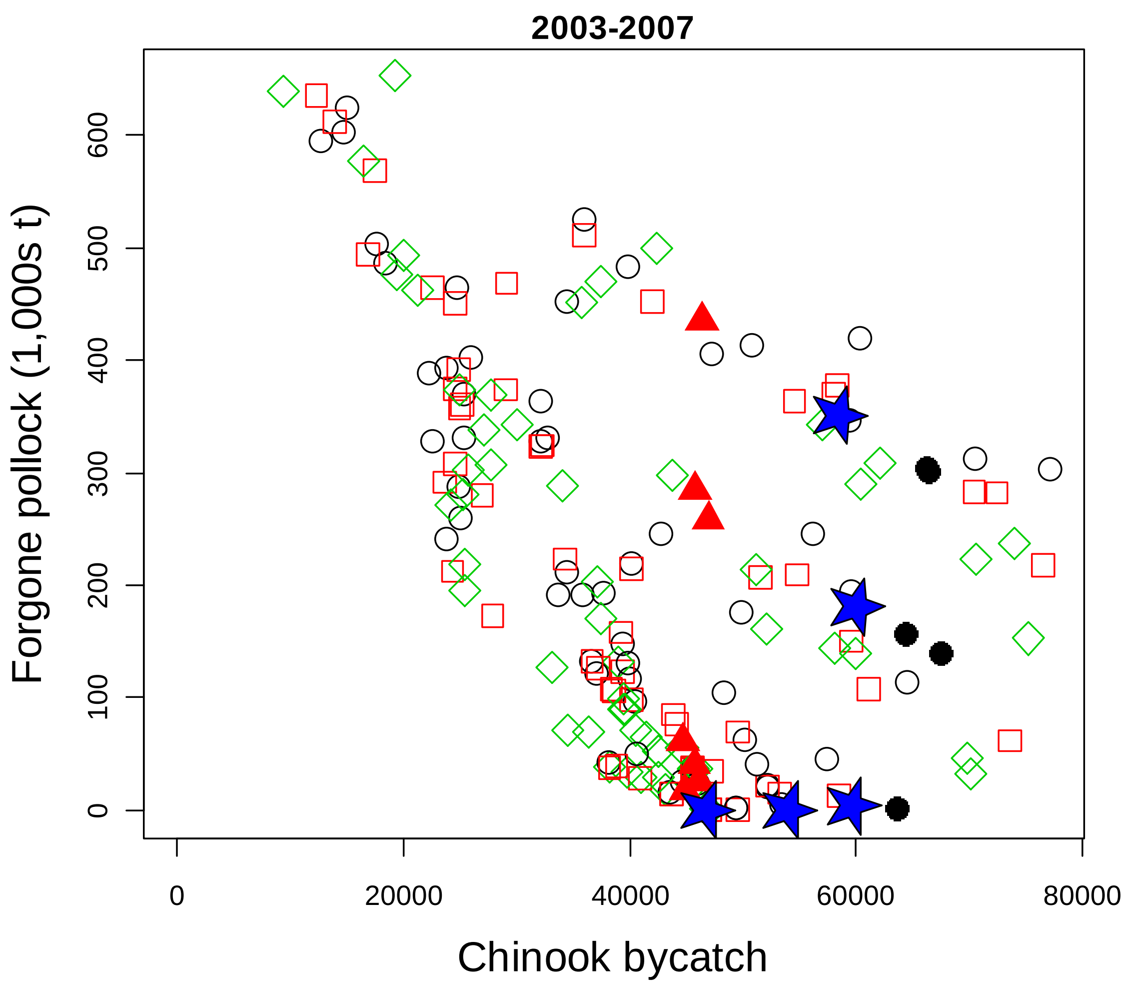


Fig. 5-41 Comparisons of hypothetical Chinook bycatch (numbers, horizontal axis) and forgone pollock (thousands of t, vertical axis) for all Alternative 2 options analyzed (open circles, open squares and open diamonds) as compared to the Alt 4 AS1 (closed circles), Alt 5 (and Alt 4) AS2 (closed triangles) and Alt 5 AS1(stars). Results are for all years analyzed (2003-2007).

Fig. 5-42 compares Alternative 4 and 5 annual scenarios, by year (open circles, triangles, or stars with the year indicated inside) with the results for the 4 cap levels analyzed under Alternative 2, option 2d, 70/30 seasonal split (numbers alone). These Alternative 2 options represent the closest comparable option to Alternatives 4 and 5 for sector and seasonal split.

For Alternatives 4 and 5, the retrospective examination shows that allowing for transferability among sectors and rollovers between seasons retains the feature of staying below the salmon bycatch cap while reducing the forgone pollock catch levels (Fig. 5-42). As expected, analysis of Alternative 5 AS 1 resulted in lower levels of forgone pollock but higher levels of bycatch (Fig. 5-42). Results implementing Alternative 5 AS 2 resulted in nearly the same bycatch levels in all years but had more variable impact on the ability to catch the available TAC of pollock.

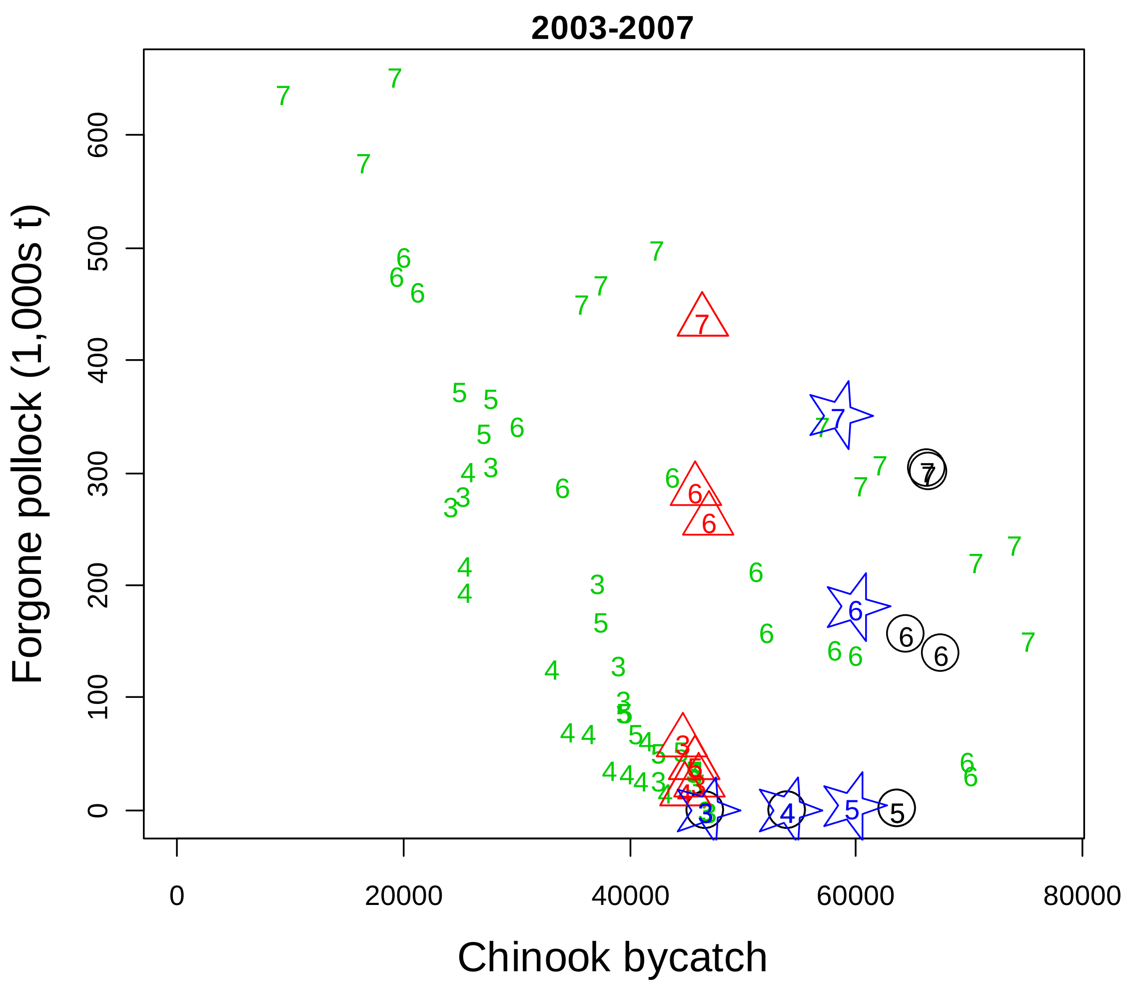


Fig. 5-42 Comparisons of hypothetical Chinook bycatch (numbers, horizontal axis) and forgone pollock (thousands of t, vertical axis) for Alt 4 AS1 (circles), Alt 5 (and Alt4) AS2 (triangles) and Alt 5 AS1(stars). Numbers represent the year (i.e., 6=2006, 7=2007 etc) and those not enclosed by symbols are from the Alternative 2 options with 70/30 A-B season split and sector splits following Option 2d (CDQ=6.5 %, inshore CV=57.5 %, Motherships=7.5 %, and at-sea processors= 28.5 %).

5.3.5 River of origin AEQ impacts under Alternatives 2, 4 and 5

In this section, the hypothetical bycatch levels, identified for each combination of seasonal and sector salmon cap in the retrospective analysis, are evaluated for their impact on salmon stocks. As described in the methodology in Chapter 3, the adult-equivalency (AEQ) of the bycatch was estimated, to determine both how many of the salmon caught as bycatch would have returned as adults to their spawning streams, and the regional distribution of the bycatch. The bycatch-at-age data is used to pro-rate how any given year of bycatch affects future potential spawning runs of salmon.

Each scenario for seasonal and sector apportionment of the Chinook salmon cap has different regional impacts for salmon. The relative proportion of salmon bycatch originating from different regions (e.g., the Upper Yukon, the Pacific Northwest, the Gulf of Alaska) varies with the season and with the sector (as the sectors fish in different areas). For example, if the inshore CV fleet receives a relatively lower allocation of Chinook bycatch, then the amount of salmon bycatch anticipated to occur in the southeast

Bering Sea during the B-season will be lower, which would change the expected stock make-up of the bycatch. To account for this, case-specific apportionments were developed and applied to each of the three spatial-temporal bycatch strata used from the genetics data. Table 5-49 shows the proportion of annual bycatch occurring in the A season, B season/northwest Bering Sea, and B season/southeast Bering Sea, under all of the cap scenarios considered, had the caps been imposed during 2003-2007.

Table 5-49 Proportions of the bycatch occurring within each stratum under the different annual scenarios in Alternatives 4 and 5 (AS1, AS2), and management options in Alternative 2 for 2003-2007. The actual observed proportion of the bycatch in each year is shown in the shaded top row. Two other rows are shaded (68,100 70/30 Opt2d and 48,700 70/30 Opt2d), representing the Alternative 2 scenarios that are most similar to Alternatives 4 and 5).

	Stratum 1, A-season					**Stratum 2, B-season NW**					**Stratum 3, B-season SE**				
	2003	**2004**	**2005**	**2006**	**2007**	**2003**	**2004**	**2005**	**2006**	**2007**	**2003**	**2004**	**2005**	**2006**	**2007**
No Cap	72%	44%	41%	71%	57%	10%	13%	20%	3%	8%	18%	43%	39%	26%	35%
Alt 5 AS 1	72%	44%	46%	69%	70%	10%	13%	18%	4%	8%	18%	43%	36%	28%	22%
Alt 5 AS 2	72%	53%	60%	70%	69%	10%	13%	16%	4%	8%	18%	33%	24%	26%	22%
Alt 4 AS 1	72%	44%	43%	70%	70%	10%	13%	18%	3%	8%	18%	43%	39%	27%	22%
Alt 4 AS 2	72%	53%	60%	70%	69%	10%	13%	16%	4%	8%	18%	33%	24%	26%	22%
87,500 70/30 opt2d	72%	56%	61%	80%	73%	2%	13%	17%	7%	15%	26%	31%	23%	13%	12%
87,500 70/30 opt2a	72%	52%	61%	75%	68%	3%	5%	22%	10%	16%	25%	42%	17%	15%	15%
87,500 70/30 opt1	72%	59%	65%	80%	71%	4%	8%	9%	7%	16%	25%	33%	26%	13%	13%
87,500 58/42 opt2d	72%	48%	53%	66%	63%	7%	11%	21%	6%	19%	21%	41%	26%	28%	18%
87,500 58/42 opt2a	70%	45%	47%	67%	59%	8%	16%	24%	10%	14%	22%	39%	29%	23%	27%
87,500 58/42 opt1	72%	55%	61%	71%	63%	2%	9%	18%	8%	17%	26%	36%	21%	21%	20%
87,500 50/50 opt2d	71%	44%	53%	62%	53%	4%	6%	19%	14%	20%	24%	50%	28%	24%	27%
87,500 50/50 opt2a	67%	45%	44%	59%	52%	5%	11%	12%	20%	22%	28%	44%	44%	21%	26%
87,500 50/50 opt1	72%	48%	53%	58%	56%	7%	8%	17%	9%	17%	21%	43%	30%	33%	27%
68,100 70/30 opt2d	72%	60%	65%	77%	71%	5%	3%	15%	8%	13%	22%	36%	20%	15%	16%
68,100 70/30 opt2a	70%	58%	60%	77%	73%	6%	7%	10%	13%	13%	24%	35%	30%	10%	14%
68,100 70/30 opt1	72%	63%	68%	80%	72%	7%	5%	13%	5%	12%	21%	32%	19%	15%	16%
68,100 58/42 opt2d	70%	55%	61%	66%	57%	6%	13%	15%	13%	13%	24%	32%	25%	20%	30%
68,100 58/42 opt2a	67%	49%	51%	62%	59%	2%	16%	22%	17%	15%	30%	35%	27%	21%	25%
68,100 58/42 opt1	72%	59%	61%	65%	61%	4%	5%	15%	14%	15%	24%	37%	24%	21%	24%
68,100 50/50 opt2d	67%	48%	52%	51%	49%	4%	11%	11%	18%	20%	28%	41%	37%	30%	32%
68,100 50/50 opt2a	66%	42%	49%	57%	48%	9%	13%	18%	9%	34%	25%	45%	33%	35%	18%
68,100 50/50 opt1	70%	55%	61%	65%	55%	5%	13%	12%	12%	18%	25%	32%	27%	23%	28%
48,700 70/30 opt2d	69%	66%	68%	73%	66%	5%	7%	7%	11%	13%	26%	27%	25%	15%	21%
48,700 70/30 opt2a	71%	64%	64%	73%	69%	8%	9%	13%	7%	18%	22%	27%	23%	20%	13%
48,700 70/30 opt1	74%	70%	70%	77%	72%	5%	9%	10%	9%	11%	21%	21%	20%	15%	16%
48,700 58/42 opt2d	66%	59%	63%	63%	57%	2%	11%	16%	13%	24%	31%	30%	21%	24%	19%
48,700 58/42 opt2a	66%	53%	55%	51%	54%	4%	4%	23%	18%	26%	30%	43%	23%	30%	20%
48,700 58/42 opt1	64%	63%	67%	68%	46%	4%	6%	8%	10%	35%	32%	31%	25%	22%	19%
48,700 50/50 opt2d	64%	53%	55%	57%	51%	9%	9%	18%	9%	24%	26%	38%	27%	34%	25%
48,700 50/50 opt2a	65%	52%	53%	46%	38%	9%	14%	19%	16%	20%	26%	34%	28%	38%	41%
48,700 50/50 opt1	61%	56%	59%	63%	39%	3%	9%	19%	12%	29%	36%	35%	22%	25%	32%
29,300 70/30 opt2d	71%	75%	71%	73%	30%	8%	6%	13%	6%	39%	22%	19%	16%	22%	31%
29,300 70/30 opt2a	69%	71%	71%	71%	72%	10%	9%	13%	9%	11%	21%	21%	16%	20%	17%
29,300 70/30 opt1	72%	71%	69%	72%	56%	3%	7%	14%	9%	20%	25%	23%	17%	19%	24%
29,300 58/42 opt2d	55%	60%	55%	65%	14%	11%	4%	21%	12%	44%	34%	36%	24%	24%	42%
29,300 58/42 opt2a	59%	58%	58%	58%	16%	9%	7%	10%	24%	42%	32%	36%	33%	18%	42%
29,300 58/42 opt1	62%	59%	60%	66%	49%	10%	7%	14%	9%	25%	28%	34%	26%	26%	26%
29,300 50/50 opt2d	52%	51%	50%	55%	14%	12%	14%	18%	18%	34%	36%	35%	33%	27%	53%
29,300 50/50 opt2a	54%	53%	48%	52%	12%	3%	15%	24%	21%	34%	42%	32%	28%	27%	54%
29,300 50/50 opt1	51%	56%	48%	57%	22%	7%	5%	18%	17%	30%	42%	39%	34%	26%	47%

Expanding the fleet's bycatch to adult equivalents by region shows the degree to which different scenarios might have varied had they been applied historically (2003-2007). Table 5-50 and Table 5-51 displays the adult equivalent Chinook salmon bycatch mortality totals for the two annual scenarios in Alternatives 4 and 5, and Table 5-50 displays similar results for Alternatives 4 and 5 annual scenarios in conjunction with the other 36 alternatives analyzed as the subset of Alternative 2 components and options. The estimated adult equivalent bycatch with no cap in place (status quo) is listed in the second row of each table. Almost all of the scenarios evaluated result in fewer adult equivalent salmon being removed from the system than under status quo, except in years where the bycatch level was already low (i.e., two scenarios in 2003). On average, for 2003-2007, the different options resulted in AEQ bycatch mortality that was from 88% to 34% of the estimated AEQ mortality under status quo (see 'Mean % of actual' column in Table 5-50). For Alternative 5 annual scenarios, the average AEQ bycatch mortality was 80% and 69% of the average bycatch mortality with no cap in place.

Table 5-50 Hypothetical adult equivalent Chinook salmon bycatch mortality **totals** under each cap in Alternative 4 and 5(AS 1 and AS2[43]) and cap and management option in Alternative 2, 2003-2007. Numbers are based on the median AEQ values with the original estimates shown in the second row. Right-most column shows the mean over all years relative to the estimated AEQ bycatch.

	2003	2004	2005	2006	2007	Mean % of actual
No Cap	**33,215**	**41,047**	**47,268**	**61,737**	**78,814**	
Alternative 5 AS1	33,454	38,140	39,431	47,165	51,695	80%
Alternative 5 AS1	32,607	36,338	35,986	37,263	37,971	69%
Alternative 4 AS1	33,629	38,350	39,517	47,971	51,886	81%
Alternative 4 AS 2	32,607	36,338	35,986	37,263	37,971	69%
Cap, AB, sector						
87,500 70/30 opt2d	32,903	38,255	38,479	49,058	56,397	82%
87,500 70/30 opt2a	33,081	38,485	38,753	49,986	54,164	82%
87,500 70/30 opt1	32,864	37,582	36,635	43,381	51,106	77%
87,500 58/42 opt2d	33,368	39,856	42,197	47,135	51,981	82%
87,500 58/42 opt2a	32,143	39,887	44,402	54,960	59,119	88%
87,500 58/42 opt1	33,108	38,163	38,153	44,338	51,012	78%
87,500 50/50 opt2d	33,010	40,943	42,928	49,228	51,971	83%
87,500 50/50 opt2a	30,747	38,967	43,140	47,977	53,212	82%
87,500 50/50 opt1	33,151	39,747	41,912	43,139	43,599	77%
68,100 70/30 opt2d	33,162	36,866	36,314	40,583	45,112	73%
68,100 70/30 opt2a	29,981	34,695	36,854	44,290	47,643	74%
68,100 70/30 opt1	32,948	36,791	35,507	39,891	42,666	72%
68,100 58/42 opt2d	32,364	37,417	37,704	40,948	43,194	73%
68,100 58/42 opt2a	30,023	36,658	39,105	43,534	45,139	74%
68,100 58/42 opt1	33,108	37,477	37,402	35,895	38,137	69%
68,100 50/50 opt2d	30,769	37,607	41,249	38,952	38,063	71%
68,100 50/50 opt2a	30,084	37,224	39,182	43,200	45,144	74%
68,100 50/50 opt1	32,342	37,659	38,203	36,334	35,679	69%
48,700 70/30 opt2d	29,249	33,665	33,408	30,077	28,277	59%
48,700 70/30 opt2a	28,798	31,431	31,021	33,765	34,297	61%
48,700 70/30 opt1	30,155	33,547	33,374	31,735	29,376	60%
48,700 58/42 opt2d	29,987	33,692	34,121	30,697	30,120	61%
48,700 58/42 opt2a	27,722	31,175	32,007	28,025	27,065	56%
48,700 58/42 opt1	28,349	33,201	33,788	30,543	25,454	58%
48,700 50/50 opt2d	28,797	33,773	33,600	30,876	29,647	60%
48,700 50/50 opt2a	26,949	30,859	31,139	28,650	27,215	55%
48,700 50/50 opt1	26,854	31,947	31,278	29,530	26,716	56%
29,300 70/30 opt2d	19,200	22,679	23,095	20,513	13,338	38%
29,300 70/30 opt2a	21,115	23,813	23,825	20,612	17,220	41%
29,300 70/30 opt1	19,252	22,524	21,886	19,101	15,220	37%
29,300 58/42 opt2d	18,963	23,646	22,393	20,476	15,041	38%
29,300 58/42 opt2a	19,376	23,043	22,132	20,827	15,039	38%
29,300 58/42 opt1	18,259	21,267	21,286	18,331	14,924	36%
29,300 50/50 opt2d	19,122	22,130	21,382	18,665	14,048	36%
29,300 50/50 opt2a	19,123	21,927	21,513	20,925	16,004	38%
29,300 50/50 opt1	17,104	20,672	19,676	17,542	13,161	34%

Note: Shading indicates Alternative 2 scenarios that are most similar to Alternatives 4 and 5.

[43] Annual scenarios have 70:30 A:B season split, 80% rollover from the A to B season (Alt 4), 100% rollover from the A to B season (Alt 5) and between season transferability.

The pattern of bycatch relative to AEQ is variable. In some years, the bycatch records may be below the actual AEQ, due to the lagged impact of previous years catches. For example, in 2000, as shown in Fig. 5-43, actual bycatch is below the predicted AEQ bycatch. This is because 1996-1998, the actual bycatch was high. The impacts from those high bycatch years show up in the AEQ bycatch for subsequent years. Some of the Chinook salmon caught as bycatch in those years would not have returned to their river of origin in the year of bycatch. Based on their age and maturity, they might have returned up to one to four years later. Some proportion of the bycatch would not have returned in any year due to ocean mortality.

A similar situation is predicted for the AEQ model results for 2008, because of high bycatch in previous years, especially for 2007. Although to date, 2008 bycatch has been low, compared to previous years, the impacts from 2007 bycatch will continue to be experienced in river systems for several years to come. This impact analysis focuses does not predict impacts past 2007, however we acknowledge that bycatch during the years 2003-2007 will continue to influence adult equivalent salmon returning to river systems for several years into the future.

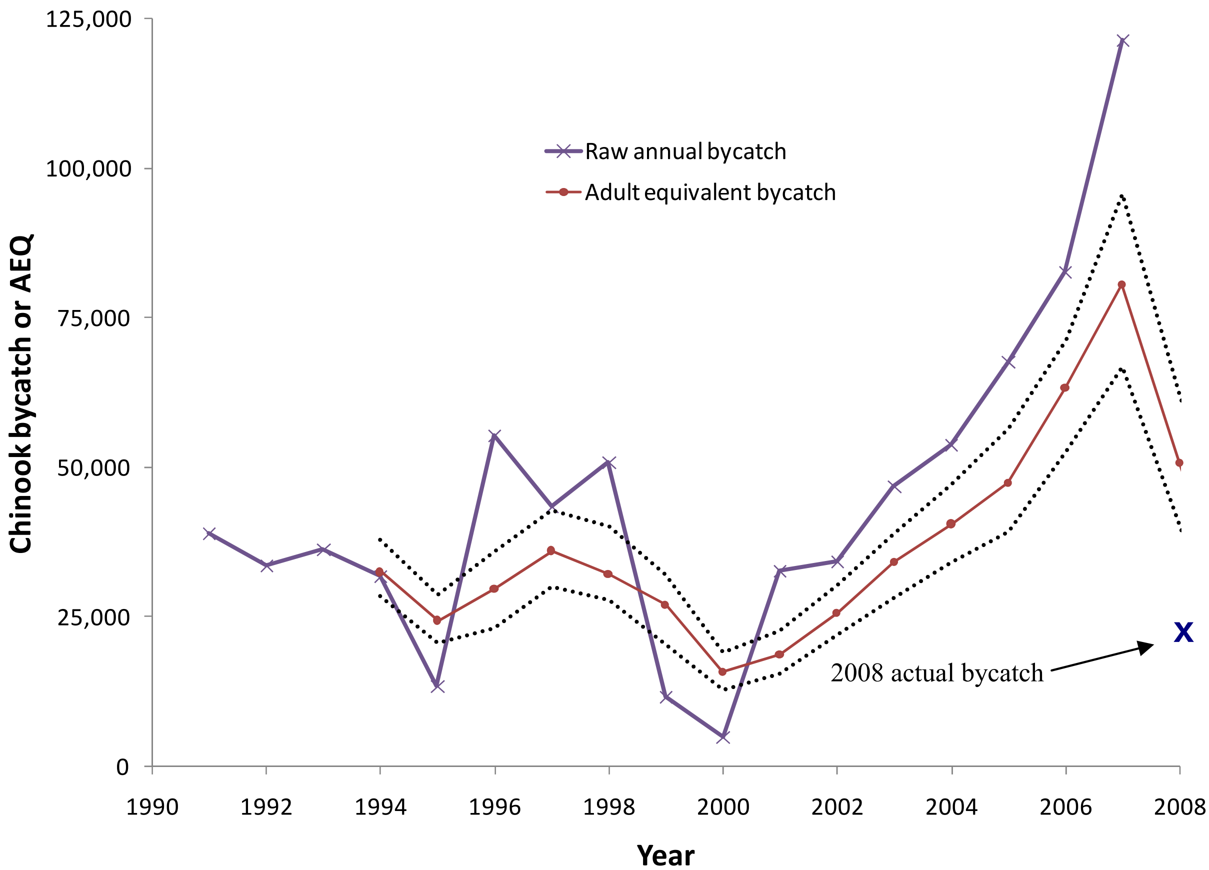


Fig. 5-43 Time series of Chinook actual and adult equivalent bycatch from the pollock fishery, 1991-2007 (2008 raw annual bycatch also indicated separately). The dotted lines represent the uncertainty of the AEQ estimate, due to the combined variability of ocean mortality, maturation rate, and age composition of bycatch estimates.

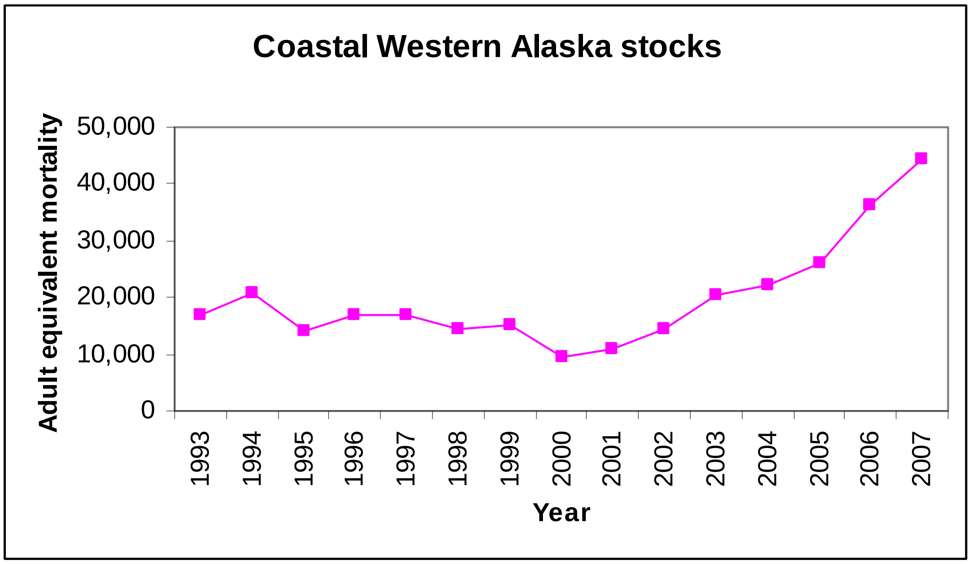


Fig. 5-44 Annual estimated pollock fishery adult equivalent removals on stocks from the Coastal western Alaska returns, 1993-2007.

Estimates of AEQ impacts to specific regions have been developed (Fig. 5-44, Fig. 5-45). Here historical estimates of AEQ are shown for the aggregate coastal western Alaska stocks (Fig. 5-44; which includes the lower Yukon River, Kuskokwim, Bristol Bay and other components) and aggregate Pacific Northwest stocks (Fig. 5-45). A complete listing of stocks included in both aggregate groupings is contained in Table 3-7 in Chapter 3. Note that indicating historical AEQ removals by region implies that the relative distribution of salmon bycatch occurring in space and time would be the same as what was observed during the genetics sampling years (2005-2007). As described previously, the relative intensity of inter-annual patterns of pollock fishing areas and seasons affects the relative contribution of various stocks by year in the bycatch. While these estimates are based on a number of assumptions, alternative approaches (such as assuming a constant fraction of annual bycatch tallies) require even more questionable assumptions.

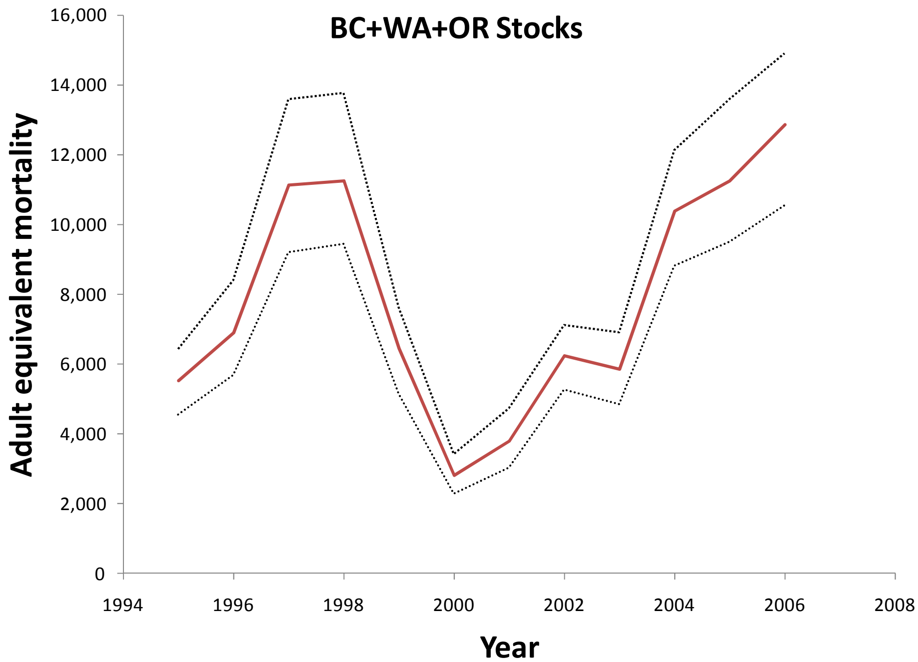


Fig. 5-45 Annual estimated pollock fishery adult equivalent removals on stocks from the Pacific Northwest aggregate stock returns, 1995-2007 with stochasticity in natural mortality (Model 2, CV=0.1), bycatch age composition (via bootstrap samples), maturation rate (CV=0.1), and stock composition.

Breaking the AEQ bycatch to Chinook stock-specific impacts for each stock-specific region, by year, is shown in Table 5-51 for Alternatives 4 and 5, which illustrates hypothetical bycatch levels to the river system regions. Table 5-52 through Table 5-56 compare annual AEQ Chinook bycatch for all Alternative 2, 5 and 5 scenarios, and estimate the number of AEQ Chinook salmon that would have been saved had the management measure been in place. The value is expressed as the baseline AEQ estimate minus the estimate with the management measure in place.

In years when the actual bycatch was below a given cap level, this could have resulted in negative AEQ salmon savings (i.e., more not fewer salmon were prevented from spawning than actually occurred), and the management options appear to actually increase the AEQ bycatch compared to the baseline estimates in some years (shown as negative numbers). This can happen when the combined cumulative effect from prior years bycatch levels are low in some seasons and sectors and high in others. The model has momentum from years prior to 2003 and the restrictions (via caps etc) propagate forward. So even though 2003 is a low bycatch year, the savings from that year is cumulative from previous years as well. There could also be a contribution due to non-linearities in the simulations. For example, the Pacific northwest (PNW) stocks show an increased AEQ value from the baseline for several of the options for 2003 (Table 5-52).

In a high-bycatch year such as 2007 (Table 5-56), some management options also result in higher AEQ salmon mortalities for some systems (e.g., negative numbers for certain options for the middle Yukon and Upper Yukon rivers). This results because Chinook from these rivers tend to be found most commonly in the NW during the B season, and the proportion attributed to that stratum increases from the estimated 8% shown in Table 5-49 to 14%–22% under those scenarios. These complexities reveal the difficulty in predicting how any management action will affect specific stocks of salmon, particularly since their relative effects appears to vary in different years.

Some stock specific trends are discussed in the sections that follow, and additional tables showing all of the scenarios and impacts by region are included in Table 5-53 through Table 5-56. Results primarily indicate the inter-annual variability in stock specific impacts, and should be considered accordingly.

Table 5-51 Hypothetical adult equivalent Chinook bycatch levels attributed to river system, under the two annual scenarios for Alternatives 4 and 5. For each Alternative the A-B split is equal to 70:30, Alternative 4 has an 80% rollover from A to B season, Alternative 5 has 100% rollover from A to B season and both employ between sector transferability, 2003-2007.

	PNW	Coast W AK	Cook Inlet	Middle Yukon	N AK Penin	Russia	TBR	Upper Yukon	Other	Total
Alt 5 Annual Scenario 1										
2003	5,888	20,656	422	364	4,521	221	316	326	733	33,448
2004	9,682	20,515	975	444	4,326	299	676	379	829	38,123
2005	9,043	22,095	923	584	4,450	346	645	500	830	39,416
2006	9,910	27,635	745	324	6,373	256	541	293	1,075	47,152
2007	9,741	31,306	727	512	6,932	329	535	458	1,144	51,684
Alt 5 Annual Scenario 2										
2003	5,747	20,126	412	354	4,406	215	308	317	715	32,601
2004	8,086	20,680	761	450	4,356	282	537	390	784	36,326
2005	6,822	21,628	605	519	4,462	293	436	453	761	35,978
2006	7,547	22,106	554	274	5,069	206	405	248	845	37,253
2007	7,198	22,952	540	376	5,082	242	397	336	841	37,963
Alt 4 Annual Scenario 1										
2003	5,919	20,764	424	366	4,545	222	317	327	737	33,623
2004	9,735	20,628	980	447	4,349	300	679	381	834	38,334
2005	9,407	21,794	980	585	4,372	351	681	499	832	39,502
2006	9,975	28,219	737	322	6,525	256	537	292	1,095	47,958
2007	9,775	31,421	731	518	6,949	331	539	463	1,148	51,875
Alt 4 Annual Scenario 2										
2003	5,747	20,126	412	354	4,406	215	308	317	715	32,601
2004	8,086	20,680	761	450	4,356	282	537	390	784	36,326
2005	6,822	21,628	605	519	4,462	293	436	453	761	35,978
2006	7,547	22,106	554	274	5,069	206	405	248	845	37,253
2007	7,198	22,952	540	376	5,082	242	397	336	841	37,963

Table 5-52 Hypothetical reduction in region-specific adult equivalent Chinook salmon bycatch mortality under each cap and management option for **2003.** Values are based on median AEQ values and mean proportions regional assignments within strata (A-season, and NW and SE B seasons) genetics data collected from 2005-2007. Note that the median estimated adult equivalent bycatch levels are given in the second row.

2003	**PNW**	**Coast WAK**	**Cook Inlet**	**Mid Yukon**	**N AK Pen**	**Russia**	**TBR**	**Up Yukon**	**Other**	**Total**
No Cap	**5,828**	**20,522**	**431**	**366**	**4,485**	**218**	**322**	**321**	**721**	**33,215**
Alt 5 AS1	-60	-134	9	2	-36	-3	6	-5	-12	-233
Alt 5 AS2	81	396	19	12	79	3	14	4	6	614
Alt 4 AS1	-91	-242	7	0	-60	-4	5	-6	-16	-408
Alt 4 AS2	81	396	19	12	79	3	14	4	6	614
Cap, AB, sector										
87,500 70/30 opt2d	-951	1,082	-60	171	-68	55	-38	149	-29	312
87,500 70/30 opt2a	-784	795	-49	138	-75	45	-31	120	-26	134
87,500 70/30 opt1	-730	917	-46	136	-39	44	-29	118	-20	352
87,500 58/42 opt2d	-330	174	-21	49	-54	15	-14	42	-14	-153
87,500 58/42 opt2a	-268	1,091	-34	55	167	18	-20	49	14	1,072
87,500 58/42 opt1	-966	937	-62	165	-93	53	-39	144	-32	108
87,500 50/50 opt2d	-719	801	-51	119	-35	38	-32	104	-20	205
87,500 50/50 opt2a	-609	2,502	-77	126	383	42	-45	112	33	2,468
87,500 50/50 opt1	-290	306	-18	51	-24	16	-12	44	-9	64
68,100 70/30 opt2d	-485	464	-26	91	-65	30	-16	79	-18	53
68,100 70/30 opt2a	-93	2,607	-19	113	436	43	-7	99	54	3,234
68,100 70/30 opt1	-253	430	-16	53	3	18	-10	46	-5	267
68,100 58/42 opt2d	-472	1,097	-46	83	112	27	-27	73	3	851
68,100 58/42 opt2a	-771	3,201	-83	189	435	65	-47	166	37	3,193
68,100 58/42 opt1	-690	692	-44	119	-63	38	-28	104	-23	107
68,100 50/50 opt2d	-665	2,532	-78	139	364	46	-45	123	30	2,447
68,100 50/50 opt2a	-97	2,570	-48	60	533	22	-25	54	63	3,132
68,100 50/50 opt1	-599	1,224	-51	111	89	36	-31	97	-2	874
48,700 70/30 opt2d	-130	3,211	-24	141	534	54	-9	124	66	3,966
48,700 70/30 opt2a	424	3,054	24	87	601	40	22	77	88	4,417
48,700 70/30 opt1	162	2,199	33	126	307	52	25	109	47	3,060
48,700 58/42 opt2d	-851	3,310	-96	189	462	64	-55	167	38	3,228
48,700 58/42 opt2a	-199	4,488	-53	167	806	63	-25	148	97	5,493
48,700 58/42 opt1	-478	4,270	-86	163	759	58	-47	145	83	4,866
48,700 50/50 opt2d	13	3,488	-54	65	756	26	-27	60	93	4,418
48,700 50/50 opt2a	433	4,529	-13	90	970	41	2	81	132	6,266
48,700 50/50 opt1	-531	5,499	-107	196	1,005	70	-58	174	113	6,361
29,300 70/30 opt2d	2,216	8,885	158	181	1,896	100	121	159	299	14,015
29,300 70/30 opt2a	1,929	7,669	128	137	1,677	78	99	120	262	12,100
29,300 70/30 opt1	1,978	9,043	153	236	1,827	118	117	206	286	13,964
29,300 58/42 opt2d	1,506	9,807	30	163	2,167	83	41	146	309	14,252
29,300 58/42 opt2a	1,568	9,405	54	172	2,047	87	55	153	297	13,840
29,300 58/42 opt1	2,034	9,834	103	169	2,161	93	88	151	324	14,956
29,300 50/50 opt2d	1,408	9,793	7	143	2,202	74	26	130	310	14,093
29,300 50/50 opt2a	888	10,237	-15	250	2,101	110	12	223	287	14,093
29,300 50/50 opt1	1,490	11,273	21	221	2,423	106	38	198	342	16,111

Note: Shading indicates Alternative 2 scenarios that are most similar to Alternatives 4 and 5.

Table 5-53 Hypothetical reduction in region-specific adult equivalent Chinook salmon bycatch mortality under each cap and management option for **2004.** Values are based on median AEQ values and mean proportions regional assignments within strata (A-season, and NW and SE B seasons) genetics data collected from 2005-2007. Note that the median estimated adult equivalent bycatch levels are given in the second row.

2004	PNW	Coast WAK	Cook Inlet	Mid Yukon	N AK Pen	Russia	TBR	Up Yukon	Other	Total
No Cap	**10,446**	**22,060**	**1,063**	**482**	**4,650**	**323**	**732**	**408**	**882**	**41,047**
Alt 5 AS1	764	1,545	88	38	324	24	56	29	53	2,924
Alt 5 AS2	1,981	4,321	324	304	497	145	213	254	121	8,161
Alt 4 AS1	890	1,132	200	191	-84	86	128	155	15	2,712
Alt 4 AS2	1,981	4,321	324	304	497	145	213	254	121	8,161
Cap, AB, sector										
87,500 70/30 opt2d	2,215	7	291	-2	8	28	187	-8	66	2,792
87,500 70/30 opt2a	544	1,356	147	201	-57	87	96	171	18	2,562
87,500 70/30 opt1	2,009	661	315	122	-74	74	203	99	56	3,465
87,500 58/42 opt2d	553	357	93	53	-15	28	60	44	17	1,190
87,500 58/42 opt2a	909	70	77	-76	170	-18	50	-66	44	1,159
87,500 58/42 opt1	1,555	670	242	99	-26	59	157	80	47	2,883
87,500 50/50 opt2d	-1,126	1,074	-71	193	-114	62	-45	168	-38	104
87,500 50/50 opt2a	349	1,270	47	63	197	29	33	54	36	2,080
87,500 50/50 opt1	177	773	70	122	-47	50	46	104	5	1,300
68,100 70/30 opt2d	1,641	1,513	313	248	-109	119	203	207	46	4,180
68,100 70/30 opt2a	2,341	2,595	344	188	286	104	226	156	111	6,352
68,100 70/30 opt1	2,260	988	379	194	-134	106	245	159	59	4,255
68,100 58/42 opt2d	2,296	587	294	12	127	34	191	5	83	3,630
68,100 58/42 opt2a	2,142	1,392	224	-40	436	12	148	-38	113	4,389
68,100 58/42 opt1	1,482	1,207	282	215	-121	104	182	179	39	3,570
68,100 50/50 opt2d	1,042	1,643	143	89	240	49	95	75	63	3,440
68,100 50/50 opt2a	730	2,297	62	47	489	28	45	41	82	3,822
68,100 50/50 opt1	2,243	448	289	9	98	32	187	2	78	3,388
48,700 70/30 opt2d	3,504	2,253	503	180	215	116	327	146	137	7,382
48,700 70/30 opt2a	4,047	3,515	530	161	575	116	348	130	195	9,616
48,700 70/30 opt1	4,195	1,687	582	131	170	106	377	102	150	7,500
48,700 58/42 opt2d	3,255	2,537	423	108	431	85	277	86	152	7,354
48,700 58/42 opt2a	2,353	5,345	321	276	809	139	217	234	178	9,872
48,700 58/42 opt1	3,131	2,980	450	210	341	123	295	173	142	7,846
48,700 50/50 opt2d	2,275	3,420	301	165	541	94	200	138	139	7,273
48,700 50/50 opt2a	3,502	4,586	386	80	1,009	76	258	64	227	10,187
48,700 50/50 opt1	3,035	4,116	385	169	711	106	256	140	181	9,099
29,300 70/30 opt2d	6,328	8,145	780	289	1,497	195	519	238	377	18,368
29,300 70/30 opt2a	6,071	7,533	734	237	1,445	171	488	194	361	17,234
29,300 70/30 opt1	6,141	8,466	741	278	1,602	188	494	229	384	18,523
29,300 58/42 opt2d	4,812	8,870	582	328	1,603	191	392	275	347	17,401
29,300 58/42 opt2a	5,049	9,146	583	286	1,756	178	394	240	370	18,004
29,300 58/42 opt1	5,549	10,056	634	303	1,954	191	429	254	409	19,780
29,300 50/50 opt2d	5,383	9,610	566	198	2,051	147	385	165	411	18,917
29,300 50/50 opt2a	5,654	9,510	597	183	2,055	144	405	152	419	19,120
29,300 50/50 opt1	5,349	10,713	607	333	2,061	200	413	281	417	20,375

Note: Shading indicates Alternative 2 scenarios that are most similar to Alternatives 4 and 5.

Table 5-54 Hypothetical reduction in region-specific adult equivalent Chinook salmon bycatch mortality under each cap and management option for **2005.** Values are based on median AEQ values and mean proportions regional assignments within strata (A-season, and NW and SE B seasons) genetics data collected from 2005-2007. Note that the median estimated adult equivalent bycatch levels are given in the second row.

2005	PNW	Coast WAK	Cook Inlet	Mid Yukon	N AK Pen	Russia	TBR	Up Yukon	Other	Total
No Cap	**11,232**	**26,043**	**1,223**	**774**	**5,079**	**449**	**841**	**658**	**969**	**47,268**
Alt 5 AS1	2,189	3,948	300	190	629	103	196	158	139	7,852
Alt 5 AS2	2,674	8,245	235	156	1,794	93	171	124	288	13,779
Alt 4 AS1	1,981	4,321	324	304	497	145	213	254	121	8,161
Alt 4 AS2	2,674	8,245	235	156	1,794	93	171	124	288	13,779
Cap, AB, sector										
87,500 70/30 opt2d	4,064	2,801	574	203	311	132	374	164	166	8,789
87,500 70/30 opt2a	4,806	1,935	620	66	364	88	403	45	188	8,515
87,500 70/30 opt1	3,887	4,315	617	396	309	207	404	330	169	10,634
87,500 58/42 opt2d	2,970	1,035	393	50	166	58	255	36	109	5,071
87,500 58/42 opt2a	2,212	114	256	-60	152	4	165	-57	81	2,867
87,500 58/42 opt1	4,347	2,802	594	171	376	123	387	136	180	9,116
87,500 50/50 opt2d	2,602	801	364	75	56	63	235	57	87	4,340
87,500 50/50 opt2a	15	3,074	85	299	183	119	60	257	35	4,128
87,500 50/50 opt1	2,361	1,791	356	166	126	96	232	136	92	5,356
68,100 70/30 opt2d	4,769	3,783	675	263	440	165	441	214	204	10,954
68,100 70/30 opt2a	3,334	4,704	530	388	423	196	349	325	166	10,414
68,100 70/30 opt1	4,968	4,183	724	325	418	192	473	267	210	11,761
68,100 58/42 opt2d	3,946	3,501	571	258	378	153	373	212	173	9,564
68,100 58/42 opt2a	3,514	2,959	422	65	626	71	278	49	181	8,164
68,100 58/42 opt1	4,094	3,603	581	247	426	150	381	202	182	9,867
68,100 50/50 opt2d	1,490	3,081	296	328	129	149	195	278	74	6,019
68,100 50/50 opt2a	2,633	3,697	352	184	573	107	233	153	154	8,087
68,100 50/50 opt1	3,452	3,554	537	317	273	170	351	264	148	9,066
48,700 70/30 opt2d	4,521	6,206	695	477	629	246	458	399	229	13,860
48,700 70/30 opt2a	5,322	7,384	720	385	1,112	220	477	321	306	16,247
48,700 70/30 opt1	5,165	5,631	761	414	609	230	499	343	243	13,894
48,700 58/42 opt2d	5,039	5,261	680	278	786	174	447	228	254	13,147
48,700 58/42 opt2a	5,381	6,686	635	182	1,340	141	422	148	326	15,261
48,700 58/42 opt1	4,522	5,924	686	445	620	234	451	372	227	13,480
48,700 50/50 opt2d	4,523	6,217	575	257	1,070	159	382	213	272	13,669
48,700 50/50 opt2a	4,914	7,788	593	271	1,442	170	397	226	328	16,129
48,700 50/50 opt1	5,485	7,106	682	263	1,286	174	453	216	326	15,991
29,300 70/30 opt2d	7,386	11,597	932	478	1,998	283	623	399	476	24,174
29,300 70/30 opt2a	7,266	11,144	919	461	1,916	275	614	385	462	23,443
29,300 70/30 opt1	7,570	12,385	934	475	2,204	284	626	397	506	25,383
29,300 58/42 opt2d	7,030	12,597	804	377	2,454	239	543	316	516	24,875
29,300 58/42 opt2a	6,308	13,408	780	547	2,318	297	529	463	486	25,137
29,300 58/42 opt1	7,030	13,398	847	493	2,424	285	572	416	517	25,983
29,300 50/50 opt2d	6,547	13,840	749	454	2,615	263	511	384	524	25,886
29,300 50/50 opt2a	6,930	13,413	764	368	2,678	234	520	310	539	25,756
29,300 50/50 opt1	6,841	14,899	771	473	2,846	274	527	401	561	27,593

Note: Shading indicates Alternative 2 scenarios that are most similar to Alternatives 4 and 5.

Table 5-55 Hypothetical reduction in region-specific adult equivalent Chinook salmon bycatch mortality under each cap and management option for **2006.** Values are based on median AEQ values and mean proportions regional assignments within strata (A-season, and NW and SE B seasons) genetics data collected from 2005-2007. Note that the median estimated adult equivalent bycatch levels are given in the second row.

2006	**PNW**	**Coast WAK**	**Cook Inlet**	**Mid Yukon**	**N AK Pen**	**Russia**	**TBR**	**Up Yukon**	**Other**	**Total**
No Cap	**12,712**	**36,453**	**943**	**408**	**8,455**	**322**	**689**	**358**	**1,398**	**61,737**
Alt 5 AS1	2,802	8,818	198	84	2,082	66	148	65	323	14,585
Alt 5 AS2	6,471	7,398	860	332	1,229	211	571	259	341	17,672
Alt 4 AS1	2,674	8,245	235	156	1,794	93	171	124	288	13,779
Alt 4 AS2	6,471	7,398	860	332	1,229	211	571	259	341	17,672
Cap, AB, sector										
87,500 70/30 opt2d	4,805	5,374	463	-55	1,479	40	311	-53	315	12,679
87,500 70/30 opt2a	4,561	4,955	384	-161	1,583	-5	260	-142	316	11,751
87,500 70/30 opt1	5,724	8,971	516	-7	2,298	70	353	-10	442	18,356
87,500 58/42 opt2d	2,897	8,804	152	2	2,235	37	118	5	351	14,602
87,500 58/42 opt2a	2,160	3,406	92	-189	1,243	-47	69	-161	203	6,777
87,500 58/42 opt1	4,473	9,480	327	-25	2,462	47	233	-21	424	17,399
87,500 50/50 opt2d	3,264	6,936	117	-241	2,245	-54	93	-204	353	12,509
87,500 50/50 opt2a	4,105	7,212	133	-401	2,635	-106	105	-341	417	13,759
87,500 50/50 opt1	3,098	11,831	85	-23	3,053	30	83	-12	453	18,598
68,100 70/30 opt2d	5,969	10,962	503	5	2,779	78	349	3	507	21,154
68,100 70/30 opt2a	6,210	7,887	509	-189	2,387	4	347	-167	459	17,447
68,100 70/30 opt1	6,031	11,402	537	75	2,752	106	372	61	508	21,846
68,100 58/42 opt2d	5,371	11,376	339	-130	3,154	17	245	-110	528	20,789
68,100 58/42 opt2a	4,850	9,918	240	-254	3,030	-39	180	-215	492	18,203
68,100 58/42 opt1	6,190	14,568	392	-76	3,858	48	287	-63	638	25,842
68,100 50/50 opt2d	4,514	13,898	122	-198	3,929	-22	112	-162	592	22,785
68,100 50/50 opt2a	2,799	12,076	45	-13	3,094	30	57	-2	450	18,536
68,100 50/50 opt1	5,797	14,576	365	-30	3,767	61	269	-22	618	25,403
48,700 70/30 opt2d	7,737	17,586	585	47	4,379	117	417	42	751	31,660
48,700 70/30 opt2a	6,505	15,827	497	99	3,829	121	356	86	651	27,971
48,700 70/30 opt1	7,512	16,463	597	70	4,047	123	422	61	706	30,002
48,700 58/42 opt2d	6,784	18,069	433	23	4,549	95	321	25	742	31,039
48,700 58/42 opt2a	6,825	20,214	354	-28	5,196	75	275	-16	818	33,712
48,700 58/42 opt1	6,980	17,955	490	75	4,416	118	357	68	734	31,194
48,700 50/50 opt2d	5,659	18,997	307	108	4,613	114	241	101	720	30,861
48,700 50/50 opt2a	5,957	20,559	252	11	5,204	79	210	20	795	33,087
48,700 50/50 opt1	6,910	18,856	446	54	4,687	109	331	52	764	32,207
29,300 70/30 opt2d	8,831	24,021	664	236	5,637	205	481	207	941	41,224
29,300 70/30 opt2a	8,949	23,852	662	197	5,673	191	480	173	947	41,125
29,300 70/30 opt1	9,306	24,699	692	206	5,869	199	501	181	982	42,636
29,300 58/42 opt2d	8,790	24,150	613	160	5,820	175	450	143	958	41,261
29,300 58/42 opt2a	9,227	23,545	602	5	5,977	119	442	10	983	40,910
29,300 58/42 opt1	9,035	25,577	643	225	6,055	203	472	199	996	43,406
29,300 50/50 opt2d	8,991	25,435	582	117	6,233	160	433	108	1,012	43,071
29,300 50/50 opt2a	8,607	24,066	525	40	6,039	125	394	42	974	40,812
29,300 50/50 opt1	9,271	26,037	616	140	6,341	173	456	127	1,034	44,195

Note: Shading indicates Alternative 2 scenarios that are most similar to Alternatives 4 and 5.

Table 5-56 Hypothetical reduction in region-specific adult equivalent Chinook salmon bycatch mortality under each cap and management option for **2007.** Values are based on median AEQ values and mean proportions regional assignments within strata (A-season, and NW and SE B seasons) genetics data collected from 2005-2007. Note that the median estimated adult equivalent bycatch levels are given in the second row.

2007	PNW	Coast WAK	Cook Inlet	Mid Yukon	N AK Pen	Russia	TBR	Up Yukon	Other	Total
No Cap	**18,185**	**44,391**	**1,639**	**739**	**9,814**	**523**	**1,152**	**634**	**1,736**	**78,814**
Alt 5 AS1	8,444	13,085	912	227	2,882	194	617	176	592	27,130
Alt 5 AS2	11,135	21,182	1,202	504	4,389	338	821	414	865	40,851
Alt 4 AS1	8,489	12,325	1,042	414	2,318	269	699	330	534	26,420
Alt 4 AS2	11,135	21,182	1,202	504	4,389	338	821	414	865	40,851
Cap, AB, sector										
87,500 70/30 opt2d	9,581	8,379	1,010	-63	2,264	97	670	-69	549	22,417
87,500 70/30 opt2a	9,385	10,379	926	-74	2,793	90	620	-75	606	24,650
87,500 70/30 opt1	10,355	11,829	1,035	-40	3,093	116	694	-47	671	27,708
87,500 58/42 opt2d	9,336	12,215	847	-117	3,345	73	575	-109	668	26,833
87,500 58/42 opt2a	6,167	9,610	549	-22	2,490	70	376	-23	477	19,694
87,500 58/42 opt1	9,230	13,043	853	-41	3,403	101	580	-43	675	27,802
87,500 50/50 opt2d	7,920	13,668	613	-134	3,746	48	427	-117	673	26,843
87,500 50/50 opt2a	7,951	12,706	593	-224	3,681	13	413	-194	662	25,601
87,500 50/50 opt1	9,453	18,683	800	78	4,597	151	558	65	829	35,214
68,100 70/30 opt2d	10,667	16,179	1,071	160	3,800	199	725	127	773	33,702
68,100 70/30 opt2a	10,613	14,242	1,084	104	3,419	177	730	77	724	31,170
68,100 70/30 opt1	11,054	17,709	1,113	218	4,073	227	756	177	820	36,148
68,100 58/42 opt2d	8,944	19,426	783	206	4,530	195	548	176	811	35,619
68,100 58/42 opt2a	9,344	17,537	829	104	4,256	160	574	85	786	33,674
68,100 58/42 opt1	10,887	21,530	982	202	5,074	218	681	169	933	40,677
68,100 50/50 opt2d	10,037	22,513	797	116	5,494	173	564	100	955	40,750
68,100 50/50 opt2a	10,866	16,377	785	-399	4,966	-20	547	-346	893	33,669
68,100 50/50 opt1	10,974	23,424	939	193	5,573	216	657	164	995	43,134
48,700 70/30 opt2d	12,997	27,185	1,209	379	6,159	315	838	321	1,132	50,536
48,700 70/30 opt2a	12,951	22,551	1,212	174	5,392	234	831	141	1,031	44,517
48,700 70/30 opt1	13,227	26,063	1,274	389	5,855	322	878	327	1,103	49,438
48,700 58/42 opt2d	13,073	25,796	1,134	158	6,247	229	789	132	1,135	48,693
48,700 58/42 opt2a	13,559	27,743	1,160	180	6,698	244	809	152	1,204	51,749
48,700 58/42 opt1	14,035	28,639	1,139	72	7,143	207	799	60	1,267	53,359
48,700 50/50 opt2d	12,511	26,731	1,046	176	6,448	229	734	150	1,143	49,167
48,700 50/50 opt2a	11,521	29,594	905	295	6,936	263	649	257	1,178	51,598
48,700 50/50 opt1	12,560	29,053	978	153	7,083	220	696	133	1,220	52,097
29,300 70/30 opt2d	15,507	36,664	1,284	366	8,594	342	909	316	1,495	65,476
29,300 70/30 opt2a	15,241	33,683	1,421	536	7,497	406	989	456	1,365	61,593
29,300 70/30 opt1	15,306	35,266	1,357	481	8,010	385	952	411	1,425	63,593
29,300 58/42 opt2d	14,686	36,190	1,141	280	8,644	297	816	245	1,473	63,772
29,300 58/42 opt2a	14,632	36,228	1,146	304	8,606	306	819	265	1,468	63,775
29,300 58/42 opt1	15,299	35,541	1,328	444	8,154	370	934	380	1,440	63,890
29,300 50/50 opt2d	14,310	37,272	1,132	406	8,667	342	812	353	1,471	64,765
29,300 50/50 opt2a	13,690	36,364	1,047	358	8,533	315	756	313	1,434	62,810
29,300 50/50 opt1	14,766	37,492	1,210	449	8,638	365	862	389	1,482	65,653

Note: Shading indicates Alternative 2 scenarios that are most similar to Alternatives 4 and 5.

Western Alaska Stocks: Yukon, Kuskokwim, Bristol Bay (Nushagak)

As discussed in Chapter 3, since the genetics results are limited in the ability to distinguish among the specific western Alaska stocks, we used the results from scale-pattern analyses to provide estimates to western Alaska rivers. For each cap alternative and option, the proportional breakouts of western Alaska Chinook based on Myers et al.'s (2003) proportions are shown in Table 5-59 through Table 5-62 for each year and river system, expressed in terms of number of Chinook saved under each scenario. Hypothetical adult equivalent bycatch numbers are provided for annual scenarios under Alternatives 4 and 5 in Table 5-58. To further summarize these tables, we constructed a range of hypothetical reductions in coastal-west Alaska AEQ values. These values are based on medians from the simulation model and are applied to mean proportional assignments to regions within each stratum (A-season (all areas), and B-seasons broken out geographically be east and west of 170°W). For the least constraining option, results suggest that over 3,000 western Alaska AEQ Chinook would have been saved had those measures been in place in 2006 and 2007 (Table 5-55 and Table 5-56). Under the most constraining option, the number of AEQ Chinook saved to these rivers would have been over 26,000 in 2006 and over 37,000 in 2007. For the Alternative 4 scenarios these values range from 8,200 to 14,400 in 2006 to 12,300 to 21,182 in 2007. For Alternative 5 these values range from 8,800 to 14,400 in 2006 to 13,000 to 21,182 in 2007. For the Kuskokwim it should be noted that the genetics for Coastal WAK do not include the "upper Kuskokwim" which was included in the Other category. The fractional contribution of this component is likely quite small. Aggregate results for Coastal WAK are also complicated by the inclusion of other components such as Norton Sound stocks. Thus any results as noted for individual river system should be taken as a discussion of trends and not necessary any absolute value. These results are presented solely to characterize the trends in impacts of various alternatives.

Table 5-57 Hypothetical Chinook adult equivalent bycatch levels to western Alaska river systems under Alternative 5, using Myers et al. (2003) estimates for Yukon, Kuskokwim and Bristol Bay.

	Total western Alaska	Yukon	Kuskokwim	Bristol Bay
Alternative 5 Annual Scenario 1				
2003	21,346	8,538	5,550	7,258
2004	21,338	8,535	5,548	7,255
2005	23,179	9,272	6,027	7,881
2006	28,252	11,301	7,346	9,606
2007	32,276	12,910	8,392	10,974
Alternative 5 Annual Scenario 2				
2003	21,362	8,545	5,554	7,263
2004	21,792	8,717	5,666	7,409
2005	22,615	9,046	5,880	7,689
2006	22,415	8,966	5,828	7,621
2007	23,664	9,466	6,153	8,046

Table 5-58 Hypothetical Chinook adult equivalent bycatch levels to western Alaska river systems under Alternative 4, using Myers et al. (2003) estimates for Yukon, Kuskokwim and Bristol Bay.

	Total western Alaska	Yukon	Kuskokwim	Bristol Bay
Alternative 4 Annual Scenario 1				
2003	22,032	8,813	5,728	7,491
2004	21,472	8,589	5,583	7,300
2005	22,596	9,038	5,875	7,683
2006	28,694	11,478	7,460	9,756
2007	32,695	13,078	8,501	11,116
Alternative 4 Annual Scenario 2				
2003	21,362	8,545	5,554	7,263
2004	21,792	8,717	5,666	7,409
2005	22,615	9,046	5,880	7,689
2006	22,415	8,966	5,828	7,621
2007	23,664	9,466	6,153	8,046

Norton Sound Stocks

Due to the limitations in the genetic ability to differentiate Norton Sound stocks separately from other stocks, specific impact assessment for Norton Sound cannot be estimated at this time. Genetically the stocks from Norton Sound are included as an unresolved component of the Coastal western Alaska stocks thus trends for those stocks could be used to approximate trends for impacts to Norton Sound stocks (Table 5-59, expressed in terms of number of Chinook saved under each scenario). The extent to which Norton Sound stocks may differ from the aggregate Coastal western Alaska grouping at this time cannot be determined. Geneticists have noted that the Norton Sound stocks do show some distinction from other western Alaska groups, but the distinctions are not currently sufficient to resolve these groups separately based upon developed threshold criteria. Some uncertainty be resolved by having better representation in sampling of populations from this area and sampling is planned to continue to resolve these distinctions to better estimate the Norton Sound stocks.

Cook Inlet Stocks

Impacts on Cook Inlet stocks are characterized by year in Table 5-57, expressed in terms of number of Chinook saved under each scenario compared to the estimated actual mortalities due to bycatch. For most Alternative 2 options, the 2003 levels actually had a higher impact (negative salmon saved) compared with similar cap levels in the Alternative 4 and 5 scenarios. In this year Alternative 5 AS1 and AS2 show increases in each year in reduced mortality of Cook Inlet AEQ, while many of the Alternative 2 options analyzed show a decrease. These are likely due to changes in fishing locations due to sector-specific cap constraints which could (expanded by regional apportionments of bycatch to river of origin) result in higher impacts to some systems than actually are presently estimated to have occurred. The Cook Inlet AEQ levels for 2003 are relatively low compared to all other years.

Cap levels of 68,100 (option 2d, 70/30 seasonal) and 48,700 (option 2d, 70/30 seasonal) are the closest to the sector and seasonal divisions in Alternatives 4 and 5 yet indicate much higher inter-annual differences than the annual scenarios under these alternatives. This is primarily due to the differences in seasonal sector specific allocations under these alternatives compared with the fixed sector allocation amounts in Alternative 2, option 2d.

Southeast Alaska Stocks

Southeast Alaska stocks are not individually resolved in the genetics used as the baseline for this impact analysis. These stocks are combined into two different genetic groupings and the ability to differentiate trends in specific Southeast Alaska stocks from the combined aggregate grouping is not possible at this time. Two genetic groupings contain the Southeast Alaska stocks: the Transboundary region (TBR) and the “other” category. The TBR group is represented by collections from trans-mountain Canada stocks (Taku and Stikine rivers) and are genetically distinct from the Andrew Creek wild and hatchery stocks which derive from Andrew Creek at the mouth of the Stikine River (W. Templin, pers. Comm..). The “Other” grouping represents the following stocks: Upper Kuskokwim, South Alaska Peninsula, Upper Cooper River, Lower Cooper river, North Southeast Alaska, Coastal Southeast Alaska and Andrew Creek. Additional information on the river systems within these aggregate groupings is contained in Chapter 3. While estimates are available for the individual reporting groups in the Other category, the contributions are generally below 1% and the 90% confidence intervals include 0.0 (W. Templin, pers. Comm.).

Trends in these two categories (TBR and Other) can be evaluated for an aggregate estimate of the impacts of the alternatives to Southeast Alaska stocks, but given the number of river systems combined to form these categories results should be interpreted with caution as a magnitude of impact to Southeast Alaska stocks (Table 5-64 addresses transboundary stocks, expressed in terms of number of Chinook saved under each scenario). It is not possible at this time to estimate the individual impact to specific Southeast Alaska river systems of the alternatives.

Pacific Northwest Stocks

A single grouping represents the aggregate Pacific Northwest (PNW) stocks including over 200 stocks from British Columbia, Oregon and Washington State. The specific stocks included are listed in Table

3-7 in Chapter 3. As described previously, where (and when) bycatch occurs affects the relative bycatch stock composition as evidence by negative trends for PNW stocks under many alternatives and years (Table 5-65). Impacts of nearly all cap alternatives for PNW stocks in 2003 indicate an increase in AEQ bycatch (as indicated by a negative number in Table 5-62) due to the spatial extent of the bycatch and regional contribution from these stocks in the southeast portion of the Bering Sea.

Table 5-59 Hypothetical reduction in region-specific adult equivalent Chinook salmon bycatch mortality under each cap and management option for **Coastal WAK** by year **2003-2007.** Values are based on median AEQ values and mean proportions regional assignments within strata (A-season, and NW and SE B seasons) genetics data collected from 2005–2007. Note that the median estimated adult equivalent bycatch levels are given in the second row.

Coastal WAK	**2003**	**2004**	**2005**	**2006**	**2007**
No Cap	20,522	22,060	26,043	36,453	44,391
Alt 5 AS1	-134	1,545	3,948	8,818	13,085
Alt 5 AS2	396	789	4,129	14,419	21,182
Alt 4 AS1	-242	1,132	4,321	8,245	12,325
Alt 4 AS2	396	789	4,129	14,419	21,182
Alt 2Cap, AB, sector					
87,500 70/30 opt2d	1,082	7	2,801	5,374	8,379
87,500 70/30 opt2a	795	1,356	1,935	4,955	10,379
87,500 70/30 opt1	917	661	4,315	8,971	11,829
87,500 58/42 opt2d	174	357	1,035	8,804	12,215
87,500 58/42 opt2a	1,091	70	114	3,406	9,610
87,500 58/42 opt1	937	670	2,802	9,480	13,043
87,500 50/50 opt2d	801	1,074	801	6,936	13,668
87,500 50/50 opt2a	2,502	1,270	3,074	7,212	12,706
87,500 50/50 opt1	306	773	1,791	11,831	18,683
68,100 70/30 opt2d	464	1,513	3,783	10,962	16,179
68,100 70/30 opt2a	2,607	2,595	4,704	7,887	14,242
68,100 70/30 opt1	430	988	4,183	11,402	17,709
68,100 58/42 opt2d	1,097	587	3,501	11,376	19,426
68,100 58/42 opt2a	3,201	1,392	2,959	9,918	17,537
68,100 58/42 opt1	692	1,207	3,603	14,568	21,530
68,100 50/50 opt2d	2,532	1,643	3,081	13,898	22,513
68,100 50/50 opt2a	2,570	2,297	3,697	12,076	16,377
68,100 50/50 opt1	1,224	448	3,554	14,576	23,424
48,700 70/30 opt2d	3,211	2,253	6,206	17,586	27,185
48,700 70/30 opt2a	3,054	3,515	7,384	15,827	22,551
48,700 70/30 opt1	2,199	1,687	5,631	16,463	26,063
48,700 58/42 opt2d	3,310	2,537	5,261	18,069	25,796
48,700 58/42 opt2a	4,488	5,345	6,686	20,214	27,743
48,700 58/42 opt1	4,270	2,980	5,924	17,955	28,639
48,700 50/50 opt2d	3,488	3,420	6,217	18,997	26,731
48,700 50/50 opt2a	4,529	4,586	7,788	20,559	29,594
48,700 50/50 opt1	5,499	4,116	7,106	18,856	29,053
29,300 70/30 opt2d	8,885	8,145	11,597	24,021	36,664
29,300 70/30 opt2a	7,669	7,533	11,144	23,852	33,683
29,300 70/30 opt1	9,043	8,466	12,385	24,699	35,266
29,300 58/42 opt2d	9,807	8,870	12,597	24,150	36,190
29,300 58/42 opt2a	9,405	9,146	13,408	23,545	36,228
29,300 58/42 opt1	9,834	10,056	13,398	25,577	35,541
29,300 50/50 opt2d	9,793	9,610	13,840	25,435	37,272
29,300 50/50 opt2a	10,237	9,510	13,413	24,066	36,364
29,300 50/50 opt1	11,273	10,713	14,899	26,037	37,492

Note: Shading indicates Alternative 2 scenarios that are most similar to Alternatives 4 and 5.

Table 5-60 Hypothetical reduction in region-specific adult equivalent Chinook salmon bycatch mortality under each cap and management option for **Yukon** stocks by year **2003-2007.** Values are based on median AEQ values and mean proportions regional assignments within strata (A-season, and NW and SE B seasons) genetics data collected from 2005–2007. Note that the median estimated adult equivalent bycatch levels are given in the second row.

Yukon	2003	2004	2005	2006	2007
No Cap	**8,484**	**9,180**	**10,990**	**14,887**	**18,306**
Alt 5 AS1	-54	645	1,718	3,586	5,396
Alt 5 AS2	-61	463	1,944	5,921	8,840
Alt 4 AS1	-329	591	1,952	3,409	5,228
Alt 4 AS2	-61	463	1,944	5,921	8,840
Alt 2Cap, AB, sector					
87,500 70/30 opt2d	561	-2	1,267	2,107	3,299
87,500 70/30 opt2a	421	691	819	1,861	4,092
87,500 70/30 opt1	468	353	2,017	3,581	4,697
87,500 58/42 opt2d	106	182	448	3,524	4,796
87,500 58/42 opt2a	478	-29	-1	1,223	3,826
87,500 58/42 opt1	498	340	1,244	3,774	5,184
87,500 50/50 opt2d	409	574	373	2,597	5,367
87,500 50/50 opt2a	1,096	555	1,452	2,588	4,915
87,500 50/50 opt1	161	400	837	4,718	7,531
68,100 70/30 opt2d	254	787	1,704	4,388	6,586
68,100 70/30 opt2a	1,128	1,176	2,167	3,012	5,770
68,100 70/30 opt1	211	537	1,910	4,615	7,242
68,100 58/42 opt2d	501	242	1,588	4,454	7,923
68,100 58/42 opt2a	1,422	526	1,229	3,780	7,090
68,100 58/42 opt1	366	640	1,621	5,772	8,761
68,100 50/50 opt2d	1,118	723	1,475	5,415	9,092
68,100 50/50 opt2a	1,073	954	1,614	4,824	6,253
68,100 50/50 opt1	572	184	1,654	5,810	9,512
48,700 70/30 opt2d	1,390	1,032	2,833	7,070	11,154
48,700 70/30 opt2a	1,287	1,522	3,236	6,405	9,146
48,700 70/30 opt1	974	768	2,555	6,638	10,711
48,700 58/42 opt2d	1,466	1,093	2,307	7,247	10,434
48,700 58/42 opt2a	1,921	2,342	2,806	8,068	11,230
48,700 58/42 opt1	1,831	1,345	2,696	7,239	11,508
48,700 50/50 opt2d	1,445	1,489	2,675	7,682	10,823
48,700 50/50 opt2a	1,880	1,892	3,314	8,236	12,058
48,700 50/50 opt1	2,348	1,770	3,034	7,585	11,736
29,300 70/30 opt2d	3,690	3,469	4,989	9,786	14,938
29,300 70/30 opt2a	3,170	3,185	4,796	9,689	13,870
29,300 70/30 opt1	3,794	3,589	5,303	10,034	14,463
29,300 58/42 opt2d	4,046	3,789	5,316	9,782	14,686
29,300 58/42 opt2a	3,892	3,869	5,767	9,424	14,719
29,300 58/42 opt1	4,062	4,245	5,723	10,400	14,546
29,300 50/50 opt2d	4,027	3,989	5,871	10,264	15,213
29,300 50/50 opt2a	4,284	3,938	5,636	9,659	14,814
29,300 50/50 opt1	4,676	4,531	6,309	10,522	15,332

Note: Shading indicates Alternative 2 scenarios that are most similar to Alternatives 4 and 5.

Table 5-61 Hypothetical reduction in region-specific adult equivalent Chinook salmon bycatch mortality under each cap and management option for **Kuskokwim** stocks by year **2003-2007.** Values are based on median AEQ values and mean proportions regional assignments within strata (A-season, and NW and SE B seasons) genetics data collected from 2005–2007. Note that the median estimated adult equivalent bycatch levels are given in the second row.

Kuskokwim	2003	2004	2005	2006	2007
No Cap	**5,514**	**5,967**	**7,144**	**9,677**	**11,899**
Alt 5 AS1	-36	419	1,117	2,331	3,507
Alt 5 AS2	-40	301	1,264	3,849	5,746
Alt 4 AS1	-214	384	1,269	2,217	3,398
Alt 4 AS2	-40	301	1,264	3,849	5,746
Alt 2Cap, AB, sector					
87,500 70/30 opt2d	365	-1	824	1,369	2,144
87,500 70/30 opt2a	274	449	532	1,210	2,660
87,500 70/30 opt1	304	229	1,311	2,328	3,053
87,500 58/42 opt2d	69	118	291	2,291	3,117
87,500 58/42 opt2a	310	-19	-1	795	2,487
87,500 58/42 opt1	324	221	808	2,453	3,369
87,500 50/50 opt2d	266	373	243	1,688	3,488
87,500 50/50 opt2a	712	361	944	1,682	3,195
87,500 50/50 opt1	104	260	544	3,067	4,895
68,100 70/30 opt2d	165	512	1,108	2,852	4,281
68,100 70/30 opt2a	733	764	1,409	1,958	3,750
68,100 70/30 opt1	137	349	1,242	3,000	4,707
68,100 58/42 opt2d	326	157	1,032	2,895	5,150
68,100 58/42 opt2a	925	342	799	2,457	4,609
68,100 58/42 opt1	238	416	1,054	3,751	5,694
68,100 50/50 opt2d	727	470	959	3,520	5,910
68,100 50/50 opt2a	698	620	1,049	3,136	4,064
68,100 50/50 opt1	372	119	1,075	3,776	6,183
48,700 70/30 opt2d	904	671	1,841	4,595	7,250
48,700 70/30 opt2a	837	989	2,103	4,163	5,945
48,700 70/30 opt1	633	499	1,661	4,314	6,962
48,700 58/42 opt2d	953	710	1,499	4,710	6,782
48,700 58/42 opt2a	1,249	1,522	1,824	5,244	7,299
48,700 58/42 opt1	1,190	875	1,753	4,705	7,480
48,700 50/50 opt2d	939	968	1,739	4,994	7,035
48,700 50/50 opt2a	1,222	1,230	2,154	5,353	7,838
48,700 50/50 opt1	1,526	1,150	1,972	4,930	7,628
29,300 70/30 opt2d	2,399	2,255	3,243	6,361	9,710
29,300 70/30 opt2a	2,061	2,071	3,117	6,298	9,016
29,300 70/30 opt1	2,466	2,333	3,447	6,522	9,401
29,300 58/42 opt2d	2,630	2,463	3,455	6,358	9,546
29,300 58/42 opt2a	2,530	2,515	3,749	6,126	9,567
29,300 58/42 opt1	2,640	2,759	3,720	6,760	9,455
29,300 50/50 opt2d	2,617	2,593	3,816	6,672	9,888
29,300 50/50 opt2a	2,784	2,560	3,664	6,279	9,629
29,300 50/50 opt1	3,040	2,945	4,101	6,839	9,966

Note: Shading indicates Alternative 2 scenarios that are most similar to Alternatives 4 and 5.

Table 5-62 Hypothetical reduction in region-specific adult equivalent Chinook salmon bycatch mortality under each cap and management option for **Bristol Bay** stocks by year **2003-2007.** Values are based on median AEQ values and mean proportions regional assignments within strata (A-season, and NW and SE B seasons) genetics data collected from 2005–2007. Note that the median estimated adult equivalent bycatch levels are given in the second row.

Bristol Bay	2003	2004	2005	2006	2007
No Cap	**7,211**	**7,803**	**9,342**	**12,654**	**15,560**
Alt 5 AS1	-47	548	1,461	3,048	4,586
Alt 5 AS2	-52	394	1,653	5,033	7,514
Alt 4 AS1	-280	503	1,659	2,898	4,444
Alt 4 AS2	-52	394	1,653	5,033	7,514
Alt 2Cap, AB, sector					
87,500 70/30 opt2d	477	-1	1,077	1,791	2,804
87,500 70/30 opt2a	358	587	696	1,582	3,478
87,500 70/30 opt1	398	300	1,714	3,044	3,993
87,500 58/42 opt2d	90	155	381	2,996	4,076
87,500 58/42 opt2a	406	-24	-1	1,039	3,252
87,500 58/42 opt1	424	289	1,057	3,207	4,406
87,500 50/50 opt2d	348	488	317	2,207	4,562
87,500 50/50 opt2a	932	472	1,235	2,200	4,178
87,500 50/50 opt1	136	340	712	4,011	6,401
68,100 70/30 opt2d	216	669	1,448	3,730	5,598
68,100 70/30 opt2a	959	999	1,842	2,561	4,904
68,100 70/30 opt1	180	456	1,624	3,923	6,155
68,100 58/42 opt2d	426	205	1,350	3,786	6,735
68,100 58/42 opt2a	1,209	447	1,045	3,213	6,027
68,100 58/42 opt1	311	544	1,378	4,906	7,447
68,100 50/50 opt2d	950	615	1,254	4,603	7,728
68,100 50/50 opt2a	912	811	1,372	4,101	5,315
68,100 50/50 opt1	487	156	1,406	4,938	8,085
48,700 70/30 opt2d	1,182	877	2,408	6,009	9,481
48,700 70/30 opt2a	1,094	1,294	2,750	5,444	7,774
48,700 70/30 opt1	828	653	2,172	5,642	9,105
48,700 58/42 opt2d	1,246	929	1,961	6,160	8,869
48,700 58/42 opt2a	1,633	1,991	2,385	6,858	9,545
48,700 58/42 opt1	1,557	1,144	2,292	6,153	9,782
48,700 50/50 opt2d	1,228	1,266	2,274	6,530	9,199
48,700 50/50 opt2a	1,598	1,608	2,817	7,000	10,250
48,700 50/50 opt1	1,996	1,504	2,579	6,447	9,976
29,300 70/30 opt2d	3,137	2,948	4,241	8,318	12,697
29,300 70/30 opt2a	2,695	2,708	4,077	8,235	11,790
29,300 70/30 opt1	3,225	3,051	4,507	8,529	12,294
29,300 58/42 opt2d	3,439	3,221	4,518	8,314	12,483
29,300 58/42 opt2a	3,308	3,289	4,902	8,010	12,511
29,300 58/42 opt1	3,452	3,608	4,865	8,840	12,364
29,300 50/50 opt2d	3,423	3,391	4,990	8,724	12,931
29,300 50/50 opt2a	3,641	3,347	4,791	8,210	12,592
29,300 50/50 opt1	3,975	3,851	5,363	8,944	13,032

Note: Shading indicates Alternative 2 scenarios that are most similar to Alternatives 4 and 5.

Table 5-63 Hypothetical reduction in region-specific adult equivalent Chinook salmon bycatch mortality under each cap and management option for **Cook Inlet stocks** by year **2003-2007.** Values are based on median AEQ values and mean proportions regional assignments within strata (A-season, and NW and SE B seasons) genetics data collected from 2005–2007. Note that the median estimated adult equivalent bycatch levels are given in the second row.

Cook Inlet	**2003**	**2004**	**2005**	**2006**	**2007**
No Cap	431	1,063	1,223	943	1,639
Alt 5 AS1	9	88	300	198	912
Alt 5 AS2	19	302	618	389	1099
Alt 4 AS1	7	83	243	206	908
Alt 4 AS2	19	302	618	389	1099
Alt 2Cap, AB, sector					
87,500 70/30 opt2d	-60	7	574	463	1,010
87,500 70/30 opt2a	-49	1,356	620	384	926
87,500 70/30 opt1	-46	661	617	516	1,035
87,500 58/42 opt2d	-21	357	393	152	847
87,500 58/42 opt2a	-34	70	256	92	549
87,500 58/42 opt1	-62	670	594	327	853
87,500 50/50 opt2d	-51	1,074	364	117	613
87,500 50/50 opt2a	-77	1,270	85	133	593
87,500 50/50 opt1	-18	773	356	85	800
68,100 70/30 opt2d	-26	1,513	675	503	1,071
68,100 70/30 opt2a	-19	2,595	530	509	1,084
68,100 70/30 opt1	-16	988	724	537	1,113
68,100 58/42 opt2d	-46	587	571	339	783
68,100 58/42 opt2a	-83	1,392	422	240	829
68,100 58/42 opt1	-44	1,207	581	392	982
68,100 50/50 opt2d	-78	1,643	296	122	797
68,100 50/50 opt2a	-48	2,297	352	45	785
68,100 50/50 opt1	-51	448	537	365	939
48,700 70/30 opt2d	-24	2,253	695	585	1,209
48,700 70/30 opt2a	24	3,515	720	497	1,212
48,700 70/30 opt1	33	1,687	761	597	1,274
48,700 58/42 opt2d	-96	2,537	680	433	1,134
48,700 58/42 opt2a	-53	5,345	635	354	1,160
48,700 58/42 opt1	-86	2,980	686	490	1,139
48,700 50/50 opt2d	-54	3,420	575	307	1,046
48,700 50/50 opt2a	-13	4,586	593	252	905
48,700 50/50 opt1	-107	4,116	682	446	978
29,300 70/30 opt2d	158	8,145	932	664	1,284
29,300 70/30 opt2a	128	7,533	919	662	1,421
29,300 70/30 opt1	153	8,466	934	692	1,357
29,300 58/42 opt2d	30	8,870	804	613	1,141
29,300 58/42 opt2a	54	9,146	780	602	1,146
29,300 58/42 opt1	103	10,056	847	643	1,328
29,300 50/50 opt2d	7	9,610	749	582	1,132
29,300 50/50 opt2a	-15	9,510	764	525	1,047
29,300 50/50 opt1	21	10,713	771	616	1,210

Note: Shading indicates Alternative 2 scenarios that are most similar to Alternatives 4 and 5.

Table 5-64 Hypothetical reduction in region-specific adult equivalent Chinook salmon bycatch mortality under each cap and management option for **Transboundary** (TBR) stocks by year **2003-2007.** Values are based on median AEQ values and mean proportions regional assignments within strata (A-season, and NW and SE B seasons) genetics data collected from 2005–2007. Note that the median estimated adult equivalent bycatch levels are given in the second row.

TBR	2003	2004	2005	2006	2007
No Cap	322	732	841	689	1,152
Alt 5 AS1	6	56	196	148	617
Alt 5 AS2	14	195	405	284	755
Alt 4 AS1	5	53	160	152	613
Alt 4 AS2	14	195	405	284	755
Alt 2Cap, AB, sector					
87,500 70/30 opt2d	-38	187	374	311	670
87,500 70/30 opt2a	-31	96	403	260	620
87,500 70/30 opt1	-29	203	404	353	694
87,500 58/42 opt2d	-14	60	255	118	575
87,500 58/42 opt2a	-20	50	165	69	376
87,500 58/42 opt1	-39	157	387	233	580
87,500 50/50 opt2d	-32	-45	235	93	427
87,500 50/50 opt2a	-45	33	60	105	413
87,500 50/50 opt1	-12	46	232	83	558
68,100 70/30 opt2d	-16	203	441	349	725
68,100 70/30 opt2a	-7	226	349	347	730
68,100 70/30 opt1	-10	245	473	372	756
68,100 58/42 opt2d	-27	191	373	245	548
68,100 58/42 opt2a	-47	148	278	180	574
68,100 58/42 opt1	-28	182	381	287	681
68,100 50/50 opt2d	-45	95	195	112	564
68,100 50/50 opt2a	-25	45	233	57	547
68,100 50/50 opt1	-31	187	351	269	657
48,700 70/30 opt2d	-9	327	458	417	838
48,700 70/30 opt2a	22	348	477	356	831
48,700 70/30 opt1	25	377	499	422	878
48,700 58/42 opt2d	-55	277	447	321	789
48,700 58/42 opt2a	-25	217	422	275	809
48,700 58/42 opt1	-47	295	451	357	799
48,700 50/50 opt2d	-27	200	382	241	734
48,700 50/50 opt2a	2	258	397	210	649
48,700 50/50 opt1	-58	256	453	331	696
29,300 70/30 opt2d	121	519	623	481	909
29,300 70/30 opt2a	99	488	614	480	989
29,300 70/30 opt1	117	494	626	501	952
29,300 58/42 opt2d	41	392	543	450	816
29,300 58/42 opt2a	55	394	529	442	819
29,300 58/42 opt1	88	429	572	472	934
29,300 50/50 opt2d	26	385	511	433	812
29,300 50/50 opt2a	12	405	520	394	756
29,300 50/50 opt1	38	413	527	456	862

Note: Shading indicates Alternative 2 scenarios that are most similar to Alternatives 4 and 5.

Table 5-65 Hypothetical reduction in region-specific adult equivalent Chinook salmon bycatch mortality under each cap and management option for **Pacific Northwest stocks** by year **2003-2007.** Values are based on median AEQ values and mean proportions regional assignments within strata (A-season, and NW and SE B seasons) genetics data collected from 2005–2007. Note that the median estimated adult equivalent bycatch levels are given in the second row.

PNW	**2003**	**2004**	**2005**	**2006**	**2007**
No Cap	5,828	10,446	11,232	12,712	18,185
Alt 5 AS1	-60	764	2,189	2,802	8,444
Alt 5 AS2	81	2,360	4,410	5,165	10,987
Alt 4 AS1	-91	711	1,825	2,737	8,410
Alt 4 AS2	81	2,360	4,410	5,165	10,987
Alt 2Cap, AB, sector					
87,500 70/30 opt2d	-951	2,215	4,064	4,805	9,581
87,500 70/30 opt2a	-784	544	4,806	4,561	9,385
87,500 70/30 opt1	-730	2,009	3,887	5,724	10,355
87,500 58/42 opt2d	-330	553	2,970	2,897	9,336
87,500 58/42 opt2a	-268	909	2,212	2,160	6,167
87,500 58/42 opt1	-966	1,555	4,347	4,473	9,230
87,500 50/50 opt2d	-719	-1,126	2,602	3,264	7,920
87,500 50/50 opt2a	-609	349	15	4,105	7,951
87,500 50/50 opt1	-290	177	2,361	3,098	9,453
68,100 70/30 opt2d	-485	1,641	4,769	5,969	10,667
68,100 70/30 opt2a	-93	2,341	3,334	6,210	10,613
68,100 70/30 opt1	-253	2,260	4,968	6,031	11,054
68,100 58/42 opt2d	-472	2,296	3,946	5,371	8,944
68,100 58/42 opt2a	-771	2,142	3,514	4,850	9,344
68,100 58/42 opt1	-690	1,482	4,094	6,190	10,887
68,100 50/50 opt2d	-665	1,042	1,490	4,514	10,037
68,100 50/50 opt2a	-97	730	2,633	2,799	10,866
68,100 50/50 opt1	-599	2,243	3,452	5,797	10,974
48,700 70/30 opt2d	-130	3,504	4,521	7,737	12,997
48,700 70/30 opt2a	424	4,047	5,322	6,505	12,951
48,700 70/30 opt1	162	4,195	5,165	7,512	13,227
48,700 58/42 opt2d	-851	3,255	5,039	6,784	13,073
48,700 58/42 opt2a	-199	2,353	5,381	6,825	13,559
48,700 58/42 opt1	-478	3,131	4,522	6,980	14,035
48,700 50/50 opt2d	13	2,275	4,523	5,659	12,511
48,700 50/50 opt2a	433	3,502	4,914	5,957	11,521
48,700 50/50 opt1	-531	3,035	5,485	6,910	12,560
29,300 70/30 opt2d	2,216	6,328	7,386	8,831	15,507
29,300 70/30 opt2a	1,929	6,071	7,266	8,949	15,241
29,300 70/30 opt1	1,978	6,141	7,570	9,306	15,306
29,300 58/42 opt2d	1,506	4,812	7,030	8,790	14,686
29,300 58/42 opt2a	1,568	5,049	6,308	9,227	14,632
29,300 58/42 opt1	2,034	5,549	7,030	9,035	15,299
29,300 50/50 opt2d	1,408	5,383	6,547	8,991	14,310
29,300 50/50 opt2a	888	5,654	6,930	8,607	13,690
29,300 50/50 opt1	1,490	5,349	6,841	9,271	14,766

Note: Shading indicates Alternative 2 scenarios that are most similar to Alternatives 4 and 5.

5.3.6 Alternative 3 impacts

Alternative 3 establishes a salmon bycatch cap, and closes a candidate large scale area (A and B season) when cap levels are reached (i.e., rather than closing the whole fishery). The proposed cap for Alternative 3 includes the same combination of options as described for Alternative 2.

Historically since 1991, this A-season area has comprised between 72-100% of the bycatch in this time period (Table 5-66). Further break-outs show the relative bycatch in the non-CDQ fleets by sector over that time period and the CDQ fleets by sector over that time period (Table 5-67 and Table 5-68).

Table 5-66 Chinook salmon, in numbers of fish, taken as bycatch in the combined (CDQ and non-CDQ) pollock fishery during the A-season, by sector, inside and outside of the proposed closure area

Year	Outside of A-season area			Outside	Inside of A-season area			Inside	Total	Percent
	M	CP	CV	Subtotal	M	CP	CV	Subtotal		Inside
1991	18	3,323	58	3,400	8,727	13,944	10,014	32,685	36,084	91%
1992	186	3,222	9	3,417	3,043	6,546	6,383	15,972	19,390	82%
1993	0	62	3	64	3,442	8,581	3,028	15,050	15,115	100%
1994	0	1,533	17	1,550	1,777	15,422	8,347	25,547	27,096	94%
1995	30	189	5	224	939	5,782	2,031	8,752	8,976	98%
1996	111	700	259	1,070	5,358	14,577	14,995	34,930	36,000	97%
1997	32	73	12	117	1,445	3,765	4,942	10,151	10,268	99%
1998	0	1	39	40	4,284	6,636	4,315	15,234	15,274	100%
1999	15	20	66	101	539	2,673	2,558	5,771	5,872	98%
2000	4	102	0	106	15	2,421	867	3,303	3,408	97%
2001	694	2,310	2,174	5,178	970	5,954	6,320	13,245	18,423	72%
2002	174	1,153	489	1,817	1,802	8,327	9,816	19,946	21,763	92%
2003	836	3,119	3,639	7,594	2,030	11,286	12,668	25,985	33,578	77%
2004	564	2,141	1,328	4,033	1,528	7,350	11,045	19,923	23,955	83%
2005	435	1,339	1,084	2,858	1,677	10,082	12,995	24,753	27,612	90%
2006	40	291	449	780	5,369	16,935	35,531	57,835	58,615	99%
2007	290	981	930	2,200	5,719	27,024	34,528	67,271	69,471	97%
Average 1991-2007	214	1,209	621	2,032	2,863	9,841	10,611	23,315	25,347	92%
Average 2000-2007	379	1,430	1,262	3,071	2,389	11,172	15,471	29,033	32,103	90%

Table 5-67 Chinook salmon, in numbers of fish, taken as bycatch in the non-CDQ pollock fishery during the A-season, by sector, inside and outside of proposed closure areas

Year	Outside of A-season area			Outside	Inside of A-season area			Inside	Total	Percent
	M	CP	CV	Subtotal	M	CP	CV	Subtotal		Inside
1991	18	3,323	58	3,400	8,727	13,944	10,014	32,685	36,084	91%
1992	186	3,222	9	3,417	3,043	6,546	6,383	15,972	19,390	82%
1993	0	62	3	64	3,442	8,581	3,028	15,050	15,115	100%
1994	0	1,533	17	1,550	1,777	15,422	8,347	25,547	27,096	94%
1995	30	171	5	206	611	5,230	1,877	7,718	7,925	97%
1996	111	524	62	697	5,195	14,092	13,870	33,157	33,854	98%
1997	32	73	12	117	1,200	2,807	4,692	8,699	8,815	99%
1998	0	0	39	39	4,270	6,082	4,300	14,652	14,690	100%
1999	15	20	66	101	303	2,288	2,554	5,145	5,246	98%
2000	0	92	0	92	2	2,008	867	2,878	2,970	97%
2001	661	2,130	2,174	4,966	749	4,585	6,320	11,654	16,620	70%
2002	150	834	489	1,474	1,496	7,253	9,816	18,565	20,039	93%
2003	667	2,583	3,639	6,890	1,827	10,284	12,668	24,779	31,669	78%
2004	405	1,752	1,328	3,484	1,438	6,821	11,045	19,304	22,788	85%
2005	326	1,165	1,084	2,575	1,533	9,216	12,995	23,743	26,318	90%
2006	37	222	449	708	4,600	15,972	35,531	56,103	56,811	99%
2007	278	815	930	2,022	4,347	24,940	34,528	63,815	65,837	97%
Average 1991-2007	182	1,090	610	1,871	2,621	9,181	10,520	22,322	24,192	92%
Average 2000-2007	316	1,199	1,262	2,776	1,999	10,135	15,471	27,605	30,381	91%

Table 5-68 Chinook salmon, in numbers of fish, taken as bycatch in the CDQ pollock fishery during the A-season, by sector, inside and outside of proposed closure areas

Year	Outside of A-season area			Outside	Inside of A-season area			Inside	Total	Percent
	M	CP	CV	Subtotal	M	CP	CV	Subtotal		Inside
1995		18		18	328	552	154	1,034	1,051	98%
1996	0	175	197	373	163	485	1,126	1,774	2,146	83%
1997		0		0	245	958	249	1,453	1,453	100%
1998		1	0	1	13	554	15	583	584	100%
1999	0	0		0	236	385	5	625	625	100%
2000	4	10		14	13	413		425	439	97%
2001	32	181		213	221	1,369		1,590	1,803	88%
2002	24	319		343	306	1,074		1,381	1,724	80%
2003	169	535		704	203	1,003		1,206	1,910	63%
2004	160	389		548	90	529		619	1,167	53%
2005	109	175		284	144	866		1,010	1,294	78%
2006	2	70		72	769	964		1,732	1,804	96%
2007	12	166		178	1,372	2,085		3,457	3,634	95%
Average 1995-2007	51	157	99	211	316	864	310	1,299	1,510	86%
Average 2000-2007	64	230		294	390	1,038		1,427	1,722	83%

The B-season closure areas are also proposed based on regions where 90% of the bycatch, on average, has occurred from 2000-2007. Since 1991, with the exception of 2000, when there was an injunction on the fishery, these areas have comprised between 68-98% of the Chinook bycatch in the B season (Table 5-69). Further break-outs show the relative bycatch in the non-CDQ fleets by sector over that time period and the CDQ fleets by sector over that time period (Table 5-70 and Table 5-71).

Table 5-69 Chinook salmon, in numbers of fish, taken as bycatch in the combined (CDQ and non-CDQ) pollock fishery during the B-season, by sector, inside and outside of proposed closure areas

Year	Outside of B-season areas			Outside	Inside of B-season areas			Inside	Total	Percent
	M	CP	CV	Subtotal	M	CP	CV	Subtotal		Inside
1991	30	80	80	190	87	291	1,059	1,438	1,628	88%
1992	0	92	11	103	1,509	6,746	1,549	9,804	9,907	99%
1993	83	2,365	70	2,517	6,417	9,460	2,546	18,423	20,941	88%
1994	164	1,214	107	1,486	402	1,585	1,108	3,095	4,581	68%
1995	70	330	16	416	582	1,128	750	2,460	2,877	86%
1996	1,164	1,506	644	3,314	4,950	1,705	9,294	15,950	19,264	83%
1997	2,117	3,917	1,849	7,883	3,405	1,804	20,681	25,891	33,774	77%
1998	1,341	2,294	1,825	5,460	5,040	1,567	25,582	32,188	37,648	85%
1999	38	725	773	1,537	336	1,862	1,686	3,883	5,420	72%
2000	246	401	392	1,039	0	157	220	377	1,416	27%
2001	5	895	19	918	1,314	8,963	3,738	14,015	14,933	94%
2002	74	95	31	200	1,675	1,291	9,021	11,986	12,186	98%
2003	598	1,422	354	2,375	1,339	2,621	6,778	10,738	13,113	82%
2004	995	1,759	1,393	4,147	1,131	2,530	22,182	25,843	29,990	86%
2005	720	2,466	1,552	4,738	145	1,840	31,471	33,456	38,194	88%
2006	160	619	854	1,633	41	931	21,427	22,399	24,033	93%
2007	958	1,577	1,017	3,553	2,585	5,383	40,697	48,665	52,218	93%
Average 1991-2007	516	1,280	646	2,442	1,821	2,933	11,752	16,507	18,948	87%
Average 2000-2007	470	1,154	702	2,325	1,029	2,965	16,942	20,935	23,260	90%

Table 5-70 Chinook salmon, in numbers of fish, taken as bycatch in the non-CDQ pollock fishery during the B-season, by sector, inside and outside of proposed closure areas

Year	Outside of B-season areas			Outside	Inside of B-season areas			Inside	Total	Percent
	M	CP	CV	Subtotal	M	CP	CV	Subtotal		Inside
1991	30	80	80	190	87	291	1,059	1,438	1,628	88%
1992	0	92	11	103	1,509	6,746	1,549	9,804	9,907	99%
1993	83	2,365	70	2,517	6,417	9,460	2,546	18,423	20,941	88%
1994	164	1,214	107	1,486	402	1,585	1,108	3,095	4,581	68%
1995	66	173	16	254	551	371	746	1,668	1,922	87%
1996	1,164	1,451	644	3,260	4,669	217	9,225	14,111	17,371	81%
1997	2,117	3,701	1,849	7,668	1,367	1,576	20,579	23,522	31,190	75%
1998	704	1,858	1,804	4,366	3,791	221	25,325	29,338	33,704	87%
1999	15	658	773	1,446	48	1,184	1,657	2,889	4,336	67%
2000	169	316	302	787	0	117	192	310	1,097	28%
2001	0	861	19	880	813	8,817	3,738	13,368	14,248	94%
2002	74	69	31	175	1,530	815	9,021	11,366	11,540	98%
2003	573	1,156	354	2,083	1,259	2,104	6,778	10,140	12,224	83%
2004	827	905	1,393	3,124	1,122	1,706	22,182	25,011	28,135	89%
2005	551	2,165	1,552	4,268	138	1,757	31,471	33,366	37,634	89%
2006	137	537	854	1,528	27	893	21,427	22,348	23,876	94%
2007	753	1,520	1,017	3,290	1,110	4,611	40,697	46,418	49,707	93%
Average 1991-2007	437	1,125	640	2,201	1,461	2,498	11,724	15,683	17,885	88%
Average 2000-2007	385	941	690	2,017	750	2,603	16,938	20,291	22,308	91%

Table 5-71 Chinook salmon, in numbers of fish, taken as bycatch in the CDQ pollock fishery during the B-season, by sector, inside and outside of proposed closure areas

Year	Outside of B-season areas M	CP	CV	Outside Subtotal	Inside of B-season areas M	CP	CV	Inside Subtotal	Total	Percent Inside
1995	31	758	4	792	5	158	0	163	955	17%
1996	281	1,488	69	1,838		54		54	1,893	3%
1997	2,038	228	102	2,369		215		215	2,584	8%
1998	1,248	1,346	256	2,850	637	436	21	1,094	3,945	28%
1999	287	678	28	994	23	68		91	1,085	8%
2000	0	40	28	67	77	85	91	252	319	79%
2001	501	146		647	5	34		38	685	6%
2002	145	476		621	0	25		25	646	4%
2003	80	517		598	25	267		291	889	33%
2004	9	824		833	169	854		1,023	1,855	55%
2005	7	83		90	169	301		470	560	84%
2006	14	38		52	23	82		105	157	67%
2007	1,475	772		2,248	205	58		263	2,511	10%
Average 1991-2007	471	569	81	1,077	122	203	37	314	1,391	23%
Average 2000-2007	279	362	28	644	84	213	91	308	953	32%

Analysis of triggered closure impacts focuses on the historical timing and relative impact of reaching the trigger levels under consideration, by fishery (CDQ and non-CDQ), and individual sector (CDQ, inshore CV, mothership, and offshore CP) over the time period 2003-2007.

Table 5-72 and Table 5-82 show the dates for 2003-2007 when retrospective analysis shows that each of the cap scenarios would have invoked a triggered closure area, for A and B seasons, respectively. Table 5-73 and Table 5-83 show the expected Chinook bycatch by all vessels combined had the closure been triggered on these dates, while the numbers of reported salmon saved are provided in Table 5-74 and Table 5-84. Analogous values for forgone pollock are provided in Chapter 4 and show the amount of pollock in each season that was caught after the trigger closure would have been in effect. The sector-specific results are provided in Table 5-75 through Table 5-80 (A season) and in Table 5-86 through Table 5-91 (B season). Note that the numbers in these tables reflect only Chinook bycatch taken by the pollock fleet; the numbers of AEQ salmon would be different.

Table 5-72 A-season trigger-closure date scenarios, by year, reflecting when the cap level would have been exceeded in each year.

Cap scenario		CAP	2003	2004	2005	2006	2007
87,500	1-1: 70/30	61,250					6-Mar
	1-2: 58/42	50,750				12-Mar	18-Feb
	1-3: 55/45	48,125				4-Mar	17-Feb
	1-4: 50/50	43,750				25-Feb	16-Feb
68,100	1-1: 70/30	47,670				3-Mar	17-Feb
	1-2: 58/42	39,498				22-Feb	13-Feb
	1-3: 55/45	37,455				21-Feb	12-Feb
	1-4: 50/50	34,050				19-Feb	10-Feb
48,700	1-1: 70/30	34,090				19-Feb	10-Feb
	1-2: 58/42	28,246	12-Mar			12-Feb	6-Feb
	1-3: 55/45	26,785	10-Mar		15-Mar	12-Feb	5-Feb
	1-4: 50/50	24,350	5-Mar		4-Mar	10-Feb	3-Feb
29,300	1-1: 70/30	20,510	22-Feb	14-Mar	26-Feb	7-Feb	31-Jan
	1-2: 58/42	16,994	19-Feb	7-Mar	17-Feb	6-Feb	28-Jan
	1-3: 55/45	16,115	18-Feb	6-Mar	15-Feb	6-Feb	28-Jan
	1-4: 50/50	14,650	16-Feb	2-Mar	14-Feb	6-Feb	28-Jan

Table 5-73 Expected Chinook catch by **all vessels** if A-season trigger-closure was invoked.

Chinook catch				**Sector (All), A season**			
Cap scenario		**CAP**	**2003**	**2004**	**2005**	**2006**	**2007**
87,500	1-1: 70/30	61,250					64,644
	1-2: 58/42	50,750				51,820	57,563
	1-3: 55/45	48,125				49,879	56,055
	1-4: 50/50	43,750				46,517	54,464
68,100	1-1: 70/30	47,670				49,762	56,055
	1-2: 58/42	39,498				43,667	48,078
	1-3: 55/45	37,455				41,877	46,508
	1-4: 50/50	34,050				37,486	44,606
48,700	1-1: 70/30	34,090				37,486	44,606
	1-2: 58/42	28,246	30,755			33,206	40,441
	1-3: 55/45	26,785	30,049		27,529	33,206	37,400
	1-4: 50/50	24,350	27,919		26,734	29,983	36,192
29,300	1-1: 70/30	20,510	26,228	22,140	24,283	26,373	32,572
	1-2: 58/42	16,994	24,011	20,912	22,055	24,226	29,160
	1-3: 55/45	16,115	23,066	20,140	21,242	24,226	29,160
	1-4: 50/50	14,650	22,034	18,732	20,020	24,226	29,160

Table 5-74 Expected Chinook *saved* by **all vessels** if A-season trigger-closure was invoked.

Chinook Salmon saved			**Sector (All), A season**				
Cap scenario		**CAP**	**2003**	**2004**	**2005**	**2006**	**2007**
87,500	1-1: 70/30	61,250					4,827
	1-2: 58/42	50,750				6,795	11,908
	1-3: 55/45	48,125				8,736	13,417
	1-4: 50/50	43,750				12,098	15,008
68,100	1-1: 70/30	47,670				8,853	13,417
	1-2: 58/42	39,498				14,948	21,393
	1-3: 55/45	37,455				16,738	22,964
	1-4: 50/50	34,050				21,129	24,865
48,700	1-1: 70/30	34,090				21,129	24,865
	1-2: 58/42	28,246	2,824			25,409	29,031
	1-3: 55/45	26,785	3,530		83	25,409	32,071
	1-4: 50/50	24,350	5,659		878	28,632	33,279
29,300	1-1: 70/30	20,510	7,351	1,815	3,329	32,243	36,899
	1-2: 58/42	16,994	9,568	3,043	5,556	34,389	40,311
	1-3: 55/45	16,115	10,513	3,815	6,369	34,389	40,311
	1-4: 50/50	14,650	11,545	5,224	7,591	34,389	40,311

Table 5-75 Expected Chinook catch by **at-sea processors** if A-season trigger-closure was invoked.

Chinook catch			**At-sea processors, A season**				
Cap scenario		CAP	**2003**	**2004**	**2005**	**2006**	**2007**
87,500	1-1: 70/30	61,250					25,799
	1-2: 58/42	50,750				13,011	20,624
	1-3: 55/45	48,125				12,179	20,461
	1-4: 50/50	43,750				10,554	20,151
68,100	1-1: 70/30	47,670				12,138	20,461
	1-2: 58/42	39,498				10,115	18,329
	1-3: 55/45	37,455				9,906	17,649
	1-4: 50/50	34,050				9,496	16,977
48,700	1-1: 70/30	34,090				9,496	16,977
	1-2: 58/42	28,246	13,949			8,436	15,717
	1-3: 55/45	26,785	13,743		11,457	8,436	13,616
	1-4: 50/50	24,350	12,887		11,154	7,250	12,364
29,300	1-1: 70/30	20,510	11,888	9,296	9,925	6,369	11,158
	1-2: 58/42	16,994	11,166	8,720	8,750	6,136	10,375
	1-3: 55/45	16,115	10,501	8,594	8,562	6,136	10,375
	1-4: 50/50	14,650	9,639	8,054	8,263	6,136	10,375

Table 5-76 Expected Chinook *saved* by **at-sea processors** if A-season trigger-closure was invoked.

Chinook Salmon saved			**Sector P, A season**				
Cap scenario		**CAP**	**2003**	**2004**	**2005**	**2006**	**2007**
87,500	1-1: 70/30	61,250					2,206
	1-2: 58/42	50,750				4,216	7,381
	1-3: 55/45	48,125				5,048	7,544
	1-4: 50/50	43,750				6,673	7,854
68,100	1-1: 70/30	47,670				5,088	7,544
	1-2: 58/42	39,498				7,112	9,676
	1-3: 55/45	37,455				7,321	10,356
	1-4: 50/50	34,050				7,731	11,028
48,700	1-1: 70/30	34,090				7,731	11,028
	1-2: 58/42	28,246	456			8,791	12,288
	1-3: 55/45	26,785	662		-36	8,791	14,389
	1-4: 50/50	24,350	1,518		268	9,976	15,641
29,300	1-1: 70/30	20,510	2,517	195	1,496	10,858	16,847
	1-2: 58/42	16,994	3,239	771	2,671	11,091	17,630
	1-3: 55/45	16,115	3,904	897	2,859	11,091	17,630
	1-4: 50/50	14,650	4,766	1,437	3,158	11,091	17,630

Table 5-77 Expected Chinook catch by **inshore catcher vessels** if A-season trigger-closure was invoked.

Chinook catch			**Shore-based catcher vessels, A season**				
Cap scenario		**CAP**	**2003**	**2004**	**2005**	**2006**	**2007**
87,500	1-1: 70/30	61,250					32,912
	1-2: 58/42	50,750				33,619	31,654
	1-3: 55/45	48,125				32,591	30,486
	1-4: 50/50	43,750				31,683	29,393
68,100	1-1: 70/30	47,670				32,516	30,486
	1-2: 58/42	39,498				29,634	25,460
	1-3: 55/45	37,455				28,312	24,681
	1-4: 50/50	34,050				24,634	23,396
48,700	1-1: 70/30	34,090				24,634	23,396
	1-2: 58/42	28,246	14,688			21,728	20,788
	1-3: 55/45	26,785	14,446		13,923	21,728	19,859
	1-4: 50/50	24,350	13,347		13,463	19,747	19,837
29,300	1-1: 70/30	20,510	12,643	10,594	12,330	17,275	17,960
	1-2: 58/42	16,994	11,352	9,979	11,317	16,023	15,701
	1-3: 55/45	16,115	11,125	9,383	10,686	16,023	15,701
	1-4: 50/50	14,650	10,980	8,733	9,776	16,023	15,701

Table 5-78 Expected Chinook *saved* by **inshore catcher vessels** if A-season trigger-closure was invoked.

Chinook Salmon saved			**Sector S, A season**				
Cap scenario		**CAP**	**2003**	**2004**	**2005**	**2006**	**2007**
87,500	1-1: 70/30	61,250					2,546
	1-2: 58/42	50,750				2,362	3,804
	1-3: 55/45	48,125				3,389	4,972
	1-4: 50/50	43,750				4,297	6,065
68,100	1-1: 70/30	47,670				3,464	4,972
	1-2: 58/42	39,498				6,346	9,998
	1-3: 55/45	37,455				7,668	10,777
	1-4: 50/50	34,050				11,346	12,062
48,700	1-1: 70/30	34,090				11,346	12,062
	1-2: 58/42	28,246	1,620			14,252	14,670
	1-3: 55/45	26,785	1,862		156	14,252	15,599
	1-4: 50/50	24,350	2,961		616	16,233	15,621
29,300	1-1: 70/30	20,510	3,664	1,778	1,749	18,705	17,498
	1-2: 58/42	16,994	4,956	2,393	2,763	19,957	19,757
	1-3: 55/45	16,115	5,182	2,989	3,393	19,957	19,757
	1-4: 50/50	14,650	5,327	3,639	4,303	19,957	19,757

Table 5-79 Expected Chinook catch by **mothership operations** if A-season trigger-closure was invoked.

Chinook catch			**Mothership operations, A season**				
Cap scenario		CAP	**2003**	**2004**	**2005**	**2006**	**2007**
87,500	1-1: 70/30	61,250					5,813
	1-2: 58/42	50,750				5,199	5,285
	1-3: 55/45	48,125				5,091	5,099
	1-4: 50/50	43,750				4,210	4,911
68,100	1-1: 70/30	47,670				5,085	5,099
	1-2: 58/42	39,498				3,838	4,284
	1-3: 55/45	37,455				3,575	4,170
	1-4: 50/50	34,050				3,268	4,212
48,700	1-1: 70/30	34,090				3,268	4,212
	1-2: 58/42	28,246	2,556			2,862	3,904
	1-3: 55/45	26,785	2,415		2,143	2,862	3,897
	1-4: 50/50	24,350	2,346		2,083	2,807	3,933
29,300	1-1: 70/30	20,510	2,259	2,125	1,985	2,542	3,388
	1-2: 58/42	16,994	2,127	2,102	1,938	1,912	3,114
	1-3: 55/45	16,115	2,087	2,024	1,933	1,912	3,114
	1-4: 50/50	14,650	2,130	1,823	1,918	1,912	3,114

Table 5-80 Expected Chinook *saved* by **mothership operations** if A-season trigger-closure was invoked.

Chinook Salmon saved Cap scenario		**CAP**	**Sector M, A season 2003**	**2004**	**2005**	**2006**	**2007**
87,500	1-1: 70/30	61,250					195
	1-2: 58/42	50,750				209	724
	1-3: 55/45	48,125				317	909
	1-4: 50/50	43,750				1,198	1,097
68,100	1-1: 70/30	47,670				323	909
	1-2: 58/42	39,498				1,570	1,724
	1-3: 55/45	37,455				1,833	1,839
	1-4: 50/50	34,050				2,140	1,796
48,700	1-1: 70/30	34,090				2,140	1,796
	1-2: 58/42	28,246	310			2,546	2,105
	1-3: 55/45	26,785	451		-32	2,546	2,111
	1-4: 50/50	24,350	520		28	2,601	2,075
29,300	1-1: 70/30	20,510	607	-33	126	2,866	2,621
	1-2: 58/42	16,994	739	-10	173	3,497	2,894
	1-3: 55/45	16,115	779	67	178	3,497	2,894
	1-4: 50/50	14,650	736	269	193	3,497	2,894

Table 5-81 Remaining pollock catch estimated from **mothership operations** at the time A-season trigger-closures were invoked.

Pollock Cap scenario		CAP	**Mothership operations, A season 2003**	**2004**	**2005**	**2006**	**2007**
87,500	1-1: 70/30	61,250					8,566
	1-2: 58/42	50,750				4,425	21,811
	1-3: 55/45	48,125				8,149	23,280
	1-4: 50/50	43,750				15,074	24,711
68,100	1-1: 70/30	47,670				8,906	23,280
	1-2: 58/42	39,498				19,132	29,234
	1-3: 55/45	37,455				20,506	29,952
	1-4: 50/50	34,050				23,460	31,071
48,700	1-1: 70/30	34,090				23,460	31,071
	1-2: 58/42	28,246	7,416			29,722	33,893
	1-3: 55/45	26,785	8,263		815	29,722	34,800
	1-4: 50/50	24,350	11,161		9,346	32,553	36,592
29,300	1-1: 70/30	20,510	21,057	3,391	15,615	36,336	40,955
	1-2: 58/42	16,994	23,311	7,723	24,724	36,411	44,201
	1-3: 55/45	16,115	23,827	8,516	26,715	36,411	44,201
	1-4: 50/50	14,650	24,295	12,770	27,587	36,411	44,201

Table 5-82 B-season trigger-closure date scenarios by year reflecting when the cap level would have been exceeded in each year.

Cap scenario		CAP	2003	2004	2005	2006	2007
87,500	1-1: 70/30	26,250		25-Oct	13-Oct		13-Oct
	1-2: 58/42	36,750			30-Oct		26-Oct
	1-3: 55/45	39,375					28-Oct
	1-4: 50/50	43,750					31-Oct
68,100	1-1: 70/30	20,430		12-Oct	7-Oct	22-Oct	9-Oct
	1-2: 58/42	28,602		30-Oct	19-Oct		16-Oct
	1-3: 55/45	30,645			25-Oct		18-Oct
	1-4: 50/50	34,050			28-Oct		23-Oct
48,700	1-1: 70/30	14,610		2-Oct	1-Oct	12-Oct	30-Sep
	1-2: 58/42	20,454		12-Oct	7-Oct	22-Oct	9-Oct
	1-3: 55/45	21,915		14-Oct	9-Oct	26-Oct	10-Oct
	1-4: 50/50	24,350		20-Oct	11-Oct		11-Oct
29,300	1-1: 70/30	8,790	8-Oct	14-Sep	10-Sep	21-Sep	16-Sep
	1-2: 58/42	12,306	14-Oct	27-Sep	24-Sep	3-Oct	23-Sep
	1-3: 55/45	13,185		1-Oct	26-Sep	5-Oct	27-Sep
	1-4: 50/50	14,650		2-Oct	1-Oct	12-Oct	30-Sep

Table 5-83 Expected Chinook catch by **all vessels** if B-season trigger-closure was invoked on the dates provided in Table 5-82.

Chinook catch				Sector (All), B season			
Cap scenario		**CAP**	**2003**	**2004**	**2005**	**2006**	**2007**
87,500	1-1: 70/30	26,250		27,311	26,894		31,896
	1-2: 58/42	36,750			37,455		38,628
	1-3: 55/45	39,375					40,366
	1-4: 50/50	43,750					44,721
68,100	1-1: 70/30	20,430		35,452	22,067	20,670	26,714
	1-2: 58/42	28,602		29,133	29,551		33,038
	1-3: 55/45	30,645			31,013		34,914
	1-4: 50/50	34,050			34,076		37,220
48,700	1-1: 70/30	14,610		20,402	16,811	15,496	21,705
	1-2: 58/42	20,454		35,452	22,067	20,670	26,714
	1-3: 55/45	21,915		33,558	23,481	22,403	28,210
	1-4: 50/50	24,350		28,886	25,582		30,149
29,300	1-1: 70/30	8,790	10,706	13,566	13,113	10,451	15,928
	1-2: 58/42	12,306	13,110	16,131	15,162	13,529	19,126
	1-3: 55/45	13,185		18,270	15,757	13,982	20,982
	1-4: 50/50	14,650		20,402	16,811	15,496	21,705

Table 5-84 Expected Chinook *saved* by **all vessels** if B-season trigger-closure was invoked on the dates provided in Table 5-82.

Chinook saved			**Sector (All), B season**				
Cap scenario		**CAP**	**2003**	**2004**	**2005**	**2006**	**2007**
87,500	1-1: 70/30	26,250		2,680	11,300		20,322
	1-2: 58/42	36,750			739		13,590
	1-3: 55/45	39,375					11,852
	1-4: 50/50	43,750					7,497
68,100	1-1: 70/30	20,430		-5,462	16,127	3,363	25,504
	1-2: 58/42	28,602		858	8,643		19,180
	1-3: 55/45	30,645			7,181		17,304
	1-4: 50/50	34,050			4,119		14,998
48,700	1-1: 70/30	14,610		9,588	21,384	8,537	30,513
	1-2: 58/42	20,454		-5,462	16,127	3,363	25,504
	1-3: 55/45	21,915		-3,568	14,713	1,630	24,008
	1-4: 50/50	24,350		1,105	12,612		22,069
29,300	1-1: 70/30	8,790	2,406	16,424	25,081	13,582	36,290
	1-2: 58/42	12,306	3	13,859	23,032	10,504	33,092
	1-3: 55/45	13,185		11,721	22,437	10,050	31,236
	1-4: 50/50	14,650		9,588	21,384	8,537	30,513

Table 5-85 Remaining pollock catch estimated from **all vessels** at the time B-season trigger-closures were invoked on the dates provided in Table 5-82.

Cap scenario		CAP	**2003**	**2004**	**2005**	**2006**	**2007**
87,500	1-1: 70/30	26,250		5,380	22,837		71,041
	1-2: 58/42	36,750			648		21,433
	1-3: 55/45	39,375					15,070
	1-4: 50/50	43,750					2,636
68,100	1-1: 70/30	20,430		20,373	34,894	20,338	84,320
	1-2: 58/42	28,602		2,156	14,292		60,036
	1-3: 55/45	30,645			9,693		53,280
	1-4: 50/50	34,050			2,166		31,171
48,700	1-1: 70/30	14,610		39,409	50,710	57,544	111,799
	1-2: 58/42	20,454		20,373	34,894	20,338	84,320
	1-3: 55/45	21,915		15,792	32,648	10,138	80,740
	1-4: 50/50	24,350		8,273	27,731		77,229
29,300	1-1: 70/30	8,790	27,727	138,524	151,247	166,009	152,958
	1-2: 58/42	12,306	12,310	59,879	78,447	96,274	129,625
	1-3: 55/45	13,185		41,154	69,545	87,372	117,657
	1-4: 50/50	14,650		39,409	50,710	57,544	111,799

Table 5-86 Expected Chinook catch by **at-sea processors** if B-season trigger-closure was invoked on the dates provided in Table 5-82.

Chinook catch—at-sea processors			**B season**				
Cap scenario		CAP	**2003**	**2004**	**2005**	**2006**	**2007**
87,500	1-1: 70/30	26,250		-	-		5,426
	1-2: 58/42	36,750			4,306		6,504
	1-3: 55/45	39,375					6,916
	1-4: 50/50	43,750					-
68,100	1-1: 70/30	20,430		-	-	1,552	5,294
	1-2: 58/42	28,602		-	-		5,558
	1-3: 55/45	30,645			4,306		5,879
	1-4: 50/50	34,050			4,306		5,962
48,700	1-1: 70/30	14,610		4,354	4,354	1,510	5,097
	1-2: 58/42	20,454		-	-	1,552	5,294
	1-3: 55/45	21,915		-	-	-	5,296
	1-4: 50/50	24,350		-	-		5,322
29,300	1-1: 70/30	8,790	3,792	4,095	4,143	1,392	3,940
	1-2: 58/42	12,306	-	4,363	4,192	1,447	4,351
	1-3: 55/45	13,185		4,328	4,243	1,449	4,614
	1-4: 50/50	14,650		4,354	4,354	1,510	5,097

Table 5-87 Expected Chinook *saved* by **at-sea processors** if B-season trigger-closure was invoked.

Chinook saved				**Sector P, B season**			
Cap scenario		**CAP**	**2003**	**2004**	**2005**	**2006**	**2007**
87,500	1-1: 70/30	26,250					1,534
	1-2: 58/42	36,750			0		457
	1-3: 55/45	39,375					45
	1-4: 50/50	43,750					
68,100	1-1: 70/30	20,430				-	1,666
	1-2: 58/42	28,602					1,402
	1-3: 55/45	30,645			0		1,082
	1-4: 50/50	34,050			0		998
48,700	1-1: 70/30	14,610		-	-	41	1,863
	1-2: 58/42	20,454		-	-	-	1,666
	1-3: 55/45	21,915		-	-	-	1,664
	1-4: 50/50	24,350		-	-		1,639
29,300	1-1: 70/30	8,790	252	194	163	158	3,020
	1-2: 58/42	12,306	-	-	114	104	2,609
	1-3: 55/45	13,185		-	63	101	2,346
	1-4: 50/50	14,650		-	-	41	1,863

Table 5-88 Expected Chinook catch by **shorebased catcher vessels** if B-season trigger-closure was invoked on the dates provided in Table 5-82.

Chinook catch-shorebased catcher vessels					**B season**		
Cap scenario		CAP	**2003**	**2004**	**2005**	**2006**	**2007**
87,500	1-1: 70/30	26,250			23,053		23,206
	1-2: 58/42	36,750			32,284		
	1-3: 55/45	39,375					
	1-4: 50/50	43,750					-
68,100	1-1: 70/30	20,430		25,890	17,452		18,131
	1-2: 58/42	28,602		-	-		23,807
	1-3: 55/45	30,645			25,842		25,074
	1-4: 50/50	34,050			28,904		-
48,700	1-1: 70/30	14,610		15,383	11,778	13,712	13,612
	1-2: 58/42	20,454		25,890	17,452	-	18,131
	1-3: 55/45	21,915		24,485	18,831	-	19,572
	1-4: 50/50	24,350		22,367	21,042		21,733
29,300	1-1: 70/30	8,790	4,882	9,762	8,315	8,943	13,774
	1-2: 58/42	12,306	7,029	12,646	10,379	11,979	14,365
	1-3: 55/45	13,185		13,686	10,942	12,390	13,432
	1-4: 50/50	14,650		15,383	11,778	13,712	13,612

Table 5-89 Expected Chinook *saved* by **shorebased catcher vessels** if B-season trigger-closure was invoked on the dates provided in Table 5-82.

Chinook saved					**Sector S, B season**		
Cap scenario		**CAP**	**2003**	**2004**	**2005**	**2006**	**2007**
87,500	1-1: 70/30	26,250		-	9,970		18,508
	1-2: 58/42	36,750			739		-
	1-3: 55/45	39,375					-
	1-4: 50/50	43,750					-
68,100	1-1: 70/30	20,430		-	15,570	-	23,583
	1-2: 58/42	28,602		-	-		17,906
	1-3: 55/45	30,645			7,181		16,640
	1-4: 50/50	34,050			4,119		-
48,700	1-1: 70/30	14,610		8,192	21,244	8,570	28,102
	1-2: 58/42	20,454		-	15,570	-	23,583
	1-3: 55/45	21,915		-	14,192	-	22,142
	1-4: 50/50	24,350		1,208	11,981		19,981
29,300	1-1: 70/30	8,790	2,250	13,814	24,708	13,339	27,940
	1-2: 58/42	12,306	103	10,929	22,643	10,302	27,349
	1-3: 55/45	13,185		9,889	22,081	9,891	28,282
	1-4: 50/50	14,650		8,192	21,244	8,570	28,102

Table 5-90 Expected Chinook catch by **mothership operations** if B-season trigger-closure was invoked on the dates provided in Table 5-82.

Chinook catch—mothership operations					**B season**		
Cap scenario		CAP	**2003**	**2004**	**2005**	**2006**	**2007**
87,500	1-1: 70/30	26,250		1,858	871		3,011
	1-2: 58/42	36,750			-		3,613
	1-3: 55/45	39,375					3,614
	1-4: 50/50	43,750					3,564
68,100	1-1: 70/30	20,430		4,005	874	200	2,889
	1-2: 58/42	28,602		-	865		3,205
	1-3: 55/45	30,645			-		3,408
	1-4: 50/50	34,050			-		3,382
48,700	1-1: 70/30	14,610		1,732	861	202	2,352
	1-2: 58/42	20,454		4,005	874	200	2,889
	1-3: 55/45	21,915		3,952	865	200	2,906
	1-4: 50/50	24,350		1,909	925		2,920
29,300	1-1: 70/30	8,790	1,659	1,267	866	201	1,998
	1-2: 58/42	12,306	1,913	1,345	864	200	2,094
	1-3: 55/45	13,185		1,630	860	202	2,282
	1-4: 50/50	14,650		1,732	861	202	2,352

Table 5-91 Expected Chinook *saved* by **mothership operations** if B-season trigger-closure was invoked on the dates provided in Table 5-82.

Chinook saved				**Sector M, B season**			
Cap scenario		**CAP**	**2003**	**2004**	**2005**	**2006**	**2007**
87,500	1-1: 70/30	26,250		268	-		533
	1-2: 58/42	36,750			-		-
	1-3: 55/45	39,375					-
	1-4: 50/50	43,750					-
68,100	1-1: 70/30	20,430		-	-	0	654
	1-2: 58/42	28,602		-	0		339
	1-3: 55/45	30,645			-		136
	1-4: 50/50	34,050			-		161
48,700	1-1: 70/30	14,610		394	4	-	1,192
	1-2: 58/42	20,454		-	-	0	654
	1-3: 55/45	21,915		-	-	0	638
	1-4: 50/50	24,350		218	-		624
29,300	1-1: 70/30	8,790	278	860	-	-	1,546
	1-2: 58/42	12,306	24	781	1	0	1,449
	1-3: 55/45	13,185		496	5	-	1,261
	1-4: 50/50	14,650		394	4	-	1,192

5.4 Considerations of future actions

CEQ regulations require that the analysis of environmental consequences include a discussion of the action's impacts in the context of all other activities (human and natural) that are occurring in the affected environment and impacting the resources being affected by the proposed action and alternatives. This cumulative impact discussion should include incremental impacts of the action when added to past, present, and reasonably foreseeable future actions. Past and present actions affecting the Chinook salmon resource have been incorporated into the impacts discussion above. Section 3.4 provides a detailed discussion of reasonably foreseeable future actions that may affect the Bering Sea pollock fishery, the salmon caught as bycatch in that fishery, and the impacts of salmon bycatch on other resource components analyzed in the EIS.

The reasonable foreseeable future actions that will most impact the western Alaska Chinook salmon stocks are the continuation of the management of the directed commercial, subsistence, and sport fisheries for Chinook salmon and changes to the management of the Bering Sea pollock fishery.

ADF&G is responsible for managing commercial, subsistence, sport, and personal use salmon fisheries. The first priority for management is to meet spawning escapement goals to sustain salmon resources for future generations. Highest priority use is for subsistence under both State and Federal law. Surplus fish beyond escapement needs and subsistence use are made available for other uses. The BOF adopts regulations through a public process to conserve fisheries resources and to allocate fisheries resources to the various users. Yukon River salmon fisheries management includes obligations under an international treaty with Canada. Subsistence fisheries management includes coordination with U.S. Federal government agencies where federal rules apply under ANILCA. Subsistence salmon fisheries are an important culturally and greatly contribute to local economies. Commercial fisheries are also an important contributor to many local communities as well as supporting the subsistence lifestyle. While specific aspects of salmon fishery management continue to be modified, it is reasonably foreseeable that the current State management of the salmon fisheries will continue into the future.

The Council is considering action on management measure to minimize chum salmon bycatch in the Bering Sea pollock fishery. A suite of alternative management measures was proposed in April 2008, and a discussion paper was presented to the Council in October 2008. In December 2008, the Council developed a range of alternatives for analysis. Because any revised chum salmon bycatch measures will also regulate the pollock fishery, there will be a synergistic interaction between the alternatives proposed in this EIS and those considered under the chum salmon action. Analysis has not yet begun on the chum salmon action, but will be underway before this EIS is finalized, and a further discussion of the impact interactions will be included at that time. As with new chum salmon measures, analysis of any new management measures for the pollock fleet would consider the impacts of adding those new measures to the existing suite of management measure for the pollock fleet and analyzing those impacts on non-target species, such as Chinook salmon.

The development and deployment of the salmon excluder devise may reduce Chinook salmon bycatch and improve the fleets ability to harvest the pollock TAC under a hard cap.

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