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**Norton Sound Subdistrict 5 (Shaktoolik) and
Subdistrict 6 (Unalakleet) King Salmon Stock Status
and Action Plan, 2013; a Report to the Alaska Board
of Fisheries**

by

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December 2012

Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries



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TABLE OF CONTENTS

| | Page |
|--|-------------|
| LIST OF TABLES..... | ii |
| LIST OF FIGURES..... | ii |
| ABSTRACT..... | 1 |
| INTRODUCTION..... | 1 |
| Stock Assessment Background..... | 2 |
| Test Fishing..... | 3 |
| Escapement..... | 3 |
| Yield..... | 4 |
| Exploitation Rate..... | 6 |
| STOCK OF CONCERN RECOMMENDATION..... | 7 |
| Outlook..... | 7 |
| Alaska Board of Fisheries Action..... | 7 |
| ESCAPEMENT GOAL EVALUATION..... | 7 |
| MANAGEMENT ACTION PLAN OPTIONS FOR ADDRESSING STOCKS OF CONCERN AS OUTLINED IN THE <i>POLICY FOR THE MANAGEMENT OF SUSTAINABLE SALMON FISHERIES</i> | 8 |
| <i>Norton Sound Subdistricts 5 and 6 King Salmon Management Plan Review/Development</i> | 8 |
| Current Stock Status..... | 8 |
| Customary and Traditional Use Finding and Amount Necessary for Subsistence Uses..... | 8 |
| Habitat Factors Adversely Affecting the Stock..... | 8 |
| Do New or Expanding Fisheries on this Stock Exist?..... | 9 |
| Existing Management Plan..... | 9 |
| ACTION PLAN DEVELOPMENT..... | 9 |
| Norton Sound Subdistricts 5 and 6 King Salmon Action Plan Goal..... | 9 |
| Regulation Changes Adopted in February 2004..... | 9 |
| Regulation Changes Adopted in February 2007..... | 10 |
| Regulation Changes Adopted in January 2010..... | 10 |
| Management Review..... | 10 |
| Commercial and Subsistence Fisheries..... | 10 |
| Sport Fisheries..... | 12 |
| 2013 ALASKA BOARD OF FISHERIES REGULATORY PROPOSALS AFFECTING NORTON SOUND SUBDISTRICTS 5 AND 6 KING SALMON..... | 12 |
| Subsistence..... | 12 |
| Commercial..... | 12 |
| RESEARCH PLAN..... | 13 |
| Research And Stock Assessment Projects..... | 13 |
| REFERENCES CITED..... | 15 |
| TABLES AND FIGURES..... | 17 |

LIST OF TABLES

| Table | Page |
|---|------|
| 1. Estimated escapement, total harvest, and total run, Unalakleet River king salmon, 1984–1986 and 1996–2012..... | 18 |
| 2. Subdistricts 5 (Shaktoolik) and 6 (Unalakleet) commercial and subsistence king salmon harvests, Norton Sound District, 1961–2012..... | 19 |
| 3. Unalakleet River king salmon sport fish harvest and catch estimates for 1983–2012..... | 21 |
| 4. Subdistricts 5 (Shaktoolik) and 6 (Unalakleet) historical management actions. | 22 |
| 5. Unalakleet River drainage king salmon percent exploitation by fishery, 1984–1986 and 1996–2012. | 28 |
| 6. Combined subdistricts 5 and 6 incidental king salmon harvest data compared to commercial chum salmon harvests during directed chum salmon openings, 2007–2012, Norton Sound District. | 29 |

LIST OF FIGURES

| Figure | Page |
|---|------|
| 1. Salmon commercial fishing subdistricts and rivers in Norton Sound..... | 30 |
| 2. Annual king salmon escapement compared with established escapement goal ranges, 1984–1986 and 1996–2012, North River counting tower, Unalakleet River drainage, Norton Sound District. <i>Note: The 2011 North River tower count is considered an incomplete estimate of escapement because of poor counting conditions.</i> | 31 |
| 3. Annual king salmon North River tower escapement and aerial survey indices compared to the lower bound of the tower-based escapement goal range (1,200), 1984–1986 and 1996–2012, North River, Unalakleet River drainage, Norton Sound District. <i>Note: Black diamond markers and bars indicate incomplete aerial surveys and tower counts, respectively.</i> | 31 |
| 4. Subdistrict 5 combined (subsistence + commercial) king salmon harvests, compared to the recent 5-year (2008–2012) and historic (1994–1998) averages, 1961–2012. | 32 |
| 5. Subdistrict 6 combined (subsistence + commercial) king salmon harvests compared to the recent 5-year (2008–2012) and historic (1994–1998) averages, 1961–2012. | 32 |
| 6. Subdistricts 5 and 6 combined king salmon harvests, compared to the recent 5-year (2008–2012) and historic (1994–1998) averages, 1961–2012..... | 33 |
| 7. Estimated annual king salmon bycatch in Bering Sea-Aleutian Islands (BSAI) groundfish fisheries, including the 1991–2002, 2003–2007, and 2008–2012 averages..... | 33 |
| 8. Comparison of the 2010–2012 king salmon age and sex structure with 1986–1999, and 2000–2009 average age and sex compositions of Unalakleet River test fishery (5 7/8" mesh) samples, 1986–2012..... | 34 |

ABSTRACT

In response to the guidelines established in the *Policy for Management of Sustainable Salmon Fisheries* (SSFP; 5 AAC 39.222), the Alaska Board of Fisheries (board) classified the Norton Sound Subdistrict 5 (Shaktoolik) and Subdistrict 6 (Unalakleet) king salmon *Oncorhynchus tshawytscha* as a stock of concern, specifically a yield concern, at its January 2004 meeting. An action plan was developed by the Alaska Department of Fish and Game (department) and acted upon by the board in January 2004. The SSFP directs the department to assess salmon stocks in areas addressed during the board regulatory cycle to identify stocks of concern and in the case of Norton Sound subdistricts 5 and 6 king salmon, to reassess the stock of concern status. The board continued the Subdistrict 5 and Subdistrict 6 king salmon classification as a stock of yield concern in 2007, and adopted a king salmon management plan (5 AAC 04.395) in order to increase escapements and restore the stock to historical levels of abundance. In 2010, the board continued the stock of concern designation and modified the management plan to provide direction for prosecuting commercial chum (*O. keta*) and pink (*O. gorbuscha*) salmon fisheries in times of low king salmon abundance. Escapement goals were achieved in 2007, 2009, and 2010, but only as a result of the subsistence fishing schedule stipulated in the management plan, inriver gillnet mesh size restrictions, and early closures to subsistence and sport fisheries. Escapement goals were not achieved in 2008 and 2012 despite similar conservation measures; escapement estimates are considered incomplete for 2011. Given the continued inability to maintain near average yields despite the use of specific management measures, subdistricts 5 and 6 king salmon continue to meet the definition for a stock of yield concern as defined in the SSFP. Therefore, the department recommends continuing the stock of yield concern classification. A key challenge to fisheries management is developing strategies to allow commercial fisheries directed on chum and pink salmon while minimizing adverse impacts on reaching king salmon escapement goals and meeting subsistence needs in subdistricts 5 and 6.

Key words: Norton Sound, king salmon, *Oncorhynchus tshawytscha*, stock of concern, yield concern, commercial, fishing, department, sustainable salmon fisheries policy, Alaska Board of Fisheries.

INTRODUCTION

The *Policy for Management of Sustainable Salmon Fisheries* (SSFP; 5 AAC 39.222) directs the Alaska Department of Fish and Game (department) to provide the Alaska Board of Fisheries (board) with reports on the status of salmon stocks and identify any salmon stocks that present a concern related to yield, management, or conservation during regular board meetings. This report provides the department's reassessment of the Norton Sound subdistricts 5 (Shaktoolik) and 6 (Unalakleet) king salmon (*Oncorhynchus tshawytscha*) stock of concern, which has been classified as a yield concern.

A stock of 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; a yield concern is less severe than a management concern” (5 AAC 39.222(f)(42)). The SSFP defines a chronic inability as “the continuing or anticipated inability to meet expected yields over a 4 to 5 year period”. Therefore, in the supporting analysis, only the most recent 5-year escapement performance history along with a comparison of the most recent 5-year yields or harvestable surpluses and a select 10-year historical level of yield or harvestable surpluses are considered.

In response to the guidelines established in the SSFP, the board classified the Norton Sound subdistricts 5 and 6 king salmon stock as a yield concern at the January 2004 board meeting. An action plan developed by the department (Jones 2003) was acted upon by the board in January 2004. Following 3 consecutive years (2004–2006) of failing to meet escapement goals, despite reductions in harvests and the continuing inability to meet expected yields over a 5-year period, the department recommended continuing the stock of yield concern classification (Kent and

Bergstrom 2006). The board agreed with this determination at its February 2007 meeting, and in an effort to further conserve king salmon and restore the stock to historical yield levels, adopted the *Subdistricts 5 and 6 of the Norton Sound District and the Unalakleet River King Salmon Management Plan* (5 AAC 04.395). The management plan incorporates a restrictive subsistence fishing schedule and 50% reductions in daily and annual sport fish bag limits. As specified in 5 AAC 04.395, subsistence fishing from June 15 to July 15 in Subdistrict 6 is limited to two 48-hour periods per week in the marine waters, and two 36-hour periods per week in Unalakleet River. Likewise, the Unalakleet River sport fish bag and possession limit for king salmon, 20 inches or greater, was reduced to 1 fish per day, and the annual harvest limit was reduced from 4 to 2 fish. The plan provides authority to the department to liberalize subsistence fishing time and sport fish bag limits if the midpoint of the king salmon escapement goal range is projected to be reached. The intent of 5 AAC 04.395 was to increase king salmon escapements by providing escapement windows between subsistence fishing periods and reducing sport fish harvests. At the 2010 board meeting, subdistricts 5 and 6 king salmon retained its stock of yield concern designation based on escapement goals being reached in only 2 of the 3 previous years and harvestable surpluses remaining well below historical (1989–1998 average) yield levels.

In accordance with the SSFP, 5 AAC 39.222, the department recommended continuing the designation of Norton Sound subdistricts 5 and 6 king salmon as a stock of yield concern at the October 2012 Alaska Board of Fisheries work session. This recommendation, as a yield concern, was based on low harvests during the most recent 5-year period (2008–2012) compared to the historical average yield, as indicated by the historical 10-year (1989–1998) average for commercial harvests. Subsistence harvest data were not collected in some years and, prior to 1994 varying data collection methods were used. Additionally, subsistence data were not expanded to account for households not surveyed. Therefore, the historical baseline for comparison, the 10-year period from 1989–1998, cannot be used in this analysis. Alternatively, the 5-year period from 1994 through 1998 was used for the yield analysis for subsistence harvests because data collection methodology and analysis was similar during this period. Unalakleet River and marine (2012) king salmon test fishery catches were distributed to subsistence users and were added to subsistence survey harvest estimates for all years to fully capture subsistence harvests.

Sport fishing harvest and effort information has been collected from anglers on the Unalakleet River by the department since 1983 and catch information is available starting in 1990. Sport fish harvest and catch information is not yet available for 2012. Therefore, the most recent 5-year (2007–2011) average harvest and catch statistics were substituted for 2012 in order to make comparisons with the historical 10-year period from 1989–1998.

STOCK ASSESSMENT BACKGROUND

The Norton Sound District is composed of 6 commercial fishing subdistricts (Figure 1). In Subdistrict 5, most freshwater subsistence fishing occurs in the Shaktoolik River and in Subdistrict 6, in the Unalakleet River. Subdistricts 5 and 6 salmon fisheries are managed as one unit because previously-conducted tagging studies (Gaudet and Schaeffer 1982) have shown salmon bound for these subdistricts intermingle in marine waters; thus, marine harvests likely contain fish bound for both river drainages.

Historically, king salmon abundance in subdistricts 5 and 6 has been evaluated using a combination of inseason subsistence fishery surveys and passage estimates obtained at a

counting tower project located on the North River, an important spawning tributary of Unalakleet River. More recently, additional assessments have been obtained from mainstem weir counts on the Unalakleet River using a resistance-board weir (Menard et al. *In prep*). King salmon test fishery catches in the lower Unalakleet River have historically been used only to gauge run timing (Kent 2010). Beginning in 2012, a nearshore variable mesh gillnet marine test fishery was also conducted near the village of Unalakleet to describe run timing and age, sex, and size structure of the subdistricts 5 and 6 king salmon run. Aerial surveys are also flown on the Shaktoolik and Unalakleet river drainages in order to ground truth North River tower counts, calibrate survey estimates, and correlate surveys with historical data.

Test Fishing

The department has operated a set gillnet test fishery several miles upstream from the mouth of Unalakleet River since 1985. The 5 7/8-inch stretched mesh gillnet used in the test fishery is primarily for chum (*O. keta*) and coho (*O. kisutch*) salmon stock assessment. This small mesh is relatively inefficient at capturing age-5 and older king salmon that comprise the majority of the run. Consequently, the test fishery is not considered to provide a reliable index of king salmon abundance in subdistricts 5 and 6, but does provide useful information concerning time of entry into the lower Unalakleet River. With the exception of 2011, king salmon runs to subdistricts 5 and 6 have shown a distinctive trend of late run timing since 2007.

Beginning in 2012, the department operated a nearshore marine test fishery using variable mesh gillnets (VMG) to obtain standardized comparative catch statistics and early run timing information for king salmon in the Unalakleet Subdistrict. The primary objective was to build a marine test fishery database and examine relationships between marine test fishery CPUE, and tower and weir estimates. The reliability of the marine test fishery CPUE will be evaluated as an early indicator of king salmon run strength and location of harvest north or south of the Unalakleet River. If marine test fishery CPUE has utility in this regard, it may allow for more timely management decisions to ensure harvest potential of pink (*O. gorbuscha*) and chum salmon are maximized while not jeopardizing the likelihood of achieving king salmon escapement goals.

Escapement

The *Subdistricts 5 and 6 of the Norton Sound District and the Unalakleet River King Salmon Management Plan* is largely predicated on reaching the North River tower-based sustainable escapement goal (SEG) range of 1,200–2,600 fish. The North River counting tower has been operated continually since 1996 by various agencies and entities, including Kawerak Inc. (1996–2001), Native Village of Unalakleet (NVU) (2002–2006), NVU and the department (2007–2008), and most recently, Norton Sound Economic Development Corporation (NSEDC) (2009–2012). The efficacy of the North River tower to index drainagewide king salmon escapement has also been evaluated using radiotelemetry. Wuttig (1999) and Joy and Reed (*In prep*) showed that North River accounted for 37% (1997), 40% (1998), 34% (2009), and 53% (2010) of the Unalakleet River king salmon drainagewide escapement for an average of 41%. Magnitude of the proportional abundance estimates suggest that the North River serves as an important index of drainagewide king salmon escapement. Run timing of king salmon at the North River tower from 2010–2012 was later than average, including a record late run in 2010.

Since 2010, Unalakleet River mainstem king salmon escapements have been monitored and sampled for age, sex, and length information using a resistance-board weir operated jointly by

the department, NVU, and U.S. Bureau of Land Management (BLM) with funding assistance from the U.S. Fish and Wildlife Service (USFWS) Office of Subsistence Management (OSM) (Menard et al. *In prep*). Weir counts of king salmon during the 2010–2012 seasons were 1,021; 1,111; and 807 fish, respectively (Menard et al. *In prep*). As with North River tower, late king salmon run timing characterized the 2010–2012 seasons at the Unalakleet River weir.

In 1999, an escapement goal range of 1,200–2,400 was first established for the North River (Fair et al. 1999), and later revised to an SEG with the current upper bound of 2,600 salmon (ADF&G 2004). King salmon escapements to North River were within established escapement goal ranges in 1999, 2001, 2002, 2003, 2007, 2009, and 2010 (Table 1; Figure 2). Thus, the North River SEG has been met in 2 of last 5 years. The 2009 escapement was the third highest tower count on record. However, it is unlikely escapements would have fallen within the SEG range in 2007, 2009, and 2010 without inriver set gillnet mesh size restrictions and early closures imposed on subsistence and sport fisheries. The 2008 and 2012 king salmon escapements were well below the SEG range despite restrictions and early closures to subsistence and sport fisheries. The 2011 North River tower estimate (864 king salmon) is considered a minimum count due to poor counting conditions from high water levels which resulted in unmonitored king salmon passage at the peak of the run. While the 2011 escapement goal cannot be fully evaluated because of incomplete assessment, indications from the aerial survey suggest spawning escapement may have met the minimum SEG. For historical years when acceptable aerial survey counts exceeded 400 king salmon, North River tower counts have correspondingly exceeded the lower bound of the SEG: the 2011 aerial survey count was 433 king salmon (Figure 3).

Aerial surveys of king salmon spawning areas in the Shaktoolik and Unalakleet River drainages are also flown to ground truth tower and weir counts, make comparisons with historical data, and evaluate existing aerial survey SEGs. In 1999, aerial survey SEG ranges were established for Shaktoolik (400–800 king salmon) and the upper Unalakleet (550–1,100 king salmon) rivers. The Unalakleet River aerial survey index area encompasses the upper 80 km of the mainstem of Unalakleet River, as well as Old Woman River tributary (Fair et al. 1999; ADF&G 2004). However, evaluating these goals has been problematic due to inclement weather and suboptimal viewing conditions caused by high water levels and large pink salmon escapements. Since 1999, there have only been 2 complete surveys of the Unalakleet River index area (2007 and 2009). Similarly, only 4 acceptable surveys of Shaktoolik River (2001, 2004, 2007, and 2011) have been conducted since the SEG was established. Moreover, the Unalakleet and Shaktoolik rivers have been successfully surveyed in only 19 and 21 years since statehood, respectively. For this reason, aerial survey data are only marginally used in analyses.

YIELD

Combined commercial king salmon harvests for subdistricts 5 and 6 averaged 7,131 per year for the historical period 1989–1998 (Table 2). Commercial harvests over the recent 5-year (2008–2012) period averaged 127 king salmon, which represents a 98% decline from the historical commercial harvest average. However, these fish were not caught in a directed king salmon fishery. Since 2001, the commercial harvest of king salmon has been incidental to directed chum, pink, and coho salmon fisheries, except for a small directed commercial harvest of king salmon in 2005. Subdistricts 5 and 6 subsistence harvests averaged 1,547 king salmon from 2008–2012, a 67% decline from the 1994–1998 average subsistence harvest of 4,624 king salmon (Table 2). Large decreases in commercial and subsistence harvest patterns were apparent

within each subdistrict (figures 4–5). Additionally, the average combined harvest (commercial and subsistence) of both subdistricts 5 and 6 from 2008–2012 (1,674 king salmon) decreased 86% from the historic 1994–1998 average combined harvest of 12,217 king salmon (Table 2; Figure 6).

Total run-size estimates for the Unalakleet River king salmon stock also show a steep decline since the late 1990s. Total run sizes were estimated by adding drainagewide escapement estimates to combined harvests (sport, commercial, and subsistence), assuming 100% of the marine subsistence and commercial king salmon harvest was of Unalakleet River origin. A lack of, or incomplete North River tower escapements in 1999, 2001, and 2011, precluded calculation of drainagewide escapement and total run for these years. Furthermore, it should be noted that combined harvest estimates for 2012 do not include sport fishery harvests, as these data are unavailable at the time of this writing. Therefore, 2012 estimated run size and percent exploitation estimates are considered to be conservative. The minimum North River tower count in 2011 also precluded using the 2008–2012 average run size for comparisons with the historical average (1984–1986, and 1996–2006, excluding 1999 and 2001) run size. Alternatively, the 2007–2010 and 2012 average total run was used for comparisons with the historical average. Unalakleet River king salmon total run size averaged 11,412 fish during the historical period (1984–1986 and 1996–2006, excluding 1999 and 2001), including a peak estimate of 24,942 fish in 1997 (Table 1). Since 2007, king salmon runs have declined 55%, to an average of 5,168 fish, including the lowest run on record in 2012 (2,768 fish) (Table 1). During the 2010–2012 seasons, king salmon runs have been exceptionally poor in Subdistrict 6. Subdistrict 6 harvest estimates of king salmon from 2010–2012 were 1,234, 1,149, and 965 fish (subsistence and commercial), respectively, and are 81–85% below the long-term average harvest estimate of 6,594 fish (Table 1).

Sport fisheries have been active on Unalakleet River for many years, both by local residents and nonlocals. The U.S. Air Force operated a recreational fishing camp on the river in the early 1960s, and a commercial sport fishing lodge was constructed on the river in the late 1960s. The Unalakleet Native Corporation owned the lodge for several years and contracted operations; it is currently in private ownership and has been expanded.

Since the inception of the Sport Fish Guide Logbook Program in 2005, guided anglers have harvested between 29 and 68 king salmon per year. Total king salmon sport harvests (guided and unguided) have ranged from 53 fish in 2011 to 842 fish in 1997 (Table 3), with about 50% of the harvests coming from Alaska residents. The most recent 5-year (2007–2011) average harvest of 232 king salmon represents a 38% decline from the (1989–1998) average harvest of 386 king salmon (Table 3). However, sport harvests are thought to actually be lower during the recent 5-year period. In 2008, the estimated harvest of king salmon was 580 fish, of which 519 were estimate to be “jack” king salmon (< 20 inches). This estimated harvest of “jacks” is likely erroneously high due to the expansions of one angler’s reported harvest of 32 king salmon under 20 inches in length, all before the closure on July 5. Based upon the record low escapement into North River in 2008 (903 king salmon) and relatively low contributions of these smaller king salmon to the run, it is likely that this estimate of smaller king salmon is inaccurate; likely, these 32 harvested fish were either bright pink salmon or Dolly Varden. Furthermore, 2008 was the only year in which the sport fish harvest did not trend with subsistence harvests and escapements. The recent 5-year (2007–2011) average king salmon catch of 544 king salmon, which includes fish that were released, in addition to fish harvested, dropped by 63% from the

1990–1998 average catch of 1,489 king salmon; the 1990–1998 average catch was used as a historical comparison because catch statistics were not reported until 1990. Sport fishing effort in Shaktoolik River is very light to nonexistent, and the small amount of sport fishing that does occur is generally focused on coho salmon.

Commercial fishing periods directed at king salmon have been nonexistent since 2001, except for 2 periods in 2005, which yielded a harvest of 151 king salmon (Table 2). Additionally, subsistence fishing and sport fishing closures were implemented in 2003, 2004, and from 2006–2012 (Table 4) because of below-average North River tower (Figure 2) and Unalakleet River weir escapement counts of king salmon.

EXPLOITATION RATE

An analysis of exploitation is not possible for Subdistrict 5 because reliable estimates of king salmon escapements to Shaktoolik River are unavailable. Unalakleet River exploitation rate estimates should be considered cautiously as (1) total run estimate accuracy may vary dependent on annual fluctuations in relative run strength of North River compared to other Unalakleet River spawning stocks (the average of 41% North River contribution is used, but the known range may be 34–53%), and (2) marine commercial and subsistence harvests include mixed stocks, some of which may not be Unalakleet River-bound. An absence of, or incomplete, escapement data for the years prior to 1984, from 1987–1995, 1999 and 2001, and 2011 precluded calculation of total run and exploitation rates for those years. However, for years in which total Unalakleet River king salmon run sizes can be estimated (1984–1986 and 1996–2012, excluding 1999, 2001, and 2011), yields have declined precipitously (Table 1). As subsistence use is the mandated priority consumptive use, commercial harvests have been restricted because of this decrease. Total exploitation rates of Unalakleet River king salmon ranged from a low of 26.6% in 2007 to high of 81.3% in 1985 (Table 5). Total exploitation rates have decreased approximately 41% from an average of 57.9% for the historical period (1984–2006, excluding 1999 and 2001) to an average of 34.1% during the most recent 5-year (2007–2012, excluding 2011) period (Table 3).

Exploitation rate of king salmon by commercial fishing has ranged from zero exploitation in 2004 to 64% in 1985 (Table 5). More recently, the commercial exploitation rate has decreased from an average of 20.3% for the period from 1984–2006 to an average of 2.3% since 2007 (Table 5). This dramatic decrease in the commercial exploitation is directly attributable to perennially small runs of king salmon returning to this drainage since 1998, resulting in limited or no king salmon directed fishing periods (Table 5).

Although subsistence harvests have decreased in subdistricts 5 and 6 over the last 18 years, the decrease was not as dramatic as that of the commercial harvest. Exploitation rates for subsistence harvests have varied from 16.4% in 1985 to 48.9% in 2006 (Table 5). Increases in relative exploitation by the subsistence fishery occurred as a result of drastic reductions in commercial harvests and diminishing run sizes since the 1999 season, despite substantial decreases in subsistence harvests. The recent 5-year average (2007–2012, excluding 2011) exploitation rate by the subsistence fishery of 27.1% actually represents a 17% decrease from the 1984–2006 average of 32.5% (Table 5). However, exploitation rates in the subsistence fishery averaged 22.8% prior to 2000 when the commercial fishery collapsed (Table 5).

STOCK OF CONCERN RECOMMENDATION

Management direction provided in the subdistricts 5 and 6 king salmon management plan has enabled the department to implement actions and successfully control harvests for the purpose of reaching escapement goals in 2 of the previous 5 years. It is possible that escapement goals were achieved in 2011, but high water levels precluded obtaining reliable assessments of North River king salmon escapement. However, given the continued inability to maintain near-average yields despite management measures, the Norton Sound subdistricts 5 and 6 king salmon stock continues to meet the criteria of a stock of yield concern. Therefore, based on the definitions provided in the SSFP in 5 AAC 39.222(f)(42), the department recommends continuation of the yield concern classification for the Norton Sound subdistricts 5 and 6 king salmon stock.

OUTLOOK

The 2013 king salmon run in Norton Sound subdistricts 5 and 6 is expected to be similar to very poor king salmon runs from 2010–2012. No directed commercial fishing will be allowed and it may be necessary to establish preseason restrictions to sport and subsistence fisheries in order to reduce harvests and reach king salmon escapement goals; these include inriver and marine gillnet mesh-size restrictions, reduction in subsistence fishing time, and catch-and-release restrictions and/or closure to the sport fishery for king salmon.

Additional conservation measures may be necessary in 2013 as a result of failing to achieve escapement goals in 2012, in conjunction with escapement and age composition data. Age structure of the 2011 spawning escapement, as well as test and subsistence fishery harvests, showed a high proportion of age-1.2 (4-year old) king salmon. At the time, the department interpreted the high proportion of age-1.2 fish observed in 2011 as a preliminary indicator of good survival from the 2007 brood year. Unexpectedly however, the magnitude of the 2012 run was very weak despite consisting of a majority (58%) of age-1.3 (5-year old) king salmon from the 2007 brood year. Consequently, age-1.4 (6-year old) king salmon are anticipated to contribute heavily to the 2013 run, but the overall magnitude of the run is expected to be very weak considering the poor performance of the 2007 brood year observed in 2012. Additionally, the 2008 brood year is not expected to make up for this shortfall based on a record low escapement of 903 king salmon observed at North River in 2008 (Table 1; Figure 2).

ALASKA BOARD OF FISHERIES ACTION

In response to the guidelines established in the SSFP, the board, during its January 15–20, 2013 regulatory meeting is anticipated to continue the classification of the Norton Sound subdistricts 5 and 6 king salmon stock as a yield concern.

ESCAPEMENT GOAL EVALUATION

The department has undertaken a review of escapement goals for several Norton Sound salmon stocks where long-term escapement, catch, and age composition data exist that enable development of biological escapement goals (BEGs) or SEGs based on analysis of production consistent with the escapement goal policy. In 1999, the department established king salmon aerial survey escapement goals for the Shaktoolik, Unalakleet/Old Woman, and North rivers. Additionally, a tower-based escapement goal for the North River was also established in 1999 (Fair et al. 1999). In 2004, utilizing additional data since the escapement goal for the North River was established resulted in the department establishing a SEG range of 1,200 to 2,600 king salmon (ADF&G

2004). Escapement goals were once again reviewed for the 2013 board cycle utilizing the most recent data and the escapement goal review panel is recommending that the Shaktoolik River aerial survey SEG range of 400–800 king salmon be discontinued (Conitz et al. 2012). It is difficult to obtain aerial survey counts for king salmon from the Shaktoolik and Unalakleet/Old Woman rivers because of weather and river conditions. Additionally, prodigious numbers of pink salmon spawning in both river drainages during the optimal aerial survey period mask other species in the river. Based on a feasibility project using a sonar to enumerate salmon on the Shaktoolik River, operated by NSEDC, it is anticipated that a sonar-based goal may be possible and more reliable in the future as more years of data are available upon which to base a goal.

The following is a list of current and proposed goals for subdistricts 5 and 6 king salmon stocks:

| Stream (Project Type) | Current Goal | Proposed Goal |
|-------------------------------------|-----------------|---------------|
| Shaktoolik River (aerial) | 400–800 SEG | Discontinued |
| Unalakleet/Old Woman River (aerial) | 550–1,100 SEG | No Change |
| North River (tower) | 1,200–2,600 SEG | No Change |

**MANAGEMENT ACTION PLAN OPTIONS FOR
ADDRESSING STOCKS OF CONCERN AS OUTLINED
IN THE *POLICY FOR MANAGEMENT OF
SUSTAINABLE SALMON FISHERIES***

**NORTON SOUND SUBDISTRICTS 5 AND 6 KING SALMON MANAGEMENT
PLAN REVIEW/DEVELOPMENT**

Current Stock Status

In response to guidelines established in the SSFP, the department recommended continuing the designation of the Subdistricts 5 and 6 king salmon stock as a yield concern at the October 2012 board work session. The board, after reviewing stock status information and public input during its January 15–20, 2013 regulatory meeting, is anticipated to continue the classification of subdistricts 5 and 6 king salmon stock as a yield concern. This determination is anticipated to be based on the inability, despite the use of specific management measures, to maintain expected yields, or harvestable surpluses, above a stock’s escapement needs during the last 5 years (2008-2012).

**Customary and Traditional Use Finding and Amount Necessary for Subsistence
Uses**

The board has made a positive finding for customary and traditional use for salmon in the Norton Sound-Port Clarence Area. The amount necessary for subsistence (ANS) uses has been determined to be 96,000–160,000 salmon for the Norton Sound-Port Clarence Area. Subsistence fishing restrictions targeting the king salmon stocks have occurred seven times (2006–2012) in the last 8 years in subdistricts 5 and 6.

HABITAT FACTORS ADVERSELY AFFECTING THE STOCK

There has been minimal fish habitat alteration in the Unalakleet River drainage due to road construction. An access road has altered natural rates of estuarine exchange within the lower

Unalakleet River estuary, although fish passage is maintained through other channels. Historically, this area, as well as the Shaktoolik River drainage, has not been mined as in northern Norton Sound drainages, particularly the Nome area. The upper Unalakleet River is designated as “wild” under the Wild and Scenic River Act and there are only a few seasonal fish camps located on the lower Shaktoolik River. Spawning and rearing habitats within both drainages remain pristine.

DO NEW OR EXPANDING FISHERIES ON THIS STOCK EXIST?

There are no new or expanding fisheries on this stock. King salmon of Norton Sound origin are likely taken as bycatch in the Bering Sea-Aleutian Islands (BSAI) groundfish fisheries with other co-mingling stocks from the western Alaska stock grouping. Studies of bycatch samples from the late 1990s show that over 56% of the king salmon caught as bycatch in the pollock fishery are of Western Alaskan origin (which includes the Unalakleet and Shaktoolik rivers), and over 40% of those Western Alaskan king salmon are Yukon River stocks (Myers et al. 2003). Using the total catch numbers from 2006, over 16,000 king salmon which would have returned to the Yukon River and over 38,000 which would have returned to Western Alaska were caught by the pollock fishery; however, it is unknown what portion of this bycatch consists of Norton Sound king salmon stocks and to what degree this portion may vary inter-annually. From 1991–2002, king salmon bycatch averaged 39,694 fish, but king salmon bycatch greatly increased beginning in 2003 until peaking in 2007 when nearly 130,000 king salmon were caught (Figure 7). The 2003–2007 average BSAI king salmon bycatch was 80,891 fish, which was up 103% from the 1991–2002 average (Figure 7). Since 2007, king salmon bycatch decreased; the 2008–2012 average bycatch is 17,280 fish, down 79% from the 2003–2007 average (Figure 7). The most recent genetic information on bycatch of Western Alaska king salmon in the BSAI pollock fishery, 2005–2009, is 54% (Guthrie et al. 2012).

EXISTING MANAGEMENT PLAN

5 AAC 04.395. Subdistricts 5 and 6 of the Norton Sound District and the Unalakleet River king salmon management plan.

ACTION PLAN DEVELOPMENT

NORTON SOUND SUBDISTRICTS 5 AND 6 KING SALMON ACTION PLAN

GOAL

Reduce fishing mortality in order to meet spawning escapement goals, provide reasonable opportunity for subsistence fishing, and to re-establish historical range of harvest levels in the subsistence, commercial and sport fisheries.

Regulation Changes Adopted in February 2004

In January 2004, after review of the management action plan options addressing this stock of concern (Jones 2003), the board adopted subsistence fishing regulations 5 AAC 01.170(j)(1) and sport fishing regulations 5 ACC 70.011(c)(9). Under regulation 5 AAC 01.170(j)(1), during times in which the commissioner determines it is necessary for the conservation of king salmon, the commissioner may, by emergency order, close the subsistence fishing season in subdistricts

5 and 6 and immediately reopen the season in those subdistricts during which gillnets must have a mesh size not exceeding 6 inches. The sport fish bag and possession limit in regulation 5 ACC 70.011(c)(9) for king salmon less than 20 inches was reduced from 10 to 1 fish, effectively reducing the overall bag limit from 11 to 2 fish. However, the bag limit can only be comprised of 1 fish exceeding 20 inches in length. In addition, this regulation placed an annual sport limit of 4 king salmon 20 inches or greater in the Unalakleet River drainage, of which only 2 can be taken from the North River. Regulation 5 ACC 70.011(c)(9) also stipulated that anglers targeting king salmon in the Unalakleet River drainage must possess and complete a current harvest record as described in 5 AAC 70.024.

Regulation Changes Adopted in February 2007

In February 2007, after review of the management action plan options addressing this stock of concern (Kent and Bergstrom 2006), the board adopted regulation 5 AAC 04.395, *Subdistricts 5 and 6 of the Norton Sound District and Unalakleet River King Salmon Management Plan*. Regulation 5 AAC 04.395(b)(1) directs the commissioner to close the subsistence fishery and reopen it no earlier than June 15 to a subsistence fishing schedule of two 48-hour periods per week in the ocean and two 36-hour periods per week in Unalakleet River. 5 AAC 04.395(b)(2) directs the commissioner to reduce the bag and possession limit to 2 king salmon, of which only 1 can be 20 inches and greater, and the annual possession limit for fish 20 inches or greater in length is 2 fish. Additionally, 5 AAC 04.395(c) states that if the projected escapement is below the lower end of the escapement goal range, all fishing for king salmon will be closed; and in 5 AAC 04.395(d)(3), the commissioner may open a commercial king salmon fishery of no more than two 24-hour periods per week only if the midpoint of the escapement goal is projected to be reached.

Regulation Changes Adopted in January 2010

In January 2010, the board further modified 5 AAC 04.395 based on an action plan alternative proposed by the department in the management action plan (Kent and Bergstrom 2009). Regulation 5 AAC 04.395 (h) gives the department discretion to allow commercial pink or chum salmon fisheries provided there is a harvestable surplus of pink or chum salmon available and that commercial fishing for these species will not have a significant impact on king salmon escapement needs and subsistence uses of king salmon. However, this regulation also explicitly directs the department to not allow directed pink or chum salmon commercial fisheries to occur prior to July 1 if gillnet mesh size or fishing periods are restricted in the king salmon subsistence fishery.

MANAGEMENT REVIEW

Commercial and Subsistence Fisheries

Prior to the mid-2000s, the department would wait until increasing test fishery and subsistence catches were observed for at least 7 days in the Unalakleet River before allowing commercial fishing directed at king salmon in subdistricts 5 and 6. In most years, king salmon commercial fishing consisted of twice weekly 24-hour periods to prevent fishing on milling king salmon and co-migrating Yukon River stocks, and to allow for adequate escapement. However, diminishing abundance since 2007 has necessitated a much more conservative management regime. The management plan was modified in 2007 so that a commercial king salmon fishery may only occur if the midpoint of the North River tower king salmon escapement goal range is projected to

be reached. King salmon directed commercial fisheries have not occurred during the recent 5-year period because managers projected that escapement goals would not be reached.

Since 2007, per the management plan, subsistence fishing schedules have been implemented for the subdistricts 5 and 6 marine and Unalakleet River subsistence fisheries from June 15 to July 15. In marine waters, the subsistence fishing schedule consists of two 48-hour periods per week from 6:00 p.m. Monday to 6:00 p.m. Wednesday and from 6:00 p.m. Thursday to 6:00 p.m. Saturday. In Unalakleet River, subsistence fishing is restricted to two 36-hour periods per week from 8:00 a.m. Monday to 8:00 p.m. Tuesday and from 8:00 a.m. Friday to 8:00 p.m. Saturday.

Subsistence fishing in Unalakleet River was also restricted to set gillnets with a stretched mesh size of 6 inches or less in late June from 2008–2009 and early July from 2010–2011. Mesh-size restrictions were not implemented in 2012 because of the very late run. These mesh-size restrictions were planned in order to protect milling king salmon, particularly large females, in the lower Unalakleet River during its peak migration period. Allowing more of these larger and more fecund females to reach spawning areas was considered imperative in light of continued diminished productivity of subdistricts 5 and 6 king salmon and concerns with quality of the spawning escapement.

As with other coastal western Alaska king salmon stocks, less than favorable ocean conditions in recent years may have contributed to the poor run performance observed in subdistricts 5 and 6 king salmon. However, the continued low escapements of Unalakleet River king salmon observed since 2000 are likely attributed to ocean conditions, as well as harvest patterns with respect to mesh sizes. Another important factor limiting production may be changes observed in the quality of the spawning escapement since 2000. Figure 8 illustrates an analysis of the historical test fishery data from 1986–2012 that shows a trend toward fewer larger females belonging to the older age classes being caught. From 1986–1999, test fishery samples averaged 70% combined age-1.3 and age-1.4 king salmon, and were 45% female. From 2000–2009, test fishery samples have only averaged 62% age-1.3 and age-1.4 combined and 23% female.

There has been a resurgence of market interest in Norton Sound chum and pink salmon since the last board cycle. There is also interest in commencing commercial salmon fishing for these species prior to July 1 in order to target these species earlier in their migration to increase harvests and improve the quality of the harvest. Chum and pink salmon stocks in subdistricts 5 and 6 could sustain considerably higher commercial harvest rates in most years, but the fishery has been prosecuted conservatively for the first 2 weeks of July in order to minimize incidental harvest of king salmon. Generally, this has involved restricting gillnets to 6-inch or smaller mesh size, limiting chum salmon fishing periods to 24–36 hours in duration and limiting the open area to the southern half of Subdistrict 6 to protect king salmon as they move through the northern half of the subdistrict.

Incidental harvests of king salmon in recent chum and pink salmon commercial harvests have been small and are expected to remain small if these fisheries were prosecuted earlier. Harvests of king salmon in the subdistricts 5 and 6 directed commercial chum salmon fishery have been very low since 2007. During the 2007–2012 seasons, a combined 197,150 chum salmon were harvested in subdistricts 5 and 6 commercial fisheries during 42 periods directed at chum salmon (Table 6). By comparison, only 662 king salmon were harvested incidentally from 2007–2012, including king salmon not sold, but retained for personal use (Table 6). Moreover, incidental harvests of king salmon have only constituted from 0.1–0.5% of the overall harvest during these

directed chum salmon periods (Table 6). Similarly, combined chum and king salmon harvests from 2007–2012 were composed, on average, of only 0.3% king salmon in the directed chum salmon fishery (Table 6). There has been little directed pink salmon fishing in Norton Sound during the recent 5-year period to show a similar pattern. However, there was a directed pink salmon fishery in 2012, and incidental harvest rates of king salmon in directed pink salmon openings were even lower than in the chum salmon fishery. In 2012, there were 4 directed pink salmon openings that encompassed Subdistrict 6. During these openings, only 9 king salmon were caught compared to 46,843 pink salmon, which was only 0.01% of the overall harvest. Regardless of low incidental harvest rates in chum and pink salmon fisheries, however, the North River king salmon SEG was not achieved in 2012.

Sport Fisheries

Sport fishery management actions are taken inseason, when necessary, in accordance with guidelines in the king salmon management plan. The sport fishery for king salmon has been closed in early July by emergency order (EO) 9 out of the last 10 years due to low projected escapements, and was not reopened in the 4 years in which the lower end of the escapement goal had been met later in the season (2003, 2007, 2009, and 2010). These EOs apply not only to the Unalakleet River drainage, but also to Shaktoolik River, as well as marine waters in subdistricts 5 and 6. In addition to estimating sport harvest and catch of king salmon through a mail-out Statewide Harvest Survey sent to licensed anglers, beginning in 2005, all sport fishing guides must maintain department guide logbooks, and record all catch and harvest from clients. Since 2005, the harvest of king salmon by guided anglers has ranged from 29 to 64 fish annually.

ACTION PLAN ALTERNATIVES

No new action plans necessary; continue under current plans.

2013 ALASKA BOARD OF FISHERIES REGULATORY PROPOSALS AFFECTING NORTON SOUND SUBDISTRICTS 5 AND 6 KING SALMON

SUBSISTENCE

Proposal 121 – Modify existing regulations so that the subsistence fishery will be open to beach seining for salmon, other than king salmon, in all fresh and marine waters of subdistricts 5 and 6 throughout the season or from July 1 to August 10, unless restricted or closed by EO.

COMMERCIAL

Proposal 120 – Amend the *Subdistricts 5 and 6 of the Norton Sound District and the Unalakleet River King Salmon Management Plan* to allow for pink and chum salmon commercial harvest opportunities prior to July 1 unless the marine subsistence king salmon fishery is restricted or the king salmon subsistence fishery is closed. This proposal would also prohibit commercial sale of king salmon incidentally harvested in chum and pink salmon commercial fisheries unless the midpoint of the North River tower-based king salmon escapement goal is reached.

Proposal 127 – Provide the department EO authority to allow each commercial permit holder to use up to 150 or 200 fathoms of set gillnet gear made of 4 ½-inch or less mesh in the commercial pink salmon fishery.

RESEARCH PLAN

RESEARCH AND STOCK ASSESSMENT PROJECTS

Division of Sport Fish completed a 2-year radiotelemetry study in 2009 to re-evaluate the efficacy of the North River king salmon escapement as an index of total drainagewide escapement. Initial radiotelemetry studies revealed that North River accounts for approximately 40% of the king salmon that return annually to the Unalakleet River drainage to spawn (Wuttig 1999). Joy and Reed's (*In prep*) more recent investigation showed that North River accounted for 34% and 55% of the drainagewide escapement during the 2009 and 2010 seasons, respectively.

Since 2007, Division of Commercial Fisheries personnel have documented the age, sex, and size composition of king salmon escapement to Unalakleet River by capturing king salmon upstream from subsistence fishing areas using beach seines and more recently, the Unalakleet River weir. Similarly, the age, sex, and size composition of the subsistence harvest has been documented during this time. Additionally, 140 genetic tissue samples were collected annually from 2007-2009 marine subsistence harvests of subdistricts 5 and 6 king salmon. If the proper genetic markers become available, the department intends to sequence these samples in efforts to more accurately apportion marine harvests from this regional mixed-stock fishery. Genetic baseline collections from king salmon spawning populations in Norton Sound-Port Clarence Area are ongoing and there has been significant progress developing baselines for the Golsovia, Inglutalik, Pilgrim, Shaktoolik, Tubutulik, Unalakleet, and Ungalik rivers.

Stock-specific length-fecundity and age-fecundity relationships for Unalakleet River king salmon were also recently examined from 2008–2010 (Bell and Kent *In prep*). A total of 110 king salmon were harvested and sampled. A total of 84 salmon were aged. Average fecundity was 9,223 eggs per fish. As expected, fecundity was positively correlated with length and there were distinct length-fecundity relationships for age-1.3 and age-1.4 king salmon. Interestingly, however, fecundity-at-length was larger for age-1.3 salmon than age-1.4 fish. Relationships between length and fecundity by age are unclear and may vary by region and system. Future work should explore other aspects of the reproductive potential of Unalakleet River king salmon, such as competitive interactions, egg deposition, and survival on the spawning grounds.

NSEDC has operated a Dual Frequency Identification sonar (DIDSON) unit on Shaktoolik River for 6 seasons. The first 5 years were used to pinpoint a favorable site, develop local hires, and develop sonar expertise. The 2012 season was the first season that NSEDC evaluated varying methods to apportion sonar counts by species. Additionally, the department is working with NSEDC, under a cooperative agreement, by providing funding and technical support. A draft report of the 2012 season will be provided to the department in March, 2013, with a final project report due in June, 2013.

Investigations by Division of Sport Fish and NSEDC into freshwater rearing conditions for Unalakleet king and coho salmon are also ongoing. This project is investigating how king and

coho salmon in the Unalakleet River drainage are influenced by escapements of all salmon species in the drainage. Biologists from private, state, and federal agencies have hypothesized that pink and chum salmon may be benefitting coho salmon in the form of marine-derived nutrients (MDN) and that coho salmon may, in turn, be competing with king salmon in the Unalakleet River.

There is also considerable interest in developing a marine tagging program. This research seeks to continue work conducted by Gaudet and Schaefer (1982) by using telemetry and acoustic technology to track king salmon from the marine environment to their natal rivers. Successful implementation of this research would provide estimates of the proportion of Shaktoolik River and Unalakleet River king salmon contributing to marine harvests.

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TABLES AND FIGURES

Table 1.—Estimated escapement, total harvest, and total run, Unalakleet River king salmon, 1984–1986 and 1996–2012.

| Year | Escapement | | Harvest ^b | Total Estimated Run Size | Exploitation Rate (Percent) ^c |
|---|--------------------|----------------------------------|----------------------|--------------------------------|--|
| | North River | Unalakleet River ^a | | | |
| 1984 | 2,844 | 7,368 | 9,999 ^d | 17,367 | 57.6 |
| 1985 | 1,426 | 3,694 | 16,034 ^d | 19,728 | 81.3 |
| 1986 | 1,613 | 4,179 | 8,437 ^d | 12,615 | 66.9 |
| North River Tower was not operational from 1987–1995. | | | | | |
| 1996 | 1,197 | 3,101 | 7,051 | 10,152 | 69.5 |
| 1997 | 4,185 | 10,842 | 14,100 | 24,942 | 56.5 |
| 1998 | 2,100 | 5,440 ^f | 10,992 | 16,432 ^f | 66.9 ^f |
| 1999 | 1,639 ^e | | 9,279 | | |
| 2000 | 1,046 | 2,710 ^f | 3,356 | 6,066 ^f | 55.3 ^f |
| 2001 | 1,337 ^e | | 3,176 | | |
| 2002 | 1,484 | 3,845 | 2,915 | 6,760 | 43.1 |
| 2003 | 1,452 | 3,762 | 2,692 | 6,454 | 41.7 |
| 2004 | 1,125 | 2,915 | 3,185 | 6,100 | 52.2 |
| 2005 | 1,015 | 2,630 | 2,510 | 5,140 | 48.8 |
| 2006 | 906 | 2,347 | 2,842 | 5,189 | 54.8 |
| 2007 | 1,948 | 5,047 | 1,826 | 6,873 | 26.6 |
| 2008 | 903 | 2,339 | 2,047 | 4,386 | 46.7 |
| 2009 | 2,352 | 6,093 | 2,207 | 8,300 | 26.6 |
| 2010 | 1,256 | 2,277 | 1,234 | 3,511 ^f | 35.1 ^f |
| 2011 | 864 ^g | 1,975 | 1,149 | | |
| 2012 | 996 | 1,803 | 965 ^h | 2,768 | 34.9 |
| Historical Average ⁱ | 1,699 | 4,403 | 7,009 | 11,412 | 57.9 |
| 2008– 2012 Average ^j | 1,491 ^j | 3,512 ^j | 1,520 ^j | 5,168 ^j | 34.0 ^j |

^a Drainagewide escapement estimate calculated by expanding tower counts by 0.41, the average proportion of king salmon migrating into the North River, 1997–1998 (Wuttig 1999) and 2009–2010 (Joy and Reed *In prep*).

^b Harvest includes sport, commercial, and subsistence, assuming 100% of the marine subsistence and commercial king salmon harvest was of Unalakleet River origin.

^c Because marine harvests in the Unalakleet Subdistrict represent mixed stocks, rates presented here may overestimate actual exploitation rate in years when marine harvest is a larger component of the overall harvest.

^d The 1994–2001 average subsistence harvest of 3,041 king salmon was used for 1984–1986 subsistence harvest estimates.

^e Project started late. King salmon escapement underestimated in 1999 and 2001.

^f Lack of or incomplete escapement data from 1987–1995, 1999, 2001, and for 2011 preclude calculation of total run and exploitation rates for those years.

^g King salmon escapement underestimated in 2011 due to poor counting conditions.

^h Sport fish harvest data unavailable for 2012. Combined harvest is subsistence and commercial only.

ⁱ Historical average is from 1984–1986 and 1996–2006, excluding 1999 and 2001.

^j Recent 5-year average North River and drainagewide escapements, total run sizes, and exploitation rates are from 2007–2012, excluding 2011. Recent 5-year average harvest is from 2008–2012.

Table 2.—Subdistricts 5 (Shaktoolik) and 6 (Unalakleet) commercial and subsistence king salmon harvest, Norton Sound District, 1961–2012.

| Year | Shaktoolik (5) | | Unalakleet (6) | | Subdistricts 5 and 6 | |
|------|----------------|-------------|----------------|-------------|----------------------|-------------|
| | Commercial | Subsistence | Commercial | Subsistence | Commercial | Subsistence |
| 1961 | 140 | N.S. | 5,160 | N.S. | 5,300 | N.S. |
| 1962 | 1,738 | N.S. | 5,089 | N.S. | 6,827 | N.S. |
| 1963 | 480 | N.S. | 5,941 | N.S. | 6,421 | N.S. |
| 1964 | 631 | 77 | 1,273 | 488 | 1,904 | 565 |
| 1965 | 127 | 31 | 1,321 | 521 | 1,448 | 552 |
| 1966 | 310 | 142 | 1,208 | 90 | 1,518 | 232 |
| 1967 | 43 | 262 | 1,751 | 490 | 1,794 | 752 |
| 1968 | 61 | 10 | 960 | 186 | 1,021 | 196 |
| 1969 | 33 | 40 | 2,276 | 324 | 2,309 | 364 |
| 1970 | 197 | 43 | 1,604 | 495 | 1,801 | 538 |
| 1971 | 284 | 87 | 2,166 | 911 | 2,450 | 998 |
| 1972 | 419 | 64 | 2,235 | 643 | 2,654 | 707 |
| 1973 | 289 | 51 | 1,397 | 323 | 1,686 | 374 |
| 1974 | 583 | 93 | 2,100 | 313 | 2,683 | 406 |
| 1975 | 651 | 18 | 1,638 | 163 | 2,289 | 181 |
| 1976 | 892 | 24 | 1,211 | 142 | 2,103 | 166 |
| 1977 | 1,521 | 49 | 2,691 | 723 | 4,212 | 772 |
| 1978 | 1,339 | 81 | 7,525 | 1,044 | 8,864 | 1,125 |
| 1979 | 2,377 | 62 | 6,354 | 640 | 8,731 | 702 |
| 1980 | 1,086 | 57 | 4,339 | 1,046 | 5,425 | 1,103 |
| 1981 | 1,484 | 8 | 6,157 | 869 | 7,641 | 877 |
| 1982 | 1,677 | 68 | 3,768 | 913 | 5,445 | 981 |
| 1983 | 2,742 | N.S. | 7,022 | 1,868 | 9,764 | 1,868 |
| 1984 | 1,613 | N.S. | 6,804 | 1,650 | 8,417 | 1,650 |
| 1985 | 5,312 | 298 | 12,621 | 1,397 | 17,933 | 1,695 |
| 1986 | 1,075 | N.S. | 4,494 | 1,339 | 5,569 | 1,339 |
| 1987 | 2,214 | N.S. | 3,246 | N.S. | 5,460 | N.S. |
| 1988 | 671 | N.S. | 2,218 | N.S. | 2,889 | N.S. |
| 1989 | 1,241 | N.S. | 4,402 | N.S. | 5,643 | N.S. |
| 1990 | 2,644 | N.S. | 5,998 | 2,476 | 8,642 | 2,476 |
| 1991 | 1,324 | N.S. | 4,534 | N.S. | 5,858 | N.S. |
| 1992 | 1,098 | N.S. | 3,409 | N.S. | 4,507 | N.S. |
| 1993 | 2,756 | N.S. | 5,944 | N.S. | 8,700 | N.S. |
| 1994 | 885 | 1,175 | 4,400 | 3,035 | 5,285 | 4,210 |
| 1995 | 1,239 | 1,275 | 7,617 | 3,114 | 8,856 | 4,389 |

-continued-

Table 2.–Page 2 of 2.

| Year | Shaktoolik (5) | | Unalakleet (6) | | Subdistricts 5 and 6 | |
|----------------|----------------|-------------|----------------|-------------|----------------------|-------------|
| | Commercial | Subsistence | Commercial | Subsistence | Commercial | Subsistence |
| 1996 | 1,340 | 1,114 | 3,644 | 3,023 | 4,984 | 4,137 |
| 1997 | 2,449 | 1,146 | 9,067 | 4,191 | 11,516 | 5,337 |
| 1998 | 910 | 982 | 6,413 | 4,066 | 7,323 | 5,048 |
| 1999 | 581 | 818 | 1,927 | 2,691 | 2,508 | 3,509 |
| 2000 | 160 | 440 | 582 | 2,429 | 742 | 2,869 |
| 2001 | 90 | 936 | 116 | 2,810 | 206 | 3,746 |
| 2002 | 1 | 1,230 | 4 | 2,367 | 5 | 3,597 |
| 2003 | 2 | 806 | 10 | 2,585 | 12 | 3,391 |
| 2004 | 0 | 943 | 0 | 2,829 | 0 | 3,772 |
| 2005 | 50 | 807 | 101 | 2,193 | 151 | 3,000 |
| 2006 | 0 | 382 | 12 | 2,537 | 12 | 2,919 |
| 2007 | 5 | 515 | 13 | 1,666 | 18 | 2,181 |
| 2008 | 6 | 422 | 65 | 1,402 | 71 | 1,824 |
| 2009 | 4 | 417 | 80 | 1,892 | 84 | 2,309 |
| 2010 | 4 | 327 | 124 | 1,257 | 128 | 1,584 |
| 2011 | 45 | 235 | 124 | 607 | 169 | 842 |
| 2012 | 25 | 214 | 157 | 808 | 182 | 1,022 |
| 2008–2012 Avg. | 17 | 323 | 110 | 1,193 | 127 | 1,516 |
| 1994–1998 Avg. | 1,365 | 1,138 | 6,228 | 3,486 | 7,593 | 4,624 |
| 1989–1998 Avg. | 1,589 | | 5,543 | | 7,131 | |

Note: N.S. refers to no survey. Subsistence harvests collected before 1994 are based on household surveys, but the number of households surveyed is unknown and varied annually, and actual harvests were greater. Averages are not provided for subsistence data prior to 1994 because of missing data.

Table 3.–Unalakleet River king salmon sport fish harvest and catch estimates for 1983–2012.

| Year | King Salmon Catch | King Salmon Harvest |
|-----------------------------|-------------------------|---------------------------|
| 1983 | ^a | 93 |
| 1984 | ^a | 39 |
| 1985 | ^a | 179 |
| 1986 | ^a | 850 |
| 1989 | ^a | 49 |
| 1990 | 361 | 276 |
| 1991 | 375 | 296 |
| 1992 | 476 | 117 |
| 1993 | 2,340 | 382 |
| 1994 | 517 | 379 |
| 1995 | 588 | 259 |
| 1996 | 2,059 | 384 |
| 1997 | 5,144 | 842 |
| 1998 | 1,539 | 513 |
| 1999 | 669 | 415 |
| 2000 | 1,045 | 345 |
| 2001 | 542 | 250 |
| 2002 | 835 | 544 |
| 2003 | 505 | 97 |
| 2004 | 1,930 | 356 |
| 2005 | 431 | 216 |
| 2006 | 2,511 | 394 |
| 2007 | 776 | 147 |
| 2008 | 796 | 580 |
| 2009 | 515 | 248 |
| 2010 | 99 | 61 |
| 2011 | 534 | 53 |
| 2012 | ^a | ^a |
| 2007–2011 Avg. | 544 | 218 |
| 1989–1998 Avg. ^b | 1,489 | 350 |

^a Sport fish harvest and catch data unavailable.

^b Sport fish historical average catch is from 1990–1998. Catch information was not collected prior to 1990.

Table 4.–Subdistricts 5 (Shaktoolik) and 6 (Unalakleet) historical management actions.

| | |
|------|--|
| 1993 | Commercial drift fishing allowed in June so fishermen can avoid fouling their nets with the debris loads in the spring. Chum salmon fishing closed early because of weak run. |
| 1994 | King salmon periods limited to two 24-hour periods per week. Pink salmon fishing opened continuously. There was no fishermen interest in chum salmon. A strong coho salmon run results in record harvest to date. |
| 1995 | Strong king salmon run. Buyer expresses interest in pink salmon and limited interest in chum salmon. Late season coho salmon closure (August 26) to bolster escapement. |
| 1996 | Early run of king salmon. Limited market for chum salmon. Pink salmon fishing opened continuously. Strong run of coho salmon. |
| 1997 | The last year the majority of the king salmon periods were two 48-hour periods per week. Best king commercial harvest of the decade. Limited market for chum salmon. Coho salmon run is below average and season closes on August 23. |
| 1998 | The majority of king salmon periods are now 24 hours in length. Limited market for chum salmon. Pink salmon fishing opened continuously because of large surplus of pink salmon. Subdistrict 5 opened to continuous fishing the last 2 weeks of August to provide flexibility during persistent inclement weather. |
| 1999 | Weak runs of king, chum and coho salmon. Coho salmon commercial fishing restricted to two 24-hour periods per week instead of the normal two 48-hour periods per week. |
| 2000 | Only 2 commercial king salmon fishing periods. Lowest commercial king and chum salmon harvest to date. Pink salmon fishing opened continuously to allow buyer to more effectively direct fleet. Pink salmon catches were below average which was attributed to low volumes of fish and lack of fishing interest. |
| 2001 | Only 2 commercial king salmon fishing periods. Lowest commercial king and chum salmon harvest to date. |
| 2002 | No commercial king or chum salmon fishing because of weak runs. No market interest in pink salmon unless there is a 500,000 pink salmon harvest projection. Coho salmon commercial fishing time reduced to two 24-hour periods per week. Commercial fishing closed on August 19 to protect coho salmon. Sport Fish reduces bag limit to 1 per day from 5 per day. Record low salmon harvest. |
| 2003 | No commercial king or chum salmon fishing because of weak runs. Three-week (July 3–25) subsistence salmon fishing closure to protect king and chum salmon in Shaktoolik and Unalakleet River drainages. Subsistence beach seining for pink salmon is allowed. Unalakleet and Shaktoolik rivers sport fishing closed to the retention of king salmon from July 3 through August 15 and use of bait was prohibited during this period. |

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2004 No commercial king salmon fishing periods.

Unalakleet River drainage closed to salmon gillnet fishing effective July 10. Beach seining is permitted to target large numbers of pink salmon, but closed to the retention of king salmon.

Commercial coho salmon fishing opened on July 26 to the regular schedule of two 48-hour periods per week for the remainder of the season. The season closed on September 7 by regulation.

Sport fishing was allowed in the Unalakleet River, but all king salmon had to be immediately released, effective July 1 through August 3, and the use of bait was prohibited during this period.

2005 Two 24-hour king salmon commercial fishing periods were allowed beginning June 27 and ending June 30. However, king salmon commercial catches were poor, and test fish catches and tower counts also dropped off abruptly in early July. As a result, commercial fishing was not permitted until coho salmon season.

The coho salmon commercial fishing season was opened on July 24 as a result of record test fish catches during the third week of July. The regular schedule of two 48-hour periods per week was in effect for the remainder of the season. The season closed by regulation on September 7.

2006 No commercial king salmon fishing periods.

Unalakleet River test fish catches and North River tower counts of king salmon were well below average. As a result, the fresh and marine waters of subdistricts 5 and 6 were closed to salmon gillnet fishing effective July 10. Beach seining was allowed, but king salmon had to be immediately released.

Coho salmon commercial fishing opened on July 21. Coho salmon catches were well above average to record-setting throughout the season.

Commercial coho salmon fishing extended after the regulatory closure date because of record commercial and test fish catches for the first week of September. The commercial salmon fishing season closed on September 14.

Marine and fresh waters of subdistricts 5 and 6 were closed to sport fishing for king salmon from July 8 through August 15, and the use of bait was prohibited during this period.

2007 No commercial king salmon fishing periods because of weak runs.

On June 16, subdistricts 5 and 6 marine waters placed on subsistence fishing schedule of two 48-hour periods per week and Unalakleet River placed on subsistence fishing schedule of two 36-hour periods per week.

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Table 4.–Page 3 of 6.

- 2007 Subsistence fishing closed to set gillnets in subdistricts 5 and 6 effective July 4. Sport fishery closed July 5. Beach seining allowed for other salmon species during the regularly scheduled periods.
Beach seining for other salmon allowed 7 days a week effective July 16. Also effective July 16, gillnetting reopens 7 days a week in the marine waters and in the Unalakleet River below the confluence of the North River to set gillnets with a mesh size of 6 inches or less.
- Two 24-hour commercial openings directed at chum salmon on July 18 and July 20.
- Subdistricts 5 and 6 placed on commercial fishing schedule of two 48-hour openings per week effective July 22 due to record coho salmon catches during the third week of July.
- Record catches of coho salmon for a single period occurred in Shaktoolik and Unalakleet, causing the processor to be overwhelmed. In response, the department suspended the commercial fishing schedule on August 3 and reduced fishing time to two 24-hour openings per week until August 9. One 48-hour opening was permitted on August 9.
- Commercial fishing schedule of two 48-hour periods per week resumes after August 9 period for remainder of the season.
- 2008 No commercial king salmon fishing periods allowed because of poor runs. Lower river mesh-size restrictions (6 inches or less) imposed on the Unalakleet River, effective June 30, due to anticipated difficulty in reaching escapement goals. Restrictions were timed to coincide with peak migration period of king salmon entering the lower Unalakleet River.
- Managers determine that the king salmon run is weak and exhibiting much later than average timing, indicated by a sharp decline in marine subsistence fishery catches in late June, below-average test fishery catches, and below-average king salmon passage observed at the North River tower in early July. Subsistence fishery closed to set gillnets and sport fishery closed to retention of king salmon on July 5.
- Subsistence salmon fishing with set gillnets reopens in the marine waters of subdistricts 5 and 6 on July 7. From July 8–15, daily pink salmon commercial openings occur, each ranging from 6–8 hours. Effective July 16, all marine and fresh waters of subdistricts 5 and 6 reopens to subsistence salmon fishing with set gillnets 7 days a week, but gillnets are restricted to a mesh size of 6 inches or less.
- Commercial chum salmon fishing occurs from July 17–25, consisting of one 24-hour and two 48-hour periods. Commercial coho salmon fishing schedule of two 48-hour periods per week begins July 27.
- Commercial coho salmon fishing season extended for 1 week beginning September 7 due to record early September test fishery catches.
- 2009 No commercial king salmon fishing periods for fourth consecutive year due to weak runs. Subsistence fishing schedule goes into effect June 15 for subdistricts 5 and 6.

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Lower river mesh-size restrictions (6 inches or less) implemented for the Unalakleet River effective June 29 in order to protect king salmon during their peak migration period in the lower Unalakleet River. Also, 6-year component was forecasted to dominate the age structure of the subdistricts 5 and 6 king salmon run. Mesh-size restrictions were hoped to mitigate some of the effects of a forecasted weak run by allowing larger, more productive individuals to reach spawning areas.

On July 4, king salmon set gillnet subsistence and sport fisheries closed due to below average tower counts. Beach seining allowed 7 days a week for other salmon.

On July 8, one 24-hour commercial pink salmon opening permitted in subdistricts 5 and 6.

Subsistence salmon fishing with set gillnets reopens in the marine waters of subdistricts 5 and 6. Mesh size is restricted to 6 inches or less on July 10. On July 10–16, commercial chum salmon openings occur consisting of four 24-hour periods in subdistricts 5 and 6 with set gillnets restricted to 6 inches or less. On July 16, subsistence king salmon fishery reopens to 7 days a week in the marine waters and all fresh waters, except for the Unalakleet River drainage above the confluence of the North River.

48-hour commercial chum salmon openings occur from July 17–31.

On August 1, Unalakleet River drainagewide coho salmon escapement projected to be well above average. Subdistricts 5 and 6 placed on schedule of two 48-hour periods per week.

Commercial salmon fishing season extended for another full week beginning September 6 due to record-setting coho salmon escapements.

2010 No commercial king salmon fishing periods for fifth consecutive year due to weak runs. Subsistence fishing schedule goes into effect June 15 for subdistricts 5 and 6.

Commercial salmon fishing opens July 2 for one 24-hour period directed at chum salmon (6 inches or less) in the Shaktoolik and Unalakleet subdistricts (southern half of the subdistrict only).

Lower river mesh-size restrictions (6 inches or less) implemented for the Unalakleet River, effective July 5, in order to protect king salmon during their peak migration period in the lower Unalakleet River. Unalakleet and Shaktoolik subdistricts reopened to commercial chum salmon fishing for 48 and 36 hours, respectively. However, northern half of Unalakleet Subdistrict closed to commercial fishing.

July 9, beach seining allowed until July 31 in all fresh and marine waters of subdistricts 5 and 6 to target salmon other than king salmon for subsistence purposes. On July 10, king salmon set gillnet subsistence and sport fisheries closed due to below-average tower counts. Subsistence fishing with set gillnets with a mesh size of 6 inches or less allowed 7 days in the marine waters to target other salmon. Entire Unalakleet Subdistrict and Shaktoolik Subdistrict reopens to commercial chum salmon fishing for 36 hours. On July 12, commercial chum salmon fishing schedules set for subdistricts 5 and 6 for the remainder of the July.

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On August 1, beach seining extended by EO in subdistricts 5 and 6 for another week because of bad drying weather and a late run of pink salmon.

August 1–18, Unalakleet River drainagewide coho salmon escapement projected to be average. Subdistricts 5 and 6 fishery prosecuted using individual 48-hour periods, with some periods extended due to weather. August 19, North River coho salmon escapement goal projected to be achieved. Subdistricts 5 and 6 placed on a commercial fishing schedule of two 48-hour periods per week for remainder of the season.

- 2011 No commercial king salmon fishing periods for sixth consecutive year due to weak runs. Subsistence fishing schedule goes into effect June 16 for subdistricts 5 and 6.

Lower river mesh-size restrictions (6 inches or less) implemented for the Unalakleet River effective July 1 in order to protect king salmon in the lower Unalakleet River.

From July 3–5, Shaktoolik and Unalakleet subdistricts opened to commercial fishing for chum salmon for two 24-hour periods. Northern half of Unalakleet Subdistrict remains closed.

From July 8–12, Shaktoolik and Unalakleet subdistricts reopened to commercial fishing for chum salmon for two 36-hour periods. On July 9, northern half of Subdistrict 6 reopened to commercial fishing.

On July 9, beach seining allowed until August 15 in all fresh and marine waters of subdistricts 5 and 6 to target salmon other than king salmon for subsistence purposes. King salmon set gillnet subsistence and sport fisheries closed due to below-average tower counts. Subsistence fisheries in fresh and marine waters reopened to subsistence fishing 7 days a week with 4.5-inch and 6-inch mesh, respectively.

On July 12, subdistricts 5 and 6 placed on a commercial chum salmon schedule for the remainder of July. Periods range from 48 to 72 hours in duration.

On August 5, Unalakleet River drainagewide coho salmon escapement projected to be average and North River aerial survey SEG projected to be achieved. Subdistricts 5 and 6 placed on schedule of two 48-hour periods per week for remainder of the season; some periods extended due to severe weather.

- 2012 No commercial king salmon fishing periods for seventh consecutive year due to weak runs. Subsistence fishing schedule goes into effect June 24 for subdistricts 5 and 6 due to a very late run.

On June 27, beach seining allowed 7 days a week until August 15 in all fresh and marine waters of subdistricts 5 and 6 to target salmon other than king salmon for subsistence purposes. Beach seining was opened earlier to take advantage of good drying weather.

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From July 2–5, subdistricts 5 and 6 opened to commercial pink salmon fishing with 4.5-inch mesh gillnets for 12 hours. From July 5–16, alternating pink and chum salmon periods set in subdistricts 5 and 6, varying from 12–24 hours in duration for pink salmon and 24–48 hours in duration for chum salmon. Northern half of Unalakeet Subdistrict closed to commercial chum salmon fishing until July 13 to protect king salmon.

On July 11, king salmon set gillnet subsistence and sport fisheries closed due to below-average tower counts. Subsistence fisheries in fresh r and marine waters reopened to subsistence fishing 7 days a week with 4.5-inch and 6-inch mesh, respectively.

On July 18, subdistricts 5 and 6 placed on a commercial chum salmon schedule of two 48-hour periods per week for the remainder of July. Some periods extended as a result of high surf conditions.

On August 9, North River aerial survey SEG projected to be achieved. Subdistricts 5 and 6 placed on schedule of two 48-hour periods per week for remainder of the season; some periods extended due to severe weather.

Table 5.—Unalakleet River drainage king salmon percent exploitation by fishery, 1984–1986 and 1996–2012.

| Year | Exploitation Rate (%) | | | Total |
|-------------------------------------|-----------------------|--------------|------------------|--------------|
| | Commercial | Subsistence | Sport Fish | |
| 1984 ^a | 39.2 | 18.2 | 0.2 | 57.6 |
| 1985 ^a | 64.0 | 16.4 | 0.9 | 81.3 |
| 1986 ^a | 35.6 | 24.5 | 6.7 | 66.9 |
| 1996 | 35.9 | 29.8 | 3.8 | 69.5 |
| 1997 | 36.4 | 16.8 | 3.4 | 56.5 |
| 1998 | 39.0 | 24.7 | 3.1 | 66.9 |
| 1999 | ^b | ^b | ^b | ^b |
| 2000 | 9.6 | 40.0 | 5.7 | 55.3 |
| 2001 | ^b | ^b | ^b | ^b |
| 2002 | 0.1 | 35.0 | 8.0 | 43.1 |
| 2003 | 0.2 | 40.1 | 1.5 | 41.7 |
| 2004 | 0.0 | 46.4 | 5.8 | 52.2 |
| 2005 | 2.0 | 42.7 | 4.2 | 48.8 |
| 2006 | 0.2 | 48.9 | 5.6 | 54.8 |
| 2007 | 0.2 | 24.2 | 2.1 | 26.6 |
| 2008 | 1.5 | 32.0 | 13.2 | 46.7 |
| 2009 | 1.0 | 22.3 | 4.0 | 27.3 |
| 2010 | 3.5 | 29.9 | 1.7 | 35.1 |
| 2011 | ^b | ^b | ^b | ^b |
| 2012 | 5.7 | 29.2 | ^b | 34.9 |
| Historical Average ^c | 21.8 | 32.0 | 4.1 | 57.9 |
| Average 2007–2012 Excluding 2011 | 2.4 | 27.5 | 5.3 ^d | 34.1 |

^a The 1994–2001 average subsistence harvest of 3,041 king salmon was used for 1984–1986 harvest estimates.

^b Exploitation rate could not be estimated because of incomplete run size estimates.

^c Historical average is from 1984–1986 and 1996–2006, excluding 1999 and 2001.

^d Sport fish average exploitation rate is from 2007–2010.

Table 6.—Combined subdistricts 5 and 6 incidental king salmon harvest data compared to commercial chum salmon harvests during directed chum salmon openings, 2007–2012, Norton Sound District.

| Year | Date of First Commercial Opening | Number of Periods | Subdistricts 5 and 6 Combined | | | | | |
|-----------|---|-------------------------|--|------------------------|-----|---------------------------------|----------------------------|---------------------------|
| | | | Incidental King Salmon Harvest Data ^a | | | Total King Salmon Harvest | % of Overall Harvest | Chum Salmon Harvest |
| | | | Caught and Sold | Caught but Not Sold | | | | |
| 2007 | 18-Jul | 5 | 12 | 2 | 14 | 0.12% | 11,820 | |
| 2008 | 17-Jul | 4 | 43 | 17 | 60 | 0.48% | 12,432 | |
| 2009 | ^b 10-Jul | 8 | 0 | 61 | 61 | 0.27% | 22,598 | |
| 2010 | ^b 2-Jul | 9 | 92 | 106 | 198 | 0.33% | 59,884 | |
| 2011 | 2-Jul | 9 | 114 | 33 | 147 | 0.29% | 51,301 | |
| 2012 | ^b 5-Jul | 7 | 0 | 182 | 182 | 0.46% | 39,115 | |
| Totals | | 42 | 261 | 401 | 662 | - | 197,150 | |
| 2007–2012 | | | | | | | | |
| Average | | | 44 | 67 | 110 | 0.32% | 32,858 | |

^a Does not include king salmon caught during the coho salmon fishery.

^b Incidentally-caught king salmon were not purchased by the buyer.

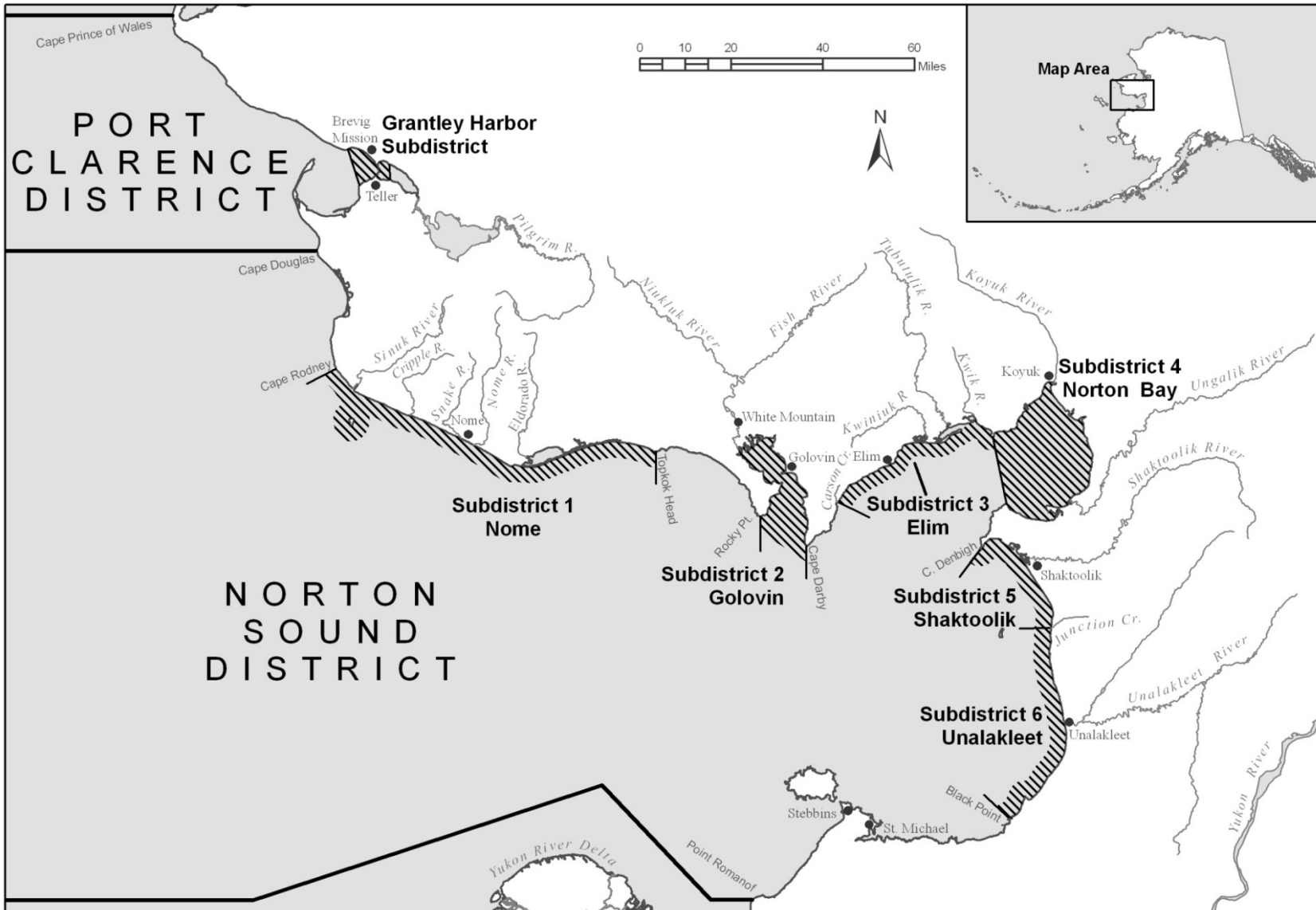
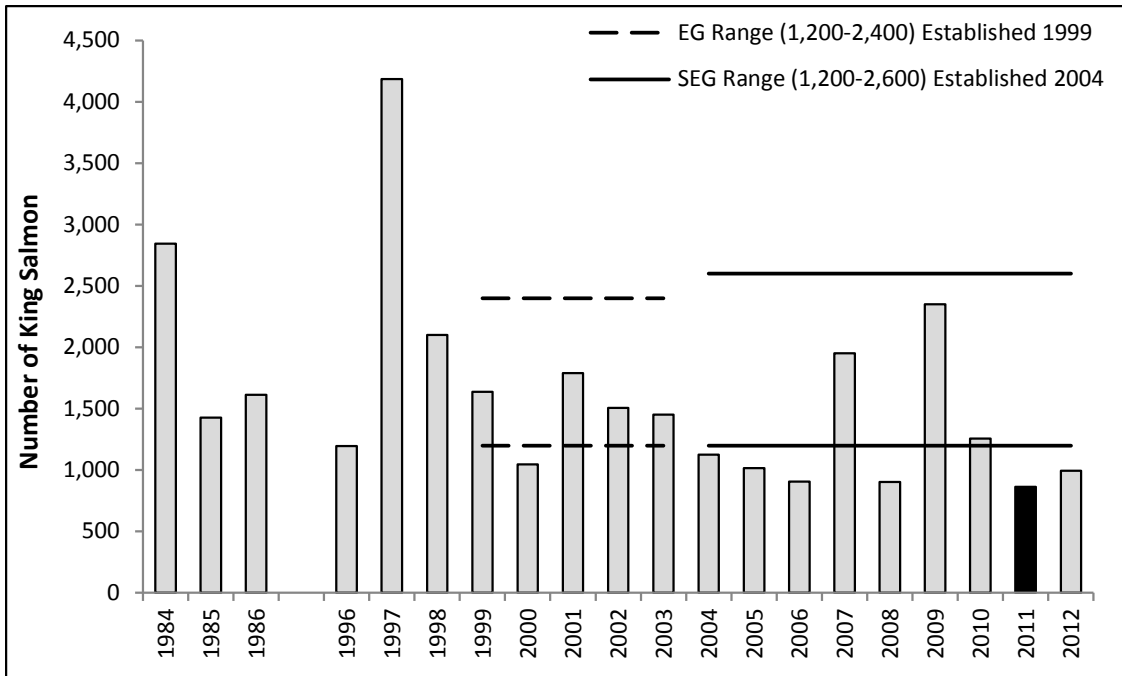
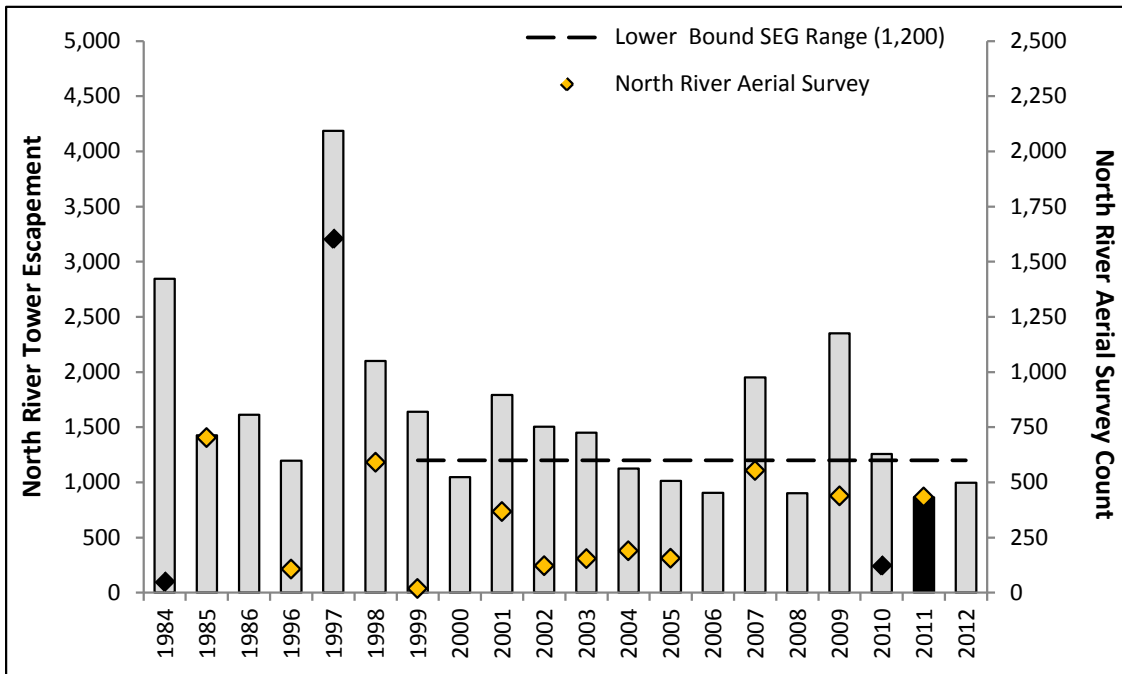


Figure 1.-Salmon commercial fishing subdistricts and rivers in Norton Sound.



Note: The 2011 North River tower count is considered an incomplete estimate of escapement because of poor counting conditions.

Figure 2.—Annual king salmon escapement compared with established escapement goal ranges, 1984–1986 and 1996–2012, North River counting tower, Unalakleet River drainage, Norton Sound District.



Note: Black diamond markers and bars indicate incomplete aerial surveys and tower counts, respectively.

Figure 3.—Annual king salmon North River tower escapement and aerial survey indices compared to the lower bound of the tower-based escapement goal range (1,200), 1984–1986 and 1996–2012, North River, Unalakleet River drainage, Norton Sound District.

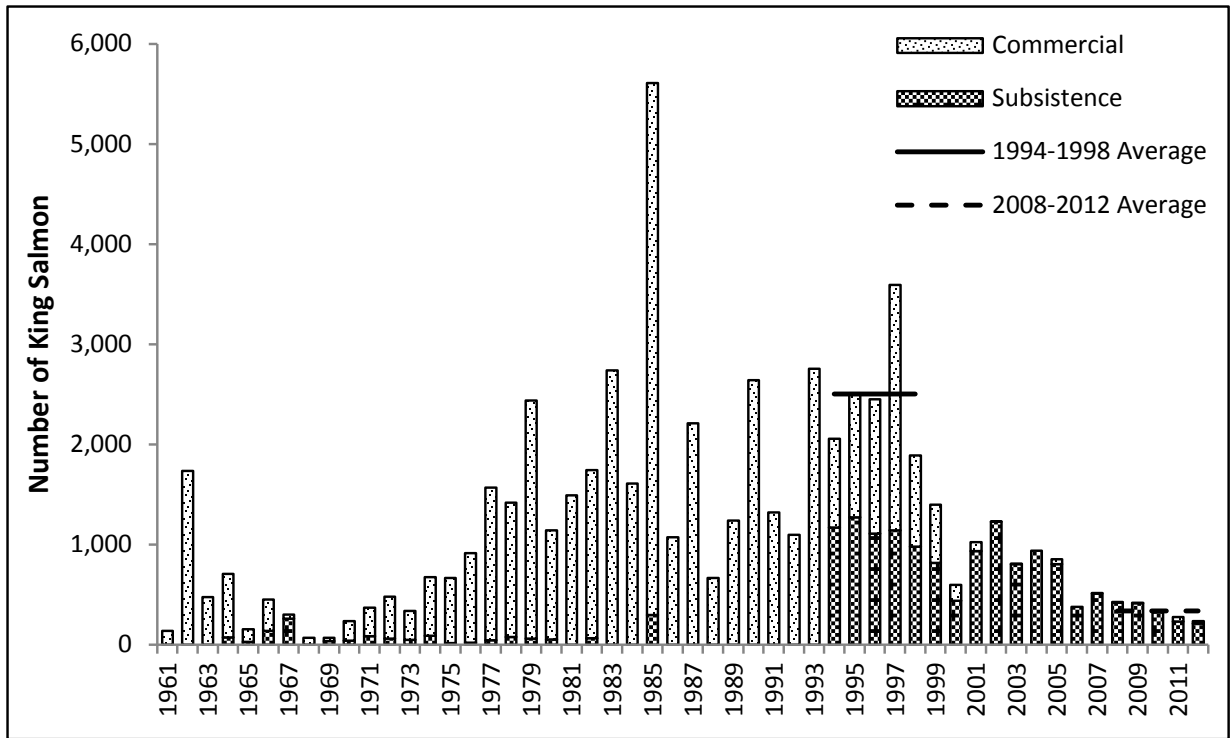


Figure 4.—Subdistrict 5 combined (subsistence + commercial) king salmon harvests, compared to the recent 5-year (2008–2012) and historic (1994–1998) averages, 1961–2012.

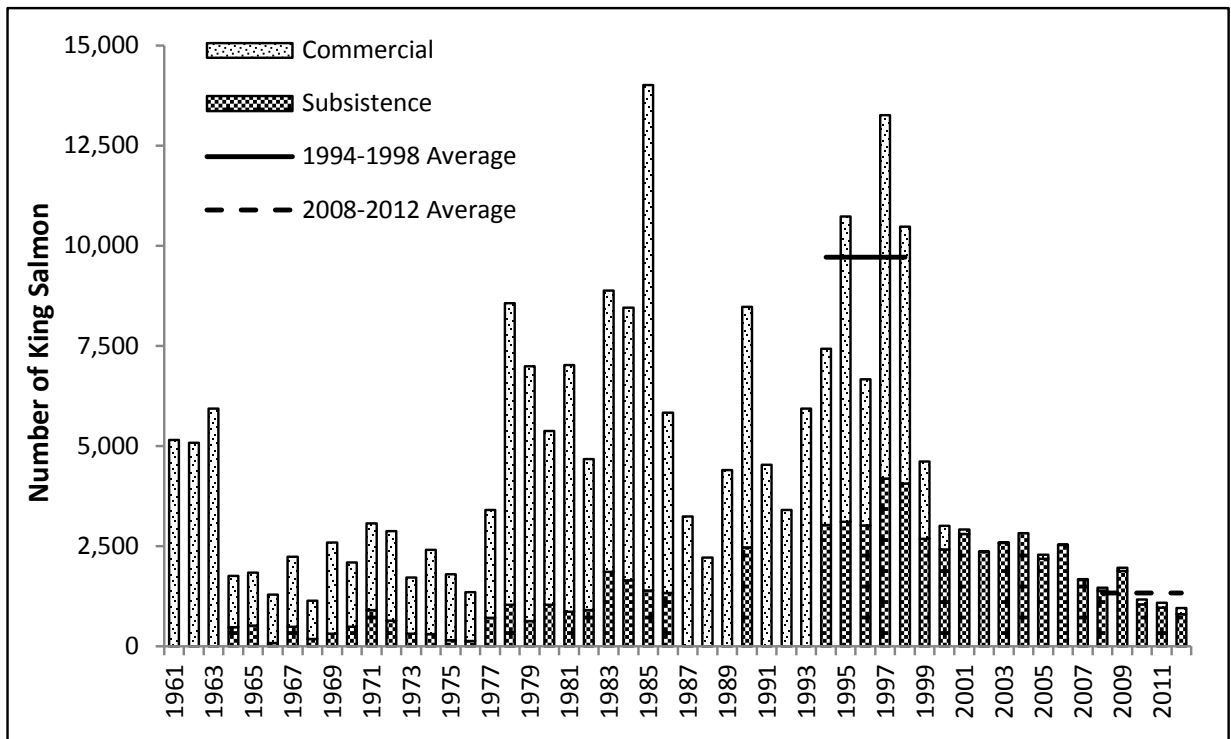


Figure 5.—Subdistrict 6 combined (subsistence + commercial) king salmon harvests compared to the recent 5-year (2008–2012) and historic (1994–1998) averages, 1961–2012.

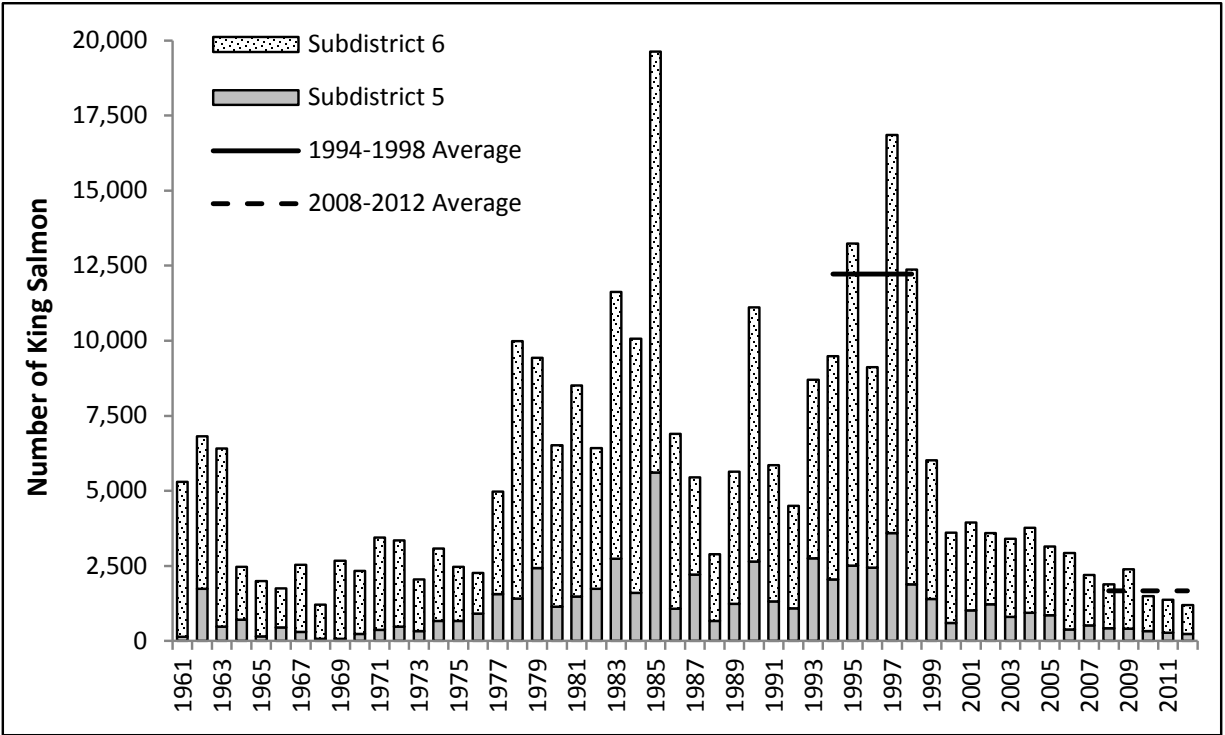


Figure 6.—Subdistricts 5 and 6 combined king salmon harvests, compared to the recent 5-year (2008–2012) and historic (1994–1998) averages, 1961–2012.

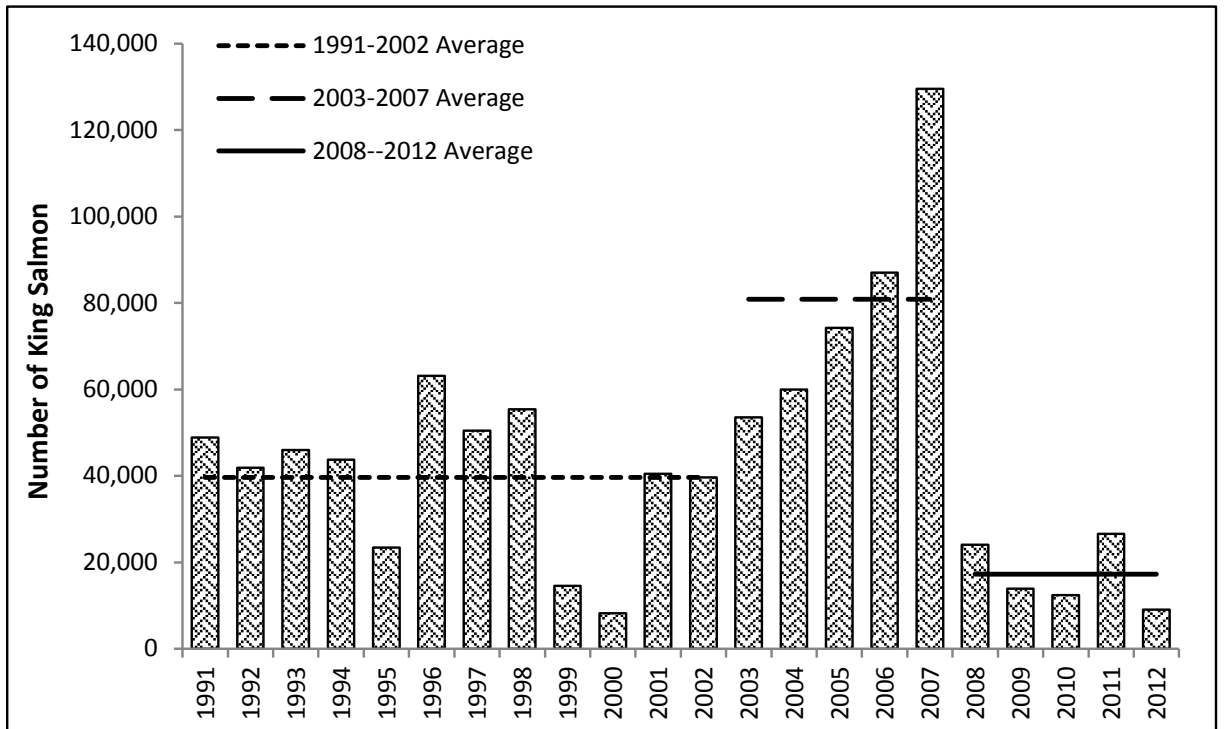


Figure 7.—Estimated annual king salmon bycatch in Bering Sea-Aleutian Islands (BSAI) groundfish fisheries, including the 1991–2002, 2003–2007, and 2008–2012 averages.

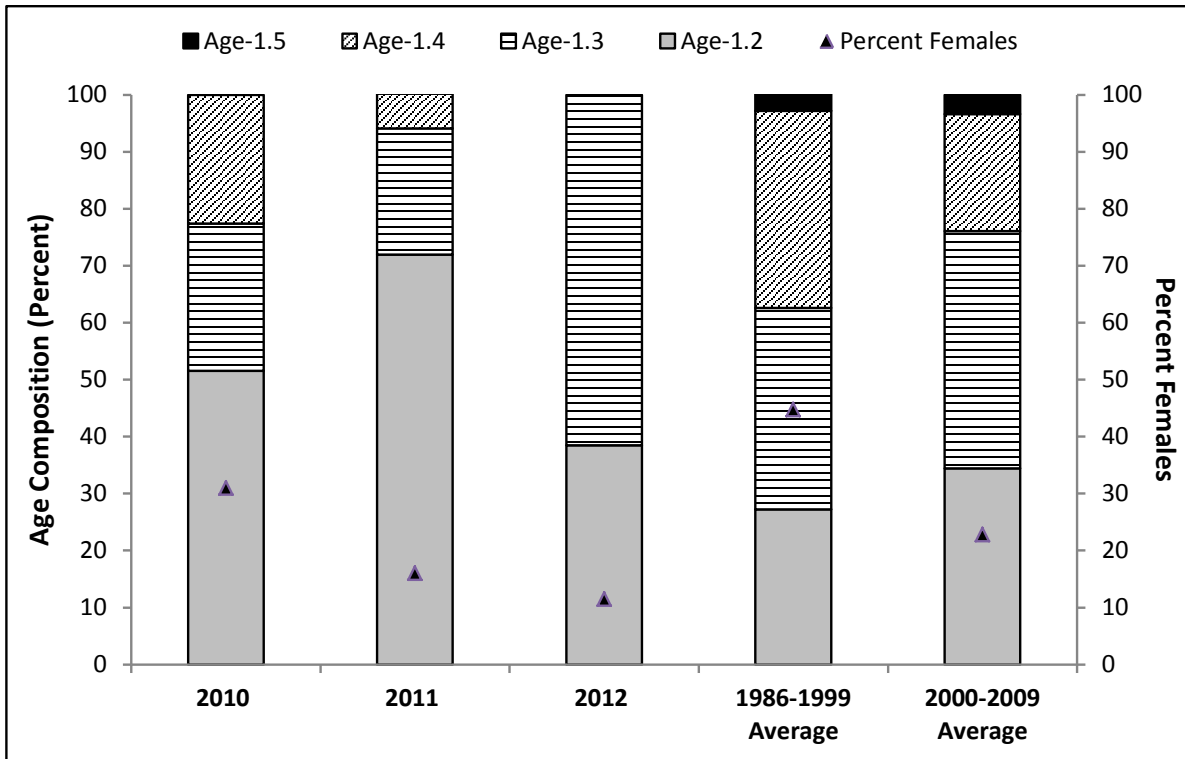


Figure 8.—Comparison of the 2010–2012 king salmon age and sex structure with 1986–1999, and 2000–2009 average age and sex compositions of Unalakleet River test fishery (5 7/8" mesh) samples, 1986–2012.