Run Forecasts and Harvest Projections for 2004 Alaska Salmon Fisheries and Review of the 2003 Season

Edited by
Michael Plotnick
Douglas M. Eggers

Regional Information Report[1] No. 5J04-01

Alaska Department of Fish and Game
P.O. Box 25526
Juneau, Alaska 99802-5526

January 2004

[1] The Regional Information Report Series was established in 1987 to provide an information access system for all unpublished divisional reports. These reports frequently serve diverse ad hoc informational purposes or archive basic uninterpreted data. To accommodate timely reporting of recently collected information, reports in this series undergo only limited internal review and may contain preliminary data; this information may be subsequently finalized and published in the formal literature. Consequently, these reports should not be cited without prior approval of the author or the Division of Commercial Fisheries.

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This report is based on information contributed by Division of Commercial Fisheries biologists located in field offices throughout the state. Hal Geiger, Tim Baker, Linda Brannian, and Patricia Nelson assembled the forecasts and season summaries for their respective regions. Individual credit for forecast material is contained in area forecast discussions in the Appendix. Area biologists throughout the state supplied reviews of the 2003 fishing season.

The editors would also like to acknowledge Amy Carroll for her editorial advice and assistance with the report figures, tables and layout.

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EXECUTIVE SUMMARY

The Alaska Department of Fish and Game expects commercial salmon catches to increase in 2004. The pink salmon (*Oncorhynchus gorbuscha*) harvest is expected to be slightly lower than 2003, while the expected sockeye salmon (*O. nerka*) and chum salmon (*O. keta*) harvests are should be higher than 2003. The 2004 commercial catch all-species projection of 196 million is distributed as 518 thousand Chinook salmon (*O. tshawytscha*), 50.2 million sockeye salmon, 5.1 million coho salmon (*O. kisutch*), 119 million pink salmon, and 21 million chum salmon. Table 1 shows specific projection numbers by species and fishing area. Catch projections generally reflect potential harvests for most of the major sockeye salmon fisheries as well as for large hatchery runs including pink, sockeye, and chum salmon hatchery runs to the Southeast Alaska, Kodiak, and Prince William Sound areas. These projections are based on quantitative projections of next years salmon run, using information on previous spawning levels, smolt outmigrations, returns of sibling age classes, and recent survival rates observed for hatchery releases. However, for other fisheries, including the wild pink salmon fisheries in Southeast Alaska, Prince William Sound, Kodiak, and the South Alaska Peninsula areas, the catch projections are based on averages of recent catch levels that are affected, to some extent, by recent levels of fishing effort. Recent levels of catch have been constrained in many areas by historically low fishing effort, thus catch levels are affected by both market conditions and size of salmon runs. Harvest projections for these fisheries may not be indicative of potential harvest levels. With the exception of the Southeast Alaska Chinook salmon fisheries, Alaskan salmon management will be based on actual observed salmon run strength. Alaska managers have the primary goal of maintaining spawning population sizes—not of reaching preseason catch projections.

At this time last year, department biologists were expecting an all-species commercial catch of 150.9 million for the 2003 season. As it turned out, the all-species catch reached 177 million. In 2003, the overall catch of pink salmon was 123.3 million compared to the preseason projection of 92 million. The overall chum salmon catch was 17.8 million compared to the preseason projection of 23 million. Table 2 shows 2003 harvest numbers by salmon species and fishing area, in units of fish harvested, and Table 3 provides this information in units of pounds harvested.

The 2003 exvessel value of the commercial harvest increased over the 2002 season. The preliminary estimate for the total value of Alaska's 2003 harvest is $195 million, above the $162.5 million for 2002, well below the record harvest value of $726 million in 1988. The recent 10-year exvessel value average (1993 to 2002) of $337 million is below the previous 10-year average (1992 to 2001) of $375 million, and well below the record 10-year average (1986 to 1995) of $503 million.

Look for inseason harvest information, postseason statistics, and other information about salmon in Alaska on the World Wide Web at http://www.cf.adfg.state.ak.us/.

INTRODUCTION

The Alaska Department of Fish and Game's (ADF&G) four major fishery management regions (Southeast, Central, Arctic-Yukon-Kuskokwim, and Westward) are shown in Figure 1. These regions supersede any references to the department's former statistical regions.

Forecasts of runs (catch + escapement) for major salmon fisheries and projections of the statewide commercial salmon harvest have been published every year by ADF&G since 1969 (ADF&G 1969 to 1973, 1975 to 1983; Eggers 1985, 1986; Eggers and Dean 1987, 1988; Geiger and Savikko, 1989 to 1993; Geiger and Simpson 1994, 1995; and Geiger and Frenette 1996 to 1997; Geiger et. al. 1997; Hart et. al. 1998; Geiger and Hart 1999; Scott and Geiger 2000; Geiger and McNair 2001, Eggers 2002, and Eggers 2003. Although the department does not produce formal run size forecasts for all salmon runs in the state, local salmon biologists prepare harvest projections or harvest outlooks for all areas. Projections are based on formal forecasts when they are available. When formal forecasts are not available, local biologists use average historical catches and local knowledge of recent events to develop these outlooks. Projections for the 2003 Alaska commercial salmon harvest, by species and area are found in Table 1. Harvest outlooks for the Arctic-Yukon-Kuskokwim Region are developed as ranges (Appendix B). Trends in total statewide salmon harvests and catch projections in numbers of fish, by species, are found in Figures 2–6. Tables 2–7 provide detailed information on the 2003 harvest.

This report also contains a detailed review of Alaska's 2003 commercial salmon season. This report is released before final catch figures are available in order to provide preliminary information to the Board of Fisheries, the fishing industry, and the public.

Predominant ages and brood years for 2004 salmon runs, by species, are as follows:

	Age of Returning Salmon in Years				
Species	2	3	4	5	6
Pink	2002				
Chum		2001	2000	1999	
Coho		2001	2000		
Sockeye			2000	1999	1998
Chinook			2000	1999	1998

The common and scientific names for Alaska's Pacific salmon species are as follows:

Common (and Vernacular) Names	Scientific Name
Chinook (king)	*Oncorhynchus tshawytscha*
sockeye (red)	*Oncorhynchus nerka*
coho (silver)	*Oncorhynchus kisutch*
pink (humpy, humpback)	*Oncorhynchus gorbuscha*
chum (dog)	*Oncorhynchus keta*

DEFINITIONS OF TERMS

Biological escapement goal	The number of salmon in a particular stock that ADF&G has determined should be allowed to escape the fishery to spawn to achieve the maximum yield (human use). This determination is based on biological information about the fish stock in question. (Also see *optimum escapement goal*.)
Commercial harvest	Harvests of fish that are used for commercial purposes. This includes fish caught by the commercial common property fishery (see below) and by hatchery operators for cost recovery; it excludes sport, subsistence, and personal use harvests.
Commercial common property harvest	Harvests taken by traditional, competitive commercial fisheries (gillnet, purse seine, and troll), as opposed to commercial harvests resulting from hatchery cost recovery, fishing derbies, and sale of confiscated fish.
Common property harvest	Harvests taken by the commercial common property fisheries (see above), as well as the sport, subsistence, and personal use fisheries. This category excludes hatchery cost recovery harvests.
Cost recovery harvest	Harvests of salmon by hatchery operators in specially designated areas to fund the operation of hatcheries and other enhancement activities.
Enhancement of runs	Hatcheries and other means of artificial propagation to create salmon runs or make existing salmon runs larger. Enhancement includes remote fish stocking, fertilization of lakes, and other techniques.
Escapement, spawning population, or brood stock	The portion of a salmon run that is not harvested and survives to reach the spawning grounds or hatchery.
Harvest projections or harvest outlooks	Harvest outlooks are the best available estimates of upcoming harvest levels. Prepared by local biologists, outlooks are based on formal run forecasts, when available. At other times outlooks are based on historical average catches, subjectively adjusted based on recent trends and local knowledge.
Optimum escapement goal	The number of salmon in a particular stock that should be allowed to spawn to achieve sustainable runs based on biological needs of the stock, as well as consideration of social and allocative needs.

Run forecast	Forecasts of a run (harvest + escapement) are estimates of the fish that will return in a given year based on such information as parent-year escapements, subsequent fry abundance, and spring seawater temperatures. Run forecasts are generally thought to be more reliable than harvest outlooks, but run forecasts are provided only for selected areas.
Salmon run	The total number of mature salmon returning in a given year from ocean-rearing areas to coastal waters.
Stock of concern	Through the SSFP process, identification of any salmon stocks, or populations within stocks, that present a concern related to yield, management, or conservation.

PRELIMINARY REVIEW OF THE 2003 ALASKA COMMERCIAL SALMON FISHERIES

Southeast Alaska and Yakutat

The cumulative commercial salmon harvest in Southeast Alaska, by all gear types, totaled 68.1 million fish in 2003 (Table 2 and 4). The harvest of most species increased from the previous year (the sockeye harvest increased by 89%, pink harvest increased by 16%, and chum harvest increased by 49%), while the coho salmon harvest decreased by 23%. The 2003 all-gear Chinook harvest of 418 thousand is the largest commercial harvest of this species since 1953. The coho harvest reached approximately 2.50 million. Even though the sockeye harvest of 1.53 million is almost twice the size of the 2002 catch, this only ranks as the sixth highest commercial harvest for this species in the past ten years. The chum salmon harvest reached approximately 11.1 million. The pink salmon harvest slightly exceeded 52.5 million fish. The downward trend in participation by commercial fishery permit holders continued in 2004. Only 60% of the seine permits, 80% of the drift gillnet permits, and 60% of the set gillnet permits were fished. This trend in reduced fishing effort is affecting the ability of the commercial fleet to harvest the available fish in some areas. The harvest of some species would have been higher had there been more demand for the product.

The current estimate of the 2003 exvessel value (reported wholesale fish-ticket value) of the Southeast Alaska area commercial salmon harvest stands at $52.3 million. This estimate is based on the price reported on fish tickets and does not include post-season price adjustments. The final exvessel value (possibly 10 to 20% higher) will not be known until final processor reports are received and analyzed by the Commercial Fisheries Entry Commission. The current exvessel value estimate was highest for purse seine gear ($19.1 million), followed by troll ($14.8 million), hatchery cost recovery ($9.3 million), drift gillnet ($7.6 million), and set gillnet gear ($1.1 million). An additional $400 thousand was paid for salmon caught at Annette Island and in other miscellaneous fisheries. Overall, the 2003 exvessel value was about 16% over the 2002 estimate of $45 million. Even so, the 2003 estimate is still the second lowest exvessel value in more than 17 years.

The 2003 common property purse seine fishery began with the Deep Inlet terminal hatchery area on June 1. The traditional purse seine fishery opened June 22 in Districts 2 and 12. The harvest (including harvests from both the traditional and the hatchery fisheries) was 55.3 million salmon, distributed as 25 thousand chinook, 681 thousand sockeye, 394 thousand coho, 49.9 million pink, and 4.3 million chum salmon. The purse seine fishery accounted for 95% of the pink salmon and 81% of the total number of salmon harvested in the region.

The drift gillnet fleet accounted for approximately 6% of the total commercial salmon harvest in the region. Drift gillnetters accounted for 17% of the coho and 14% of the chum salmon harvested. The set gillnet landings of sockeye salmon represent 10% of the regional harvest for this species. The exvessel value of the drift gillnet harvest ($7.6 million), and set gillnet harvest ($1.1 million) was split among the 377 driftnet permits and the 104 set gillnet permits that appeared on fish tickets in 2003.

Approximately 1.9 million salmon were harvested in the 2003 Southeast Alaska troll season, which ran from October of 2002 to September of 2003. The harvest included 331 thousand Chinook, 4.6 thousand sockeye, 1.22 million coho, 159 thousand pink, and 286 thousand chum salmon landed by 639 power troll and 257 hand troll permit holders. Of this, 100 thousand salmon (5%) were taken by hand troll gear and 1.8 million salmon (95%) by power troll gear. The Chinook salmon harvest ranked the fourth highest and the coho salmon harvest ranked the seventh highest since statehood. The preliminary estimated Alaska hatchery contribution of Chinook salmon to the troll fishery was 25 thousand fish (7.6%). A total of 333 thousand

coho salmon produced by Alaska hatcheries were harvested by the troll fleet, which accounted for 25.5% of the total troll coho salmon harvest.

The 2003 Yakutat set gillnet fishery produced a cumulative harvest of 282 thousand salmon—considerably below recent averages. The total harvest included 3.8 thousand Chinook, 154 thousand sockeye, 74 thousand coho, 48 thousand pink, and 540 chum salmon. The harvest was worth an approximate exvessel value of $1.13 million to 104 active permit holders. The number of active permits that were fished was 22% below the recent 10-year average, and only 58% of the total setnet permits issued for the Yakutat area. The sockeye harvest was above average in the Situk-Ahrnklin and Alsek Rivers, and below average in all other Yakutat systems. The Situk-Ahrnklin (with a harvest of 84 thousand), the Alsek River (with a harvest of 40 thousand), and Yakutat Bay (with a harvest of 14.4 thousand), altogether produced 90% of the area's sockeye catch. The total coho salmon harvest was 69% below the recent 10-year average. The Situk-Ahrnklin, with a harvest of 72 thousand coho salmon, produced 97% of the area's harvest for this species. The area's Chinook harvest of 3.9 thousand slightly exceeded the recent 10-year average of 3.8 thousand. The Situk-Ahrnklin Inlet (2.3 thousand), the Alsek River (940), and the Akwe River (300), were the top chinook salmon producers. The pink harvest was 13% above the recent 10-year average, whereas the chum harvest of 540 was 69% below the 10-year average. The Situk-Ahrnklin fishery produced most of the pink salmon, which were incidental to the sockeye salmon harvest.

In general, Chinook escapements decreased from 2002 levels, with 8 out of 11 index counts below last year's estimates. Only the Situk, Unuk and Chilkat Rivers had higher escapement estimates in 2003. The biggest declines were in the largest stocks, the Taku and Stikine Rivers, with the Taku River coming in at slightly below the aerial-index escapement goal range. However, preliminary mark-recapture results from the Taku River indicate the escapement was within the goal range. Both big rivers had strong returns of jacks, indicating potentially large runs in the next couple of years. Although the estimated Chinook escapement to the Stikine decreased over 17 thousand fish from the high escapement last year, the escapement was still above the upper end of the escapement goal range. Counts in the Chickamin and Keta Rivers and Andrew Creek declined slightly; however, they were still within or above escapement goal ranges. Escapement counts on the Blossom and King Salmon Rivers were slightly below the lower end of the escapement goal range.

Sockeye salmon escapements across the region were higher than last year's values for many areas (e.g., Hugh Smith Lake, McDonald Lake, Taku River, Chilkoot River, Chilkat River, and several others). The Hugh Smith Lake adult sockeye escapement slightly exceeded the upper end of the recently established biological escapement goal range of 8 thousand to 18 thousand adults. This stock was formally adopted as a *stock of concern* by the Alaska Board of Fisheries in early 2003. The escapement of sockeye salmon into McDonald Lake was estimated to be 89 thousand fish, based on the expanded foot survey index—just above the long-term average for this system. Escapement to Tahltan Lake was above the upper end of the goal range.

Coho salmon escapements in monitored systems were good to excellent throughout Southeast Alaska in 2003.

The pink salmon escapement index ranked 3rd highest since 1960, well above the 1990s average, and very similar to the 2001 parent year escapement index. Escapement indices were above the recently established escapement goals for all three subregions. Escapement indices for all 45 pink salmon stockgroups were within or above management targets, and 29 of 45 were above the 1990s average.

Overall, escapements of chum salmon appeared to be slightly below average. The escapement of chum salmon into Fish Creek at the head of Portland Canal was estimated to be 39 thousand based on

expanded foot survey counts. This is well above the long-term average of 24 thousand, and a continuation of a trend in improving chum salmon escapements in Portland Canal that started around 1997.

Prince William Sound

The 2003 Prince William Sound Area commercial salmon harvest of 58.30 million fish (Table 2 and 5) is the highest on record. The harvest was comprised of 51.1 million pink, 2.84 million sockeye, 3.78 million chum, 502 thousand coho, and 48 thousand Chinook salmon (Table 5). Three fourths of the catch, 43.94 million, was common property harvest and 14.33 million was sold for hatchery cost recovery (exclusive of post egg-take roe sales).

The estimated value of the combined commercial salmon harvest is $44.55 million, including hatchery sales. This estimate is based on the price reported on fish tickets and does not include post-season price adjustments. Therefore, the final exvessel value, possibly 10 to 20% higher than the current estimate, will not be known until final processor reports are received and analyzed by the Commercial Fisheries Entry Commission. During the 2003 season, 514 drift gillnet permit holders reported at least one landing. The drift gillnet catch is valued at $19.3 million, setting the average earnings at $37,599. The set gillnet catch is valued at $0.95 million, setting the average earnings of the 28 participating permit holders at $33.8 thousand. The purse seine fishery was worth $14.2 million for an average exvessel value of $133.9 thousand for the 106 permit holders that participated this year. Revenue generated for hatchery operations (exclusive of post egg-take roe sales) was approximately $10.1 million.

The Copper River sockeye salmon harvest of 1.18 million ranked as the twelfth largest since 1989, but was below the recent 10-year average harvest of 1.56 million sockeye salmon. The harvest of 47.7 thousand Chinook salmon was below the projected harvest and ranked as the seventh largest chinook salmon harvest on record. The coho salmon harvest of 363 thousand ranked as the eleventh largest commercial harvest.

The 2003 inriver goal for salmon passing the Miles Lake sonar site was set at 617.4 thousand salmon, which included 76.8 thousand hatchery surplus salmon. Approximately 701 thousand fish were counted past the Miles Lake sonar. While not finalized, it appears the estimated chinook salmon escapement into upper Copper River drainages was above the minimum escapement objective. A final Chinook salmon spawning escapement estimate will be made once all upriver harvests have been quantified. The sockeye salmon escapement index in the lower Copper River in 2003 was above the lower end of the escapement range. The actual escapement index of 73 thousand fish was 13.5% below the midpoint index goal of 85 thousand. Lower river coho salmon escapement in 2003 was above the midpoint goal of 50 thousand with a peak index count of 72 thousand fish.

The 2003 harvest of 18 thousand sockeye salmon from the Bering River District was near the recent 10-year average of 16 thousand fish. However, the coho salmon harvest of 59 thousand fish fell below the recent 10-year average of 94 thousand fish. Sockeye salmon escapement into Bering River District streams exceeded the midpoint goal of 27.5 thousand with an index estimate of 32.8 thousand sockeye salmon. The coho salmon escapement goal was achieved for the Bering River District with a peak spawning count of 32.4 thousand versus the midpoint goal of 23.0 thousand.

Gillnet fisheries in Prince William Sound primarily targeted enhanced and wild sockeye and chum salmon. In the Coghill District, the gillnet harvest was 726 thousand chum and 162 thousand sockeye salmon. A total of 791 thousand sockeye salmon were harvested by the drift and set gillnet fleets in the Eshamy District. Escapements of sockeye salmon to Coghill and Eshamy Lakes were above escapement goals.

The pink salmon return of 56.86 million to Prince William Sound was well above the 30.27 million fish forecast midpoint and resulted in the largest single season harvest of 51.13 million fish. The ratio of enhanced pink salmon to wild pink salmon in the 2003 total commercial common property harvest was 8:1. An estimated 2.86 million pink salmon escaped into Prince William Sound index streams to spawn which ranks as the second largest escapement since 1965. All districts met or exceeded their escapement goals.

The wild and enhanced chum salmon returns to Prince William Sound were strong with an area-wide chum salmon purse seine harvest of 1.5 million fish. Purse seiners did not target wild chum salmon throughout Prince William Sound due to large abundance of wild and hatchery pink salmon. Enhanced chum salmon returns to the Montague District were less than anticipated. The Port Chalmers remote release site in the Montague District had a harvest of approximately 567 thousand chum salmon, which was less than the preseason catch projection of 990 thousand. Overall, wild stock chum salmon escapement was near or above the midpoint escapement goals in the Eastern, Northern, Coghill, Northwestern and Southeastern Districts (all districts with chum escapement goals). The purse seine fleet harvested 67 thousand coho salmon in 2003, the majority of which came from the Solomon Gulch Hatchery.

Cook Inlet

Upper Cook Inlet

The commercial harvest of nearly 3.8 million salmon (Tables 2 and 5) in Upper Cook Inlet in 2003 was slightly below the average annual harvest since 1960. This was also the highest total salmon harvest since 1997. The exvessel value of $14 million is the highest in the past four years with previous values ranging as high as $120 million. As is the case statewide, prices paid for all salmon, and sockeye salmon in particular, has plummeted, thereby depressing exvessel values even in moderate sized salmon returns as experienced in 2003. Sockeye salmon escapements to most systems were at or above desired levels.

The preseason forecast in 2003 was for a total return of 3.9 million sockeye salmon and a commercial harvest of approximately 2.0 million sockeye salmon from all systems. The actual Upper Cook Inlet harvest of approximately 3.5 million sockeye salmon was 75% more than the preseason projection. Most of this increased harvest was attributable to the Kenai River and the Susitna River where the total return was approximately 1.7 million fish more than forecast. The Upper Cook Inlet sockeye salmon harvest was approximately 11% of the total statewide sockeye salmon harvest in 2003.

The forecasted return to the Kenai River of 2.0 million sockeye salmon resulted initially in an escapement goal target for the Kenai River of 750 thousand to 950 thousand (past the sonar counter at river-mile nineteen). Because the actual total return to the Kenai River was projected to exceed 2 million sockeye, the inriver sonar goal changed to 850 thousand to 1.1 million sockeye salmon as directed by regulation. This was the first year since the abundance-based goals were established that the inriver sonar goal did not change inseason. The commercial fisheries harvesting Kenai River stocks (i.e., drift gillnet and Upper Subdistrict set gillnets) were fished to the maximum extent allowed by regulation.

The remaining monitored systems were all above forecast. The Susitna River sockeye salmon run was above forecast by approximately 54%. The Kasilof River sockeye salmon run exceeded more than one million fish for the first time since 1992.

The 2003 Crescent River sockeye salmon escapement was the second highest escapement ever recorded in this system. The 2003 Fish Creek sockeye salmon run of 175 thousand fish, while one of the smaller runs in the Upper Cook Inlet area, was 50 thousand fish above the forecasted run.

Sockeye salmon prices at the beginning of the season were $0.55 to $0.65 per pound. Typically this price would have risen by the end of the season, but this did not occur in 2003. The total exvessel value in Upper Cook Inlet for sockeye salmon was $14 million, which was 96% of the total Upper Cook Inlet exvessel value for salmon.

The 2003 coho salmon harvest of approximately 100 thousand fish was less than half of the recent 10-year average harvest of 269 thousand fish. Commercial coho salmon harvests in Upper Cook Inlet during the 1980s and early 1990s were much higher than the long-term average due to good coho salmon production, and also due to strong sockeye salmon returns to Upper Cook Inlet, which resulted in more fishing time in the Central District. Since 1996, Board of Fisheries regulations have reduced the fishing time of the drift gillnet fleet in the Central District and eliminated additional fishing time directed at coho salmon surpluses in the Northern District and in the Kalgin Island and Upper Subdistricts of the Central District, which has resulted in marked reductions in the commercial exploitation rate. For systems with escapement goals, the lower end of escapement objectives were generally met or exceeded, and overall run strength appeared to be about average. The exvessel value of coho salmon to the commercial fishery was approximately $134 thousand or 1.0 % of the total Upper Cook Inlet exvessel value.

The 2003 harvest of 49 thousand pink salmon is approximately half of the odd-year average for the last thirty-three years. It is much lower than the long-term average harvest due to restrictions to fisheries to protect other stocks and also due to low participation in the fishery as a result of low prices. Pink salmon escapements are not monitored in Upper Cook Inlet to an appreciable degree. Prices paid for pink salmon were $0.03 to $0.07 per pound, resulting in an exvessel value for this species of $9 thousand, or less than 1% of the total Upper Cook Inlet exvessel value.

The 2003 harvest of 121 thousand chum salmon was below the recent 10-year average harvest of 193.5 thousand fish. The 2003 chum salmon return was much improved from returns seen during the 1990s. Since the flood of 1986, chum salmon production in much of Southcentral Alaska has been poor, with recent harvests well below the 1966 to 2002 long-term average harvest of 530 thousand. Since 1995 and 1996, small improvements have occurred each year, and returns to most of Cook Inlet in 2003 were very good. Fishermen were paid $0.10 to $0.15 per pound for chum salmon, producing an exvessel value of $108 thousand, which is just 0.8% of the overall Upper Cook Inlet fishery value.

The 2003 harvest of 17 thousand Chinook salmon is above the 1966 to 2002 long-term average harvest of 15.1 thousand fish, and above the recent 10-year harvest of 13.6 thousand fish. The two fisheries where Chinook salmon are harvested in appreciable numbers in Upper Cook Inlet are the Northern District and the Upper Subdistrict of the Central District. After experiencing a significant downturn in the early to mid-1990s, Northern District chinook salmon stocks continue to trend sharply upward. Late run Kenai River Chinook salmon returns have been relatively stable and escapement objectives have been consistently achieved or exceeded. In 2003, the exvessel value for Chinook salmon was $296 thousand, which is approximately 2.1% of the total exvessel value.

Lower Cook Inlet

The 2003 Lower Cook Inlet all-species salmon harvest of 1.55 million fish was the fourth lowest during the past decade, representing about 84% of the recent 10-year average of 1.84 million. Although the overall harvest failed to achieve the cumulative preseason forecast of 1.87 million fish, a new record Lower Cook Inlet sockeye salmon catch of over 644 thousand fish was established, surpassing the previous high of 477 thousand sockeye salmon set in 1999. Prices paid for salmon this season yielded an estimated Lower Cook Inlet exvessel value of nearly $2.2 million, making the value of the 2003 harvest about 13% greater than the recent 10-year average and the highest since 1999.

As has been the case for many years, Lower Cook Inlet commercial salmon harvests in 2003 relied heavily on the success of hatchery and enhanced fish production. Over three-fourths of the sockeye salmon harvest in numbers of fish was attributed to lake stocking and fertilization projects, most of which were originally begun by the ADF&G but are currently maintained by Cook Inlet Aquaculture Association (CIAA). These projects were conducted at Leisure and Hazel Lakes in the Southern District, Kirschner Lake in the Kamishak Bay District, and Bear Lake in the Eastern District. Another traditional sockeye salmon enhancement project, conducted by the Nanwalek Salmon Enhancement Project (NSEP) in conjunction with Chugach Regional Resources Commission (CRRC) at English Bay Lakes in the Southern District, contributed an estimated 68 thousand sockeye salmon, or over 10% of the Lower Cook Inlet sockeye salmon total to commercial set gillnet and hatchery cost recovery harvests this season.

Additional fish resulting from this project were also harvested in local subsistence fisheries. Pink salmon production from Tutka Hatchery, now operated by the Cook Inlet Aquaculture Association, was below projections, with an overall estimated return of 751 thousand fish, representing only about two-thirds of the preseason projection. An estimated 41% of the total salmon catch was taken by the Cook Inlet Aquaculture Association and Port Graham Hatchery Corporation (PGHC) as hatchery cost recovery to support the sockeye salmon lake stocking programs and Tutka and Port Graham Hatchery operations, equating to approximately 16% of the exvessel value of the 2003 Lower Cook Inlet salmon fishery.

The record sockeye salmon harvest of 644 thousand fish accounted for over 40% of the Lower Cook Inlet commercial salmon harvest in total numbers of fish, which is considerably greater than the traditional proportion for that species, while providing about 90% of the exvessel value of the entire salmon fishery this season. The 2003 Lower Cook Inlet commercial sockeye salmon harvest was characterized by strong returns to virtually all systems, especially enhanced systems. The exception to this trend occurred at Bear Lake in Resurrection Bay of the Eastern District, where the enhanced sockeye salmon return fell far short of the preseason forecast. Natural sockeye salmon returns to all systems within the management area were considered good, with all four systems achieving their respective sustainable escapement goals (SEG), while the two systems with both natural and enhanced production also attained their desired inriver returns.

The 2003 returns of pink salmon, usually the dominant species in numbers of commercially harvested salmon in Lower Cook Inlet, were considered excellent; although the overall catch of 857 thousand was the third lowest commercial harvest during the last 10 years and only about half the average catch during that time period. The majority of the catch this season was taken in the Southern District as a direct result of Tutka Hatchery production, but 90% of this district's total, or about 508 thousand fish, was utilized for hatchery cost recovery by the facility.

An additional 286 thousand pink salmon, not accounted for in commercial catch totals, were taken for hatchery brood stock purposes by the Tutka and Port Graham Hatchery facilities. The estimated overall Tutka Hatchery return, including escapement into Tutka Creek, brood stock, commercially harvested fish, and sport harvest, was 751 thousand pink salmon, falling short of the preseason projection of over 1.1 million fish. The 2003 estimated survival rate of less than 1% was one of the lowest on record and considered well below the potential for this facility. At Port Graham Hatchery, the return was also much poorer than expected, with an estimate of approximately 83 thousand fish (94% taken for broodstock), representing just over half of the preseason forecast.

Naturally produced pink salmon contributed just over one-third of the area-wide harvest of that species this season. The Outer District produced the greatest contribution of wild pink salmon to Lower Cook Inlet catches, with a total harvest of approximately 282 thousand fish. Over 90% of the Outer District harvest was taken by directed effort in Port Dick and Windy Bay Subdistricts, with the remainder

coming from East Nuka Subdistrict primarily as incidental harvest during the sockeye salmon fishery there. On the west side of Lower Cook Inlet in the Kamishak Bay District, despite excellent pink salmon returns to Brown's Peak and Sunday Creeks, a weak pink harvest of 12 thousand fish was all taken as incidental catch during directed efforts targeting Kirschner Lake sockeye salmon. Pink salmon returns to virtually all remaining systems within the management area were considered good to excellent, and pink salmon sustainable escapement goals at all major systems throughout Lower Cook Inlet were achieved.

The 2003 commercial chum salmon harvest of nearly 36 thousand fish, which was about 40% greater than the recent 10-year average, maintained a four-year trend of relatively strong catches in Lower Cook Inlet. The harvest was not surprising based on the recent pattern of comparatively strong returns and concurrently good escapements, especially to systems in Kamishak Bay. Virtually the entire Kamishak District harvest, totaling 30 thousand chum salmon this season, was taken in the northern end of the district by effort targeting the exceptional Cottonwood Creek return. The remainder of the Lower Cook Inlet harvest came as incidental catch during other directed effort, primarily in the Southern District. All chum salmon systems achieved their sustainable escapement goals as a result of the reasonable returns, including McNeil River in the Kamishak Bay District, which attained its escapement goal for only the fifth time in the past 14 years.

The 2003 commercial harvest of 11 thousand coho salmon was the highest Lower Cook Inlet total for this species since 1998, nearly equaling the average catch during the past ten years. As is typical, the majority (just over 50%) of the harvest came as a combination of hatchery cost recovery operations at Bear Lake and entries into the Seward Silver Salmon Derby, both in Resurrection Bay of the Eastern District, with the remainder split between set gillnetters (20%) and seiners (28%) in the Southern District. Because the coho salmon resource in Lower Cook Inlet, and assessment of it, is limited, commercial coho salmon harvests can sometimes be used to gauge coho salmon run strength. However, market conditions in recent years have discouraged directed effort, making the incidental commercial harvest of this species an unreliable indicator. Sport and personal use harvests generally provide the best indicators of run strength. Despite the reasonably good commercial catches, returns during 2003 were only considered average to slightly better than average. Two aerial surveys were flown for coho salmon assessment at the head of Kachemak Bay, indicating good escapement into Clearwater Slough, the major index stream.

The harvest of Chinook salmon, not normally a commercially important species in Lower Cook Inlet, was the second lowest harvest for this species over the past decade at 1.2 thousand fish and was also shy of the 20-year average of 1.4 thousand. Virtually the entire catch came from the Southern District and can be primarily attributed to enhanced production at Halibut Cove Lagoon. Set gillnetters accounted for about three-fourths of the Lower Cook Inlet Chinook catch, slightly less than the normal proportion for that gear group, with purse seiners taking the remaining 25%.

Bristol Bay

The inshore run of sockeye salmon of approximately 26.5 million fish was the seventh smallest inshore run in over 20 years. The inshore run was 28% below the 20-year average of 36 million and approximately 10% above the preseason forecast of 24 million fish. The Nushagak, Naknek-Kvichak, and Togiak Districts all had sockeye salmon runs that were higher than preseason forecasts, while the Egegik sockeye salmon run was 47% below and the Ugashik District 20% below the forecast, respectively. The Naknek River run was approximately 33% higher than its preseason forecast. The commercial harvest of 14.9 million (Table 5) sockeye salmon was 11% below the 16.8 million preseason forecast. A total escapement of approximately 11.6 million sockeye salmon was achieved.

The commercial harvest of approximately 44 thousand Chinook salmon was the eight smallest catch in the last 20 years and 43% below the 20-year average of 77 thousand. It was, however the largest harvest in five years. The chum salmon harvest totaled approximately 807 thousand fish, which is 20% below the 20-year average of 1 million fish. The pink salmon harvest of 178 fish is about what is expected for odd numbered years. The coho salmon harvest of approximately 43 thousand fish was 69% below the 20-year average of 137 thousand fish.

The 2003 harvest of all salmon species in Bristol Bay totaled approximately 15.8 million fish (Tables 2 and 5). The estimated exvessel value of the 2003 Bristol Bay salmon fisheries totaled $47.69 million, which is the third lowest exvessel value in over 20 years. It is 62% below the 20-year average exvessel value of $125.35 million.

The 2003 season was the sixth year of managing for a sockeye salmon harvest allocation between drift and set gillnet gear groups in four of the five districts in Bristol Bay; Togiak District is excluded from the allocation plan. There is no provision in regulation for meeting an allocation percentage between the gear types in the Naknek River Special Harvest Area fishery.

Sockeye salmon runs to the Egegik and Ugashik Districts were less than forecast while Naknek-Kvichak, Nushagak and Togiak Districts all exceeded forecasted returns. Escapements in the Egegik, Ugashik, Nushagak, Wood, and Igushik Rivers fell within their escapement goal ranges. The Togiak escapement exceeded the upper end of its biological escapement goal (BEG) range. The Kvichak River escapements did not reach the lower end of its biological escapement goal range.

The Naknek-Kvichak sockeye salmon harvest of approximately 3.35 million fish was the fifth smallest harvest for this system since 1983 and well below the average of 9.22 million fish. The Egegik District sockeye salmon harvest of 2.28 million fish was the smallest catch in the last 20 years and 73% below the 20-year average of 8.42 million fish. The Ugashik District harvest of approximately 1.74 million sockeye salmon was the seventh smallest since 1983 and was 40% below its 20-year average. The Nushagak District harvest of 6.79 million sockeye salmon was the third largest harvest ever recorded for the district, and was 82% below the 20-year average. The Togiak District sockeye salmon harvest of approximately 711 thousand fish was the fifth largest in 20 years and was 63% above the 20-year average of 463 thousand fish.

The 2003 Kvichak River drainage forecast of 2.58 million sockeye salmon did not allow much surplus salmon for harvest. As a result the Naknek River Special Harvest Area, the Egegik Special Harvest Area, and the Ugashik reduced fishing area were placed in effect on June 26. The Naknek/Kvichak and Egegik Districts stayed at their reduced fishing areas for the entire season. The Ugashik District's fishing area was reduced through June 28.

The first commercial opening in the Nushagak was on June 13. The Nushagak District total sockeye salmon harvest was 6.79 million. The Naknek/Kvichak District harvest was second at 3.35 million, and the Egegik harvest at 2.28 million was third. The Eastside districts in 2003 accounted for half of the total harvest.

The Chinook salmon harvests in all Bristol Bay districts were below average. There were two directed chinook salmon fishing periods in the Nushagak District resulting in approximately 40 thousand Chinook salmon landed. Other chinook salmon catches were primarily incidental to targeting sockeye salmon. The Portage Creek sonar count of 80 thousand Chinook salmon was 7% above the 75 thousand fish Nushagak River escapement goal.

The total Bristol Bay chum salmon harvest of 807 thousand fish was well below the recent 20-year average of 1 million. All of the districts except Nushagak produced harvests below their 1983 to 2002 average catch. The Nushagak harvest of 606 thousand chum salmon was 51% above its 20-year average of 402 thousand fish. Escapements counts ranged from above average in the Nushagak and Alagnak Rivers, to below average in the Egegik and Ugashik Rivers.

Coho salmon runs to all Bristol Bay districts were weak in 2003. The bay-wide coho salmon harvest of approximately 43 thousand fish was 69% below the 10-year average of 137 thousand fish. The Egegik District harvest of 41 thousand was 21% above its 20-year average of 34 thousand fish. Coho salmon escapement data are still being compiled.

Kuskokwim Area

The total 2003 commercial salmon harvest for the Kuskokwim Area was 463 thousand fish, (Tables 2 and 6) a run stronger than expected, but 42% below the 10-year average of 796 thousand fish. Low salmon prices, below average effort, limited fishing time, and limited processor capacity characterized the 2003 season. However, salmon run strength allowed subsistence use throughout all drainages of the Kuskokwim Area.

The Kuskokwim Area chinook salmon harvest of 16 thousand fish was nearly 50% below the recent 10-year (1993 to 2002) average of 32 thousand fish. A sockeye salmon harvest of 63 thousand fish was recorded, which was 47% below the recent 10-year average (1993 to 2002) of 121 thousand fish. Fishermen harvested 36 thousand chum salmon, 82% below the recent 10-year average (1993 to 2002) of 197 thousand fish. The coho salmon harvest was 347 thousand, 20% below the recent 10-year average (1993 to 2002) of 435 thousand fish.

During the 2003 fishing season no commercial fishery was directed at Chinook, chum, or sockeye salmon in the Kuskokwim River. Due to an early and strong coho salmon run, a directed commercial coho salmon fishery opened on July 30. The final opening of the season was September 1 to 3. The 2003 salmon harvest for each species was below the recent 10-year average.

Within the Kuskokwim drainage, the Aniak and Kogrukluk River escapement goals were met. Coho and sockeye salmon escapements at the Kogrukluk River weir were at historically high levels.

Quinhagak, District 4 within Kuskokwim Bay, opened to commercial salmon fishing on June 14. The Chinook salmon harvest of 14 thousand fish was 28% below the recent 10-year average; the sockeye salmon harvest of 33 thousand fish was 38% below the recent 10-year average; the incidental chum salmon harvest of 28 thousand fish was 40% below the recent 10-year average; and the coho salmon harvest of 50 thousand fish was 4% below the recent 10-year average. Approximately 128 thousand coho salmon were counted through the Kanektok River weir. Chinook, sockeye, and chum salmon aerial surveys within the Kanektok River drainage indicated that Chinook and sockeye salmon escapement goals were achieved.

Goodnews Bay, District 5 within Kuskokwim Bay, opened on June 24 to provide for a directed harvest of sockeye salmon. Commercial salmon fishing was closed during most of June to protect Chinook salmon. The Chinook salmon harvest of a little over one thousand fish was 40% below the recent 10-year average. Chinook salmon escapement, as monitored through the Middle Fork Goodnews River weir, was 2.4 thousand, which was 32% below the escapement goal of 3.5 thousand salmon. The sockeye salmon harvest of 29 thousand fish was 15% below the recent 10-year average. The Middle Fork Goodnews River escapement of 44 thousand sockeye salmon well exceeded the escapement goal of 25 thousand sockeye salmon. The incidental chum harvest of five thousand fish was 54% below the recent 10-year

average, but the chum salmon count through the Middle Fork Goodnews River weir of 21 thousand fish exceeded the escapement objective of 15 thousand fish. The coho salmon harvest of nearly 13 thousand fish was 31% below the recent 10-year average. Coho salmon escapement of 53 thousand fish at the Middle Fork Goodnews River weir was well above the five-year average of 23 thousand. An escapement goal for coho salmon has not been established for the Middle Fork Goodnews River.

Only 438 of the 841 Kuskokwim Area permit holders participated in the commercial salmon fishery in 2003. The exvessel value of the harvest was $0.88 million, 59% below the recent 10-year average exvessel value of $2.2 million. The average exvessel earning per permit holder was $2 thousand, below the most recent 10-year average value of $2.9 thousand.

Yukon Area

The 2003 Yukon River commercial salmon harvest of 88 thousand (Table 6) fish was the fourth lowest harvest since statehood (1959). The total commercial harvest, including the estimated harvest to produce roe, was 40 thousand chinook salmon, 11 thousand summer chum salmon, 11 thousand fall chum salmon, and 25 thousand coho salmon for the Alaskan portion of the Yukon River drainage.

Chinook salmon roe sales totaled 30 pounds; no roe was sold from summer chum salmon. While the 2003 Chinook salmon harvest was the best since 1997 and nearly twice the 2002 harvest, it was 52% below the recent 10-year average (1993 to 2002) harvest of 84 thousand Chinook salmon. The summer chum salmon harvest was 96% below the recent 10-year average harvest of 275 thousand fish. Due to the lack of markets, the summer chum salmon harvest occurred incidental to fishing directed at Chinook salmon, except for two directed chum salmon commercial fishing periods in District 6.

A total of 582 permit holders participated in the Chinook and summer chum salmon fishery during 2003, which was 18% below the recent 10-year average of 712 permit holders.

A total of 556 permit holders fished the summer season in the Lower Yukon Area in 2003, which was 12% below the recent 10-year average of 632 permit holders. In the Upper Yukon Area, 26 permit holders fished, which was 71% below the recent 10-year average of 88 permit holders.

Yukon River fishermen in Alaska received an estimated $1.9 million for their Chinook and summer chum salmon harvest in 2003, approximately 57% below the recent 10-year summer season average of $4.5 million but slightly higher than the value of the 2002 harvest average prices paid. The exvessel value of the Lower Yukon Area fishery of $1.9 million is 53% below the recent 10-year average of $4.0 million. The average income for Lower Yukon Area fishers that participated in the 2003 fishery was $3,365. The exvessel value of the Upper Yukon Area summer season fishery of $47 thousand is 89% below the recent 10-year average of $416 thousand. The average income for Upper Yukon Area fishers that participated in the 2003 fishery was $1,781.

In 2003, the Chinook salmon run was much stronger than anticipated. Because of the unexpected run strength, and conservative management, an estimated commercial surplus of up to 40 thousand Chinook salmon was not harvested. Chinook salmon escapements throughout the drainage were adequate although the Koyukuk River escapement was slightly lower than desired levels. The upper end of chinook salmon escapement goals was exceeded in the Chena and Salcha Rivers. The Canadian escapement objective of 28 thousand was exceeded with the largest escapement in history of almost 50 thousand fish.

The 2003 summer chum salmon run was similar to the previous two years but below preseason expectations. Overall chum salmon escapement appeared to be adequate when using Pilot Station sonar

passage estimate of 1.2 million fish to assess the run. However, the Anvik River (believed to contribute approximately 50% of the summer chum salmon run) and East Fork Andreafsky River escapements were below the low end of the escapement goal ranges.

The 2003 fall commercial fishing season for fall chum and coho salmon has become sporadic with commercial fishing occurring in only five of the past ten years, because of very poor runs. The 2003 commercial season was managed conservatively based on the trend of low fall chum salmon abundance, which resulted in a late developing fishery.

The Yukon Area estimated commercial harvest for fall chum and coho salmon was approximately 77% below the recent 10-year average of 48 thousand fall chum salmon and 74% above the recent 10-year average of 14 thousand coho salmon. Market conditions and limited buying capacity accounted for the low harvest of fall chum and coho salmon throughout the drainage.

The preliminary 2003 commercial fall chum and coho salmon season exvessel value for the Yukon Area was $33 thousand ($24 thousand for the Lower Yukon Area, 59 thousand for the upper Yukon Area). The previous 10-year commercial fall chum and coho salmon seasons combined values for the Yukon Area averaged $88 thousand ($62 thousand for the Lower Yukon Area, $27 thousand for the Upper Yukon Area).

In the previous ten fall seasons, an average of 128 permit holders fished the fall chum and coho salmon fishery (118 for the Lower Yukon Area, 10 for the Upper Yukon Area) as compared to 82 fisherman (75 for the Lower Yukon Area, 7 for the Upper Yukon Area) who participated in 2003.

The abundance of fall chum salmon was much greater than expected. However, the significant improvement of the return was not detected until late in the season due to the difficulty with inseason assessment during both summer and fall season. Once commercial surpluses were identified, limited markets became a factor in opening the fishery. The fall chum salmon drainage wide escapement goal was met in 2003. The fall chum salmon run to the Porcupine River was weak; however escapement goals were met for the remainder of the river systems which have escapement goals. In particular, the Canadian Yukon River mainstem interim escapement goal of >65 thousand was achieved along with the goal of >80 thousand fall chum salmon. Additionally, the biological escapement goal for the Tanana River fall chum salmon stock was exceeded.

The coho salmon run in the Yukon Area was exceptional in 2003. The late opening of the commercial fishery resulted in a low harvest. The Delta-Clearwater River was well above the minimum escapement goal of 9 thousand coho salmon with an estimated return of 103 thousand fish. This level of return is more than eleven times the minimum escapement goal and more than one and a half times the previous record set in 1994.

Norton Sound Area

(Actual harvests confidential because only one processor operated)

The 2003 commercial harvest in the Norton Sound Area was the second lowest on record. There were no Chinook or chum salmon directed periods and harvest of these species was incidental during the coho fishery. The chum salmon run to eastern Norton Sound was below average, but the run was much better than the chum salmon run in northern Norton Sound. The Chinook salmon harvest was 99% below the recent 5-year and 10-year averages. The chum salmon harvest was 58% below the recent 5-year average and 82% below the 10-year average. The coho harvest was 21% below the recent 5-year average and 58% below the recent 10-year average. There was no buyer for pink salmon in 2003.

The commercial season opened in eastern Norton Sound on July 31 to target coho salmon with a test period reduced to 24 hours duration compared to the normal 48 hours duration for coho salmon. A series of fishing periods were announced, each one separately, with reduced fishing time. Commercial fishing effort and catches continued to be low and even with the reduced effort, the catch per unit of effort (CPUE) continued to be below average. There were two fishing periods in September and the commercial season was closed on September 8.

The Norton Sound Salmon District has 180 active CFEC salmon permits. A total of 104 permit holders renewed their permits for the 2003 season, but only 30 actually fished during the 2003 season. The recent 5-year average was 57 permits fished and the recent 10-year average was 85 permits fished. The exvessel value of the fishery remains low, and was 49% below the recent 5-year average and 77% below the recent 10-year average.

Kotzebue Area

The 2003 Kotzebue Area commercial salmon harvest marked a slight increase compared to 2002, but was still the second lowest harvest and participation on record. The fishery continued to be capacity limited because of weak salmon marketing conditions and lack of buyers. Because of the limited fishing effort the season was open continuously from July 11 until it closed by regulation on August 31. The 2003 chum salmon harvest was 78% below the recent 5-year average. The exvessel value of the fishery was 85% below the recent 5-year average. The total permits fished were 93% below the recent 5-year average effort. There are 183 active permits for the Kotzebue Area.

The overall chum salmon run to Kotzebue Sound was estimated to be below average to poor in abundance based on the lower CPUE and the Kobuk test fish index being below average. Age composition from the test net catches showed a weak return of 4-year-old fish.

Kodiak Management Area

The 2003 Kodiak Management Area (KMA) commercial salmon fishery began on June 5 and the last commercial landing occurred on September 19. Commercial fishing effort was low for the sixth consecutive year, though slightly higher than the record low participation in 2002. Of the 598 eligible Kodiak commercial salmon permits, only 305 made commercial landings. Ninety-six permits were not renewed for the 2003 season. By gear type, 160 out of 188 set gillnet and 145 out of 377 purse seine permit holders fished; there was no participation by beach seiners again in 2003. Purse seine effort was the lowest since limited entry was implemented; while 145 seiners made at least one delivery during the season, the highest seiner participation was in June and early July, when about 125 permits were active.

Approximately 19.64 million salmon (Tables 2 and 7) were harvested in the KMA by commercial gear, which was below the previous 10-year (1993 to 2002) average of 22.79 million salmon. Of the total salmon harvested in 2003, Alaska Department of Fish and Game (ADF&G) commercial test fisheries took just over one thousand salmon, and just under 25 thousand salmon were retained from commercial catches for the permit holder's own use (taken but not sold). Subsistence or sport fishery salmon harvests will not be known until late spring of 2004, after permits and questionnaires are returned to the department. Commercial harvests for all species (19.62 million) were reduced by many factors, including early or unusual migration timing, strong runs and low effort, poor market conditions for some species (low price or suspended buying), limited tender service to some areas, poundage limits, required daily delivery, and processors restricting their fleets to specific areas.

The 2003 KMA Chinook salmon harvest of 18.6 thousand was about 2 thousand fish less than the previous 10-year average (1993 to 2002) and below forecast (20 thousand). There are two Chinook systems on Kodiak, Karluk and Ayakulik. The commercial catch in the Inner and Outer Karluk Sections included about 1.4 thousand Chinook salmon. There were no fisheries near the Ayakulik River. The total KMA chinook salmon escapement (25.5 thousand) was much greater than the aggregate escapement goal (8.4 to 16.9 thousand), but only about 1 thousand fish greater than the previous 10-year average. Chinook salmon escapement into the Karluk River appeared weak early in the season, but the final escapement (7.3 thousand) achieved the escapement goal (3.6 to 7.3 thousand). The Ayakulik River chinook salmon run was strong. With no commercial fisheries, the escapement (17.6 thousand) exceeded the goal (4.8 to 9.6 thousand)

The 2003 sockeye harvest (4.04 million) was well above forecast (2.14 million) and above the 10-year average (3.49 million). Average weight was 5.4 pounds, which is about average. The commercial sockeye harvests associated with the Karluk Lake system were particularly good, during both the early run (forecast 429 thousand, estimated harvest 1.02 million) and the late run (forecast 399 thousand, estimated harvest 1.56 million). The strong Karluk run led to a record amount of fishing time along the west side of Afognak and Kodiak Islands. West side fisheries were open almost continuously beginning June 5 (there were only 5 days when the fishery was closed in July). Despite this intensive fishery, Karluk sockeye salmon escapement for both the early (448 thousand) and late (631 thousand) runs exceeded escapement goals (150 to 250 thousand and 400 to 550 thousand, respectively).

Alitak sockeye salmon systems (Frazer and Upper Station) produced better than expected runs. During fisheries targeting Frazer Lake sockeye salmon, the commercial harvest (forecast 43 thousand, estimated harvest 95 thousand) and escapement (263 thousand, goal 140 to 200 thousand). The Upper Station early-run sockeye salmon harvest (24.2 thousand) was less than projected (forecast 100 thousand) but the escapement (76.2 thousand) exceeded the escapement goal range (25 thousand to 75 thousand). During fisheries targeting late Upper Station sockeye salmon, the commercial harvest (forecast 61 thousand, estimated harvest 222 thousand) and escapement (201 thousand, goal 150 to 200 thousand) also exceeded expectations. For the second year, the Ayakulik Lake sockeye salmon run was weak (forecast 26 thousand, harvest 100). The escapement (198 thousand) basically achieved the goal (200 to 300 thousand).

Harvests associated with supplemented sockeye production from Kodiak Regional Aquaculture Association (KRAA) stocking projects were also above projections, including Spiridon (forecast 426 thousand, estimated harvest 631 thousand), Waterfall (forecast 32 thousand, estimated harvest 51 thousand), and Foul Bay (forecast 37 thousand, estimated harvest 51 thousand). Saltery Lake sockeye salmon production was strong again (escapement 58 thousand, goal 15 to 30 thousand), with continuous fishing beginning June 21 (no forecast, estimated harvest 44 thousand). The Buskin Lake sockeye salmon run was strong, with the escapement (24 thousand) exceeding the goal (8 to 13 thousand). There are typically very limited commercial fishery opportunities for Buskin sockeye salmon. The Buskin is the primary subsistence harvest area the city of Kodiak, and the subsistence harvest will be high, though catch records will not be available until next year. Other minor sockeye systems were also strong, including Lake Rose Tead (Pasagshak), and the Malina and Little River systems. The Litnik (Afognak Lake) sockeye salmon run was weak for the third consecutive year. No commercial or sport fisheries were allowed near the Litnik system and, as occurred last year, the subsistence fishery in the adjacent marine waters was closed by joint emergency action by state and federal subsistence managers. Sockeye salmon runs to both Barabara and Uganik Lake systems initially appeared weak, but later escapement surveys documented fair to good escapements.

The Cape Igvak sockeye salmon fishery harvest (estimated harvest 135 thousand), was much less than expected (forecast 324 thousand), despite a record amount of fishing time. This may have been partly

due to weaker than forecast Chignik sockeye salmon runs, but also due to unusual migration patterns for Chignik-bound sockeye salmon. The 2003 Cape Igvak catch represented approximately 11.6% of the total harvest of sockeye considered to be Chignik bound, well below the allocated 15%. The North Shelikof sockeye salmon fishery was very good. Harvest caps are used to limit the interception of sockeye salmon that may be bound for Cook Inlet that may pass through that area. The north Mainland, Northwest Afognak, and Shuyak fisheries were restricted to inshore waters on July 8, when the catches were estimated to reach the 15 thousand sockeye salmon harvest cap. The Southwest Afognak fishery was restricted on July 16, when the harvest was expected to reach the 50 thousand sockeye salmon cap. This was only the third time since the plan began (1990) that the Southwest Afognak cap has been met and the fishery has been restricted. The Alitak Bay fishery also has allocative guidelines for the sockeye salmon harvest in four sections. Cape Alitak seiners harvested 24.7% (allocation range 38% to 44%), and the setnetters in Alitak Bay took 27.6% (allocation range 18% to 24%), in Moser Bay took 34.5% (allocation range 16% to 22%), and in Olga Bay caught 13.2% (allocation range 16% to 22%).

The coho salmon harvest (340 thousand) was below the forecasted potential harvest (514 thousand), but slightly above the 10-year average (346 thousand). Average weight of the catch was 7.5 pounds, about a half-pound below average. Coho harvest was limited by effort, with very few fishermen actually targeting wild coho runs. Estimated escapement (123 thousand) exceeded established goals (55.3 to 94.3 thousand) The Kitoi Bay Hatchery contribution of 145 thousand coho salmon was near the forecast (154 thousand).

The total pink salmon harvest (14.07 million) was within the forecast range (11.2 to 19.9 million), but below recent odd-year averages (1993 to 2001; 23.29 million). Average weight was about 3.5 pounds, which was about average. Wild stock pink salmon harvests were fair to good (actual 8.54 million; forecast 6 to10 million), though harvests were limited by market conditions. Overall, pink salmon escapement (5.10 million) exceeded the goal (1.00 to 3.02 million). The Kitoi Bay Hatchery (KBH) pink salmon harvest was also good (5.53 million) though only near the lower end of the forecast (5.2 to 9.9 million). There were significant pink salmon harvests in adjacent areas that were probably KBH pink salmon, including about 396 thousand from sections to the west, and 634 thousand from sections to the east and north. Additional Kitoi bound pink salmon were likely taken along the west side of Kodiak and Afognak Islands, but the actual harvest is unquantifiable. There was a cost recovery fishery near the hatchery, with Kitoi pink salmon harvested and sold by KRAA. The cost recovery fishery harvested approximately 1.58 million pink salmon (5.80 million pounds).

The KMA chum salmon harvest (1.15 million) was near the forecast (1.23 million) and above the 10-year average (804 thousand). Chum salmon escapement (381 thousand) was within the escapement goal range (273 to 819 thousand). The Kitoi Bay Hatchery contributed 466 thousand chum salmon, which was below forecast (533 thousand) but still a record harvest. Overall average weight was about 7.2 pounds, which is about a half-pound below average. The Sturgeon chum salmon run was weak again this year (0 harvest), but late chum salmon catches were excellent at Kukak (136 thousand) and Gull Cape (7.8 thousand).

The estimated total exvessel value of the 2003 fishery was approximately $16.68 million, well below the 1993 to 2002 average exvessel value of $29.14 million. The estimated exvessel value is based on inseason price estimates and will increase as final processor reports are submitted. The inseason values may not reflect additional payments made to fishermen for dock deliveries, RSW, iced fish, or other settlements. Additional post-season payments may add over $3 million to the KMA exvessel value.

Purse seine fishermen accounted for 85.2% of the total number of salmon harvested and averaged approximately $81.4 thousand per fished permit. This is an increase from the 2002 estimated average exvessel value, but is less than the previous 10-year average exvessel value for purse seiners of $88.7

thousand. Set gillnet fishermen accounted for 14.8% of the total number of salmon harvested and averaged approximately $30.5 thousand per fished permit. This was an increase from last year, but still less than the 1993 to 2002 set gillnetter exvessel average of $44.9 thousand.

Chignik Management Area

The 2003 Chignik Management Area (CMA) sockeye salmon fishing season was characterized by below average runs of sockeye salmon to the Black Lake system, as well as to the Chignik Lake system, compared to the 1983 to 1992 and 1993 to 2002 averages. The first commercial salmon fishery opened on June 4; the last reported landing was on September 15. This was the second season of the CMA purse seine cooperative fishery management plan. A cooperative fleet of 77 CMA permit holders formed to harvest salmon during the 2003 salmon season. Twenty four CMA permit holders who chose not to join the cooperative fleet were identified as the competitive fleet. A total of 44 Commercial Fisheries Entry Commission seine permits were actively fished in 2003 (20 cooperative fleet and 24 competitive fleet).

Due to deteriorating market conditions and the weak strength of the second run, one local processor stopped purchasing salmon during the third week of August and the other stopped processing salmon during the first week of September. One floating processor purchased salmon until September 15, when the cooperative fleet ceased all commercial fishing activities. Although salmon surplus to the September 1–15 escapement objective was available for harvest, neither fleet fished after September 15. Overall, the 2003 season provided 85.6 days of fishing opportunity for the cooperative fleet and 18.0 days for the competitive fleet to target sockeye salmon. Eleven days of fishing opportunity for both fleets was provided to target pink and chum salmon in the Western and Perryville Districts. The CMA was open to commercial fishing for 104 days and fishing activity occurred on 102 of those days. Fifty percent of the sockeye salmon harvest within the CMA occurred from June 4 through July 7.

In 2003, the Chinook salmon harvest of 2.7 thousand fish was below the 10-year 1993 to 2002 average of 4.9 thousand fish but was almost twice the 2002 harvest. This was below the 2003 forecast of 3.3 thousand fish.
The 2003 total sockeye salmon harvest was 1.09 million salmon. This was below the forecast (1.77 million) and below the 10-year (1993 to 2002) average of 1.62 million salmon. Of all the sockeye salmon harvested in the CMA (excluding department test fisheries and salmon retained for subsistence), the cooperative fleet harvested 760 thousand fish (69.5%; allocation 69.3%) and the competitive fleet harvested 334 thousand fish (30.5%; allocation 30.7%).

The 2003 total coho salmon harvest was 104 thousand salmon, which was less than the forecast (156 thousand) and the 10-year average (1993 to 2002) average of 156 thousand. The 2003 total pink salmon harvest was 502 thousand salmon, which was just over half of both the forecast (942 thousand) and the 10-year (1993 to 2002) average of 942 thousand salmon. The 2003 total chum salmon harvest was 64 thousand salmon, which was well below the forecast of 163 thousand salmon and the 10-year (1993 to 2002) average of 163 thousand salmon and was the second lowest harvest since 1985 (excluding the 1989 harvest when the Exxon Valdez oil spill occurred).

The exvessel value of the 2003 fishery was $5.7 million, which is the second lowest value since 1975 and 48% below the 1993 to 2002 10-year average of $11.0 million. The total value of the harvested salmon was worth $57 thousand per active CMA permit holder.

The Chignik weir was operational from May 28 until September 4. High water conditions at the end of May delayed the installation of the weir. Escapements were estimated by video weir counts on the Chignik River and by aerial surveys for all other streams. Sockeye salmon escapement goals, and interim

inseason objectives, were more accurately attained in 2003 than in previous years (including 2002), largely due to the ability to control daily harvests of both the cooperative and competitive fleets.

The 2003 Chinook salmon escapement to the Chignik River system was 6.4 thousand salmon, which was above the minimum goal of 1.45 thousand salmon and the 10-year (1993 to 2002) average escapement of 3.4 thousand salmon.

Sockeye salmon escapement to the Chignik lakes system from May 28 through August 31 was 607 thousand salmon with postseason analysis apportioning 350 thousand to the Black Lake run (goal 350 to 400 thousand through August 31) and 257 thousand to the Chignik Lake run (goal 225 to 250 thousand through August 31). The total September 1–30 estimated sockeye salmon escapement was 77 thousand salmon, thus the total escapement including the postweir estimate, was 684 thousand salmon. Other species enumerated through the Chignik River weir included 7.6 thousand coho, and 1.9 thousand pink

The 2003 CMA pink salmon escapement goals were met in four of the five CMA districts. The pink salmon district-wide escapement goal was not met in the Perryville District. The 2003 CMA chum salmon escapement goals were met in four of the five CMA districts. The chum salmon district-wide escapement goal was not met in the Chignik Bay District. Aerial surveys of CMA salmon streams indicated that the local pink salmon runs were strong while some localized chum salmon runs were weak and barely met, or did not meet, escapement objectives. The timing of the 2003 pink and chum salmon runs appeared to be one week earlier than historical averages. As a result of a minimal snow pack from the winter of 2002/2003 and the lack of rain, most streams experienced low water conditions from June through August. The low water conditions significantly reduced salmon spawning habitat in many streams. All species were adequately surveyed except coho salmon.

Alaska Peninsula–Aleutian Islands

South Alaska Peninsula Area

The 2003 commercial salmon fishery along the South Alaska Peninsula began on June 10, when a fishing period for all legal gear types was announced. The last landing occurred on October 10. A total of 194 permit holders participated during the 2003 season, down from 199 permit holders in 2002. The total South Peninsula harvest of approximately 2.7 thousand Chinook salmon in 2003 was 2.3 thousand less than the projection of 5 thousand fish. The sockeye salmon catch of 1.05 million was about 0.55 million less than the forecast of 1.6 million fish. The coho salmon catch of about 131 thousand was 69 thousand less than the projection of 200 thousand fish. The pink salmon harvest of approximately 4.26 million was 1.76 million more than the projection of 2.5 million fish. The total South Peninsula chum salmon catch was 637 thousand, 213 thousand less than the forecast of 850 thousand fish. The total exvessel value of the South Peninsula fishery, including the $1.4 million derived from the June fishery, was $4.7 million which is slightly more than the exvessel value in 2002 of $3.9 million. In 2003, sockeye salmon contributed $3.31 million, pink salmon $0.82 million, chum salmon $0.41 million, coho salmon $0.16 million, and Chinook salmon $0.01 million.

South Alaska Peninsula June Fishery

The total June salmon harvests in numbers of fish for the South Unimak and Shumagin Islands fisheries were approximately 1.3 thousand Chinook, 453 thousand sockeye, 200 coho, 218 thousand pink, and 282 thousand chum salmon. The South Unimak harvest was approximately 400 Chinook, 336 thousand sockeye, 90 thousand pink, and 121 thousand chum salmon. The Shumagin Islands harvest was approximately 1 thousand Chinook, 117 thousand sockeye, 128 thousand pink, 200 coho, and 161 thousand chum salmon.

Southeastern District Mainland Fishery

Based on the Chignik Management Area (CMA) sockeye salmon harvest, the Southeastern District Mainland (SEDM) opened to commercial salmon fishing for 24 hours at 11:00 PM on June 9. Between June 17 and July 25, the fleet fished outside the Northwest Stepovak Section (NWSS) during three 24-hour periods. The estimated SEDM sockeye salmon harvest, considered Chignik bound through July 25, was 70 thousand fish. This constituted 6.7% (6.0% allocation) of the total Chignik bound sockeye salmon harvest through July 25.

Beginning July 1, the NWSS of the SEDM was managed on the basis of a strong Orzinski Lake sockeye salmon run and a sockeye salmon harvest in the CMA of at least 600 thousand fish. Thirteen fishing days (four days per week) were allowed in the NWSS through July 25. Orzinski Bay was open continuously from July 2 through July 25. The sockeye salmon harvest in the NWSS from July 1–25 was 135 thousand fish. Orzinski Lake sockeye salmon escapement reached interim escapement goals throughout the season. The weir enumerated 52 thousand adult sockeye salmon prior to August 1, surpassing the 20 thousand adult salmon escapement goal.

South Peninsula Post-June Fishery

Prior to the South Peninsula post-June fishery, the ADF&G conducted a test fishery for immature salmon in the Shumagin Islands. Test fishery results on July 2 and 3 indicated that the number of immature salmon was below the regulatory threshold (100 per set) at 27 and 63 immature salmon per set respectively. The Shumagin Islands fishery was opened to seine and gillnet gear on July 6. The Shumagin Islands purse seine fishery was closed on July 9 when the harvest of immature salmon increased to above the threshold. The purse seine fishery was reopened on July 20 when the harvest of immature salmon in the test fishery dropped below the threshold. Inseason monitoring of the seine fishery after July 20 showed that the harvest of immature salmon remained below the threshold for the remainder of the season.

Fishing effort continued to be well below normal during the post-June fishery. Fishermen did not generally fish for pink and chum salmon aggressively because of low prices. The South Peninsula (excluding SEDM during July 1–25) post-June Chinook salmon harvest of 1 thousand was approximately half the 1993 to 2002 average of 2.1 thousand fish. The sockeye salmon harvest of 379 thousand was 69% of the 1993 to 2002 average of 547 thousand fish. The coho salmon harvest of 129 thousand was 62% of the 1993 to 2002 average of 208 thousand fish. During the period of July 22–31, a total of 44.4 thousand coho salmon were harvested in non-terminal areas and applied to the 60 thousand fish cap. The pink salmon harvest of 3.9 million was 64% of the 1993 to 2002 average of 6.1 million fish. The chum salmon harvest of 343 thousand was 49% of the 1993 to 2002 average of 696 thousand fish.

The South Peninsula reopened to commercial fishing on September 1. No fishing effort occurred outside of the Southeastern District. Fishing time in the Southeastern District was based on coho salmon harvest rates. Coho harvest CPUE was generally well above average. The cumulative fall fishery harvest (September 1 to October 10) was 57.6 thousand sockeye, 27.9 thousand coho, and 600 chum salmon. The sockeye harvest was slightly below the 1993 to 2002 average of 58.3 thousand fish. The coho salmon harvest was 4.7 thousand above the previous 10-year average. There was little interest by the industry in purchasing South Peninsula coho salmon and the harvest would have been much larger if market conditions were more favorable. The fall South Peninsula chum salmon harvest was the lowest since 1981.

South Peninsula Escapements

The South Peninsula estimated total escapement of 198 thousand sockeye salmon was above the escapement goal of 67 to 124 thousand fish and was the highest on record. The South Peninsula indexed

total pink salmon escapement of 5.51 million was far above the upper end of the odd-year goal range (1.6 to 3.3 million fish). The South Peninsula indexed total chum salmon escapement of 477 thousand fish was near the upper end of the goal (347 to 693 thousand fish). A total of 182 thousand coho salmon were documented in 80 South Peninsula streams. Some of the major coho salmon systems were not surveyed or surveyed during off-peak times due to inclement fall weather.

North Alaska Peninsula

In 2003, 139 permit holders (4 of which were Area T permit holders) participated in commercial salmon fisheries along the North Peninsula which began on June 10. In comparison, during 2002, 138 Area M and 2 Area T permit holders participated. The last landing during 2003 was made on September 12. The North Peninsula fishery is predominantly a sockeye salmon fishery, although depending on market conditions, directed Chinook, chum, and coho fisheries occur in some locations. During even-numbered years, pink salmon are targeted in select locations if abundance is high and market conditions are favorable.

The Chinook salmon harvest of about 4.5 thousand fish was slightly more than half of the 8 thousand fish projection. The sockeye salmon harvest of 1.48 million fish was 120 thousand fish below the harvest projection of 1.6 million. The pink salmon harvest of 18.6 thousand fish was above the projection of 10 thousand fish. The coho harvest was 53.9 thousand fish, which was slightly above the 50 thousand fish projection. If market conditions were favorable, the coho salmon harvest would have been much larger. Due to low prices, there was little fishing effort directed toward North Peninsula chum salmon, resulting in a harvest of 39 thousand fish, which was about half of the 80 thousand fish harvest projection.

The 2003 Chinook salmon harvest was slightly above the 2002 harvest, but was well below the previous 10-year average of 8.7 thousand fish. The sockeye salmon harvest was slightly higher than in 2002, but was only 69% of the 1993 to 2002 average. The coho salmon harvest was the highest since 2000 but was well below the 1993 to 2002 average of 102 thousand fish. The pink salmon harvest was slightly above the 1993 to 2002 odd-numbered year average of 17 thousand fish. The chum salmon harvest was approximately 42% of the previous 10-year North Peninsula harvest and the lowest harvest since 1975.

The total exvessel value of the 2003 North Peninsula fishery was $4.7 million. This was $1.1 million above the exvessel value in 2002.

North Peninsula Escapement

The total North Peninsula indexed Chinook salmon escapement was 11.1 thousand fish, which was near the upper end of the escapement objective range (7.4 to 14.8 thousand fish). The North Peninsula sockeye salmon escapement was estimated to be 1.23 million fish. Systems with weirs (Bear, Nelson, Sandy and Ilnik) accounted for 69% of North Peninsula sockeye salmon escapement. The total North Peninsula escapement objective range is approximately 440 to 640 thousand sockeye salmon. All sockeye salmon system escapement goals were met or exceeded. The North Peninsula coho salmon run was at least moderately strong. The bulk of the run escaped due to low prices and a lack of processor interest in purchasing coho salmon. Approximately 338 thousand coho salmon were documented in 36 North Peninsula streams during 2003. This escapement figure is lower than the actual total because some streams were not surveyed. The North Peninsula pink salmon escapement was at least 20 thousand fish. The North Peninsula is normally a minor pink salmon producer. The North Peninsula indexed total chum salmon escapement was 448 thousand fish, which was near the upper end of the 346 thousand to 692 thousand fish goal.

Aleutian Islands and Atka–Amlia Islands Areas

In 2003, no commercial salmon harvests were reported from the Aleutian Islands and Atka–Amlia Islands Areas. Pink salmon runs on Unalaska Island were apparently not strong enough and the price too

low to attract any fishing effort. However, analysis of the limited data available indicates that escapements were very good for an odd-numbered year.

An unusually strong sockeye salmon run occurred at McLees Lake. A total of 102 thousand sockeye salmon were counted through a US Fish and Wildlife Service weir that operated from May through July 28.

PRELIMINARY FORECASTS OF 2004 SALMON RUNS TO SELECTED ALASKA FISHERIES

ADF&G prepares forecasts for salmon runs that affect major fisheries around the state. Salmon runs to be forecasted are selected using several criteria, including economic importance, feasibility, compatibility with existing programs, and management needs. For the 2004 fishing year, forecast fisheries are as follows:

Southeast	—	pink salmon
Prince William Sound	—	pink, chum, and sockeye salmon
Copper River/ Copper River Delta	—	sockeye salmon
Upper Cook Inlet	—	sockeye salmon
Lower Cook Inlet	—	pink salmon
Kodiak	—	pink salmon
Upper Station Lakes	—	sockeye salmon
Frazer Lake	—	sockeye salmon
Ayakulik River (early and late)	—	sockeye salmon
Spiridon Lake	—	sockeye salmon
Karluk Lake (early and late)	—	sockeye salmon
Chignik	—	sockeye salmon
Bristol Bay	—	sockeye and Chinook salmon
Alaska Peninsula, Bear Lake	—	sockeye salmon
Alaska Peninsula, Nelson River	—	sockeye salmon

A variety of information was used to make salmon run forecasts. In most cases the principal indicator of future abundance is the escapement magnitudes of parental stocks. Other information that might have been considered includes spawning stock distribution, smolt outmigration levels, returns to date from sibling age classes of the projected return, and environmental conditions. A range of run possibilities are predicted for each forecasted fishery. In general, based on past experience, the actual run can be expected to fall within the range (between the lower and upper limits) less than half the time. Please see the appendices for further details.

Catch projections based on quantitative forecasts of salmon runs generally reflect potential harvests and are made for most of major sockeye salmon fisheries as well as for large hatchery runs including pink, sockeye, and chum salmon hatchery runs to the Southeast Alaska, Kodiak, Prince William Sound areas. However, for other fisheries, including the wild pink salmon fisheries in Southeast Alaska, Prince William Sound, Kodiak, and the South Alaska Peninsula areas, the catch projections are made based on recent catch levels and are reflective of recent levels of fishing effort. Recent harvest levels have been constrained in many areas by historically low fishing effort, thus recent catch levels are reflective of both market conditions and recent levels of salmon runs. Harvest projections for these fisheries may not be indicative of potential harvest levels.

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TABLES

Table 1. Projections of 2004 Alaska commercial salmon harvests, by fishing area and species, in thousands of fish.

	Species					
Fishing Area	Chinook	Sockeye	Coho	Pink	Chum	Total
Southeast Region Total	297 [a]	1,300 [a]	2,900 [a]	50,000	13,000 [d]	67,497
Prince William Sound						
Natural Production	44 [a]	1,441	404 [e]	2,620	393	4,901
Hatchery Production	0	1,349 [f]	201 [g]	36,041 [g]	4,148 [g]	41,739
Upper Cook Inlet	10 [a]	3,636	160 [a]	380 [a]	150 [a]	4,336
Lower Cook Inlet	1 [a]	196	14 [a]	3,255	24 [a]	3,490
Bristol Bay	64	34,731	40 [c]	7 [c]	800	35,642
Central Region Total	119	41,353	818	42,303	5,515	90,109
Kodiak Area	20	2,611	495	19,545	1,219	23,890
Chignik	3	1,440	143	827	157	2,570
South Peninsula	5	1,650	200	6,000	850	8,705
North Peninsula	5	1,750	50	30	75	1,910
Aleutian Islands	0	0	0	0	0	0
Westward Region Total	33	7,451	888	26,402	2,301	37,075
AYK Region Total	69	110	530	552	453	1,714
Statewide Total	518	50,214	5,136	119,257	21,268	196,394

Columns and rows may not total exactly due to rounding.

[a] Average harvest for the five-year, 1999-2003, period.

[c] 5-year average of odd-year harvests

[d] Projection of southeast Alaska hatchery chum salmon return of 10 million less broodstock (0.418) plus projected wild stock catch of 3.0 million. Projections made by SRAA, NSRAA, and DIPAC

[e] Average harvest for the ten-year, 1994-2003, period.

[f] Includes the harvest of Gulkana sockeye and preliminary forecasted return of Main Bay hatchery sockeye less broodstock requirements. Forecasts made by PWSAC.

[g] Preliminary forecasted returns to PWSAC and VFDA hatcheries less broodstock requirements. Forecasts made by PWSAC and VFDA.

Table 2. Preliminary 2003 Alaska commercial salmon harvests, by fishing area and species, in thousands of fish.

	Species					
Fishing Area	Chinook	Sockeye	Coho	Pink	Chum	Total [b c]
Southeast Region Total	418 [a]	1,525	2,498	52,515	11,114	68,071
Prince William Sound	48	2,835	502	51,136	3,781	58,302
Upper Cook Inlet	17	3,500	100	49	121	3,760
Lower Cook Inlet	1	644	11	860	36	1,550
Bristol Bay	44	14,900	43	0	807	15,794
Central Region Total	110	21,850	700	52,000	4,750	79,412
Kodiak Area	19	4,042	340	14,066	1,152	19,619
Chignik	3	1,092	104	502	64	1,765
South Peninsula & Aleutians	3	1,054	131	4,258	637	6,083
North Peninsula	5	1,476	54	19	39	1,593
Westward Region Total	30	7,664	629	18,848	1,896	29,067
AYK Region Total [d]	57	63	372	0	84	576
Total Alaska	615	31,102	4,199	123,363	17,844	177,126

[a] Total commercial harvest of chinook salmon for the October 1, 2002 to September 30, 2003 catch accounting period.

[b] Missing data indicates no harvest, and zeros indicate harvest activity but <1,000.

[c] Columns may not total exactly due to rounding error.

[d] AYK Region totals do not include Norton Sound Area harvest; this data is confidential.

Table 3. Preliminary 2003 Alaska commercial salmon harvests, by fishing area and species, in thousands of pounds.

Fishing Area	Species					
	Chinook	Sockeye	Coho	Pink	Chum	Total [a b]
Southeast Region Total	7,195	9,259	18,263	184,329	79,685	298,731
Prince William Sound	1,097	17,023	4,378	189,052	24,277	235,827
Upper Cook Inlet	349	20,435	652	173	831	22,441
Lower Cook Inlet	15	3,281	77	2,773	258	6,403
Bristol Bay	711	93,834	296	1	5,255	100,097
Central Region Total	2,170	134,570	5,400	192,000	30,620	364,770
Kodiak Area	189	21,674	2,604	49,935	8,250	82,652
Chignik	40	7,138	857	1,952	448	10,435
South Peninsula & Aleutians	39	6,400	954	16,297	4,346	28,036
North Peninsula	58	8,727	452	58,837	264	68,338
Westward Region Total	326	43,940	4,870	127,020	13,310	189,460
AYK Region Total	1,074	462	2,928	0	613	5,077
Total Alaska	10,770	188,230	31,460	503,350	124,230	858,040

[a] Missing data indicates no harvest, and zeros indicate harvest activity but <1,000.

[b] Columns may not total exactly due to rounding error.

Table 4. Preliminary 2003 Southeast Region commercial salmon harvests, by fishing area and species, in thousands of fish.

Fishery	Chinook	Sockeye	Coho	Pink	Chum	Total [e f]
Southern Seine [a]	18.0	535.3	297.4	27,513.6	1,470.0	29,834
Northern Seine [b]	7.3	146.1	96.7	22,381.0	2,865.0	25,496
Drift Gillnet						
Tree Point	0.7	105.3	63.6	621.4	246.3	1,037
Prince of Wales	0.4	116.9	212.1	470.7	300.3	1,100
Stikine	0.3	42.2	38.8	76.1	51.7	209
Taku-Snettisham	1.5	205.4	23.7	112.4	170.4	513
Lynn Canal	0.6	91.3	59.6	47.8	322.4	522
Hatchery Terminal	7.2	37.6	36.4	26.5	437.0	545
Set Gillnet	3.8	154.4	74.3	48.4	0.5	282
Hand Troll [c]						
Traditional	9.6	0.1	80.5	3.6	3.0	97
Hatchery Terminal	0.7	0.0	0.0	0.0	1.7	2
Experimental	3.3	0.0	0.3	0.0	0.1	4
Power Troll [c]						
Traditional	281.9	4.0	1,137.0	151.2	180.2	1,754
Hatchery Terminal	3.2	0.0	2.7	0.1	94.6	101
Experimental	32.1	0.5	2.8	4.7	6.8	47
Total Annette Isl. Res.						
Seine	0.1	3.9	6.8	466.0	9.6	486
Drift Gillnet	0.7	3.9	33.1	103.5	46.4	188
Total Annette Is. Troll [c]	0.0	0.0	0.0	0.0	0.0	0
Hand Troll	0.0	0.0	0.0	0.0	0.0	0
Power Troll	0.0	0.0	0.0	0.0	0.0	0
Trap	0.0	0.0	0.0	0.0	0.0	0
Hatchery Cost Recovery	45.7	75.9	328.7	420.1	4,889.6	5,760
	0.0	0.0	0.0	0.0	0.0	0
Miscellaneous [d]	0.9	2.6	3.6	68.3	18.2	94
Southeast Region Total	418	1,525	2,498	52,515	11,114	68,071

[a] Districts 101-108.

[b] Districts 109-114.

[c] Catch accounting period for the 2002 chinook salmon season goes from October 2002 through September 2003.

[d] Includes salmon that were confiscated, caught in sportfish derbies, or commercial test fisheries, and sold.

[e] Missing data indicates no harvest, and zeros indicate harvest activity but <1,000.

[f] Columns may not total exactly due to rounding error.

Table 5. Preliminary 2003 Central Region commercial salmon harvests, by fishing area and species, in thousands of fish.

	Species					
Fishing Area	Chinook	Sockeye	Coho	Pink	Chum	Total [d e]
Purse Seine						
Eastern	0	123	64	14,837	113	15,137
Northern	0	9	1	5,910	12	5,932
Coghill	0	126	1	11,440	751	12,318
Southwestern	0	45	2	5,789	26	5,862
Montague	0	2	0	60	567	629
Southeastern	0	2	0	514	13	529
Unakwik	0	1	0	2	0	3
Drift Gillnet						
Bering River	0	18	59	0	0	77
Copper River	48	1,188	363	13	10	1,622
Unakwik	0	2	0	0	0	2
Coghill	0	162	10	44	726	942
Eshamy	0	576	2	62	16	656
Set Gillnet						
Eshamy	0	216	1	29	6	252
Hatchery [a]	0	367	0	12,426	1,540	14,333
Misc. PWS [b]	0	0	0	10	0	10
Prince William Sound Total [c]	48	2,835	502	51,136	3,781	58,302
Southern District	1	556	5	563	6	1,131
Kamishak District	0	51	0	12	30	93
Outer District	0	27	0	282	0	308
Eastern District	0	10	6	0	0	16
Lower Cook Inlet Total	1	644	11	860	36	1,550
Central District	16	3,424	78	47	116	3,681
Northern District	1	48	23	2	4	78
Upper Cook Inlet Total	17	3,500	100	49	121	3,760
Naknek-Kvichak District	1	3,351	0	0	36	3,388
Nushagak District	40	6,787	0	0	606	7,433
Egegik District	0	2,284	41	0	42	2,367
Ugashik District	0	1,739	1	0	55	1,795
Togiak District	3	711	1	0	68	783
Bristol Bay Total	44	14,900	43	0	807	15,800
Central Region Total	110	21,850	700	52,000	4,750	79,412

[a] Hatchery sales for operating expenses. Includes meal production/roe salvage sales, processor discards. Excludes post egg-take roe sales at hatcheries.

[b] Does not include salmon taken for home use as reported on fish tickets.

[c] Some of these fish were donations.

[d] Missing data indicates no harvest and zeros indicate harvest activity but <1,000.

[e] Columns may not total exactly due to rounding error.

Table 6. Preliminary 2003 Arctic-Yukon-Kuskokwim Region commercial salmon harvests, by fishing area and species, in thousands of fish.

	Species					
Fishing Area	Chinook	Sockeye	Coho	Pink	Chum	Total [c d]
Kuskokwim River	0	0	285	0	3	288
Kuskokwim Bay	16	63	62	0	33	175
Kuskokwim Area Total	16	63	347	0	36	463
Lower Yukon River	37	0	10	0	12	59
Upper Yukon River [a]	4	0	15	0	10	29
Yukon River Total [a]	41	0	25	0	22	88
Norton Sound	[b]	[b]	[b]	[b]	[b]	[b]
Kotzebue Area	0	0	0	0	26	26
AYK Region Total	57	63	372	0	84	577

[a] The Upper Yukon River catch includes the estimated harvest to produce roe sold.

[b] Totals do not include Norton Sound harvest; data is confidential.

[c] Missing data indicates no harvest and zeros indicate harvest activity but <1,000.

[d] Columns and rows may not total exactly due to rounding error.

Table 7. Preliminary 2003 Westward Region commercial salmon harvests, by fishing area and species, in thousands of fish.

	Species					
Fishing Area	Chinook	Sockeye	Coho	Pink	Chum	Total [a b]
Kodiak	19	4,042	340	14,066	1,152	19,619
Chignik	3	1,092	104	502	64	1,765
South Peninsula and Aleutian Islands	3	1,054	131	4,258	637	6,083
North Peninsula	5	1,476	54	19	39	1,593
Alaska Peninsula Total	8	2,530	185	4,280	680	7,683
Aleutian Islands [a]						
Westward Region Total	30	7,664	629	18,848	1,896	29,067

[a] Missing data indicates no harvest and zeros indicate harvest activity but <1,000.

[b] Columns may not total exactly due to rounding error.

FIGURES

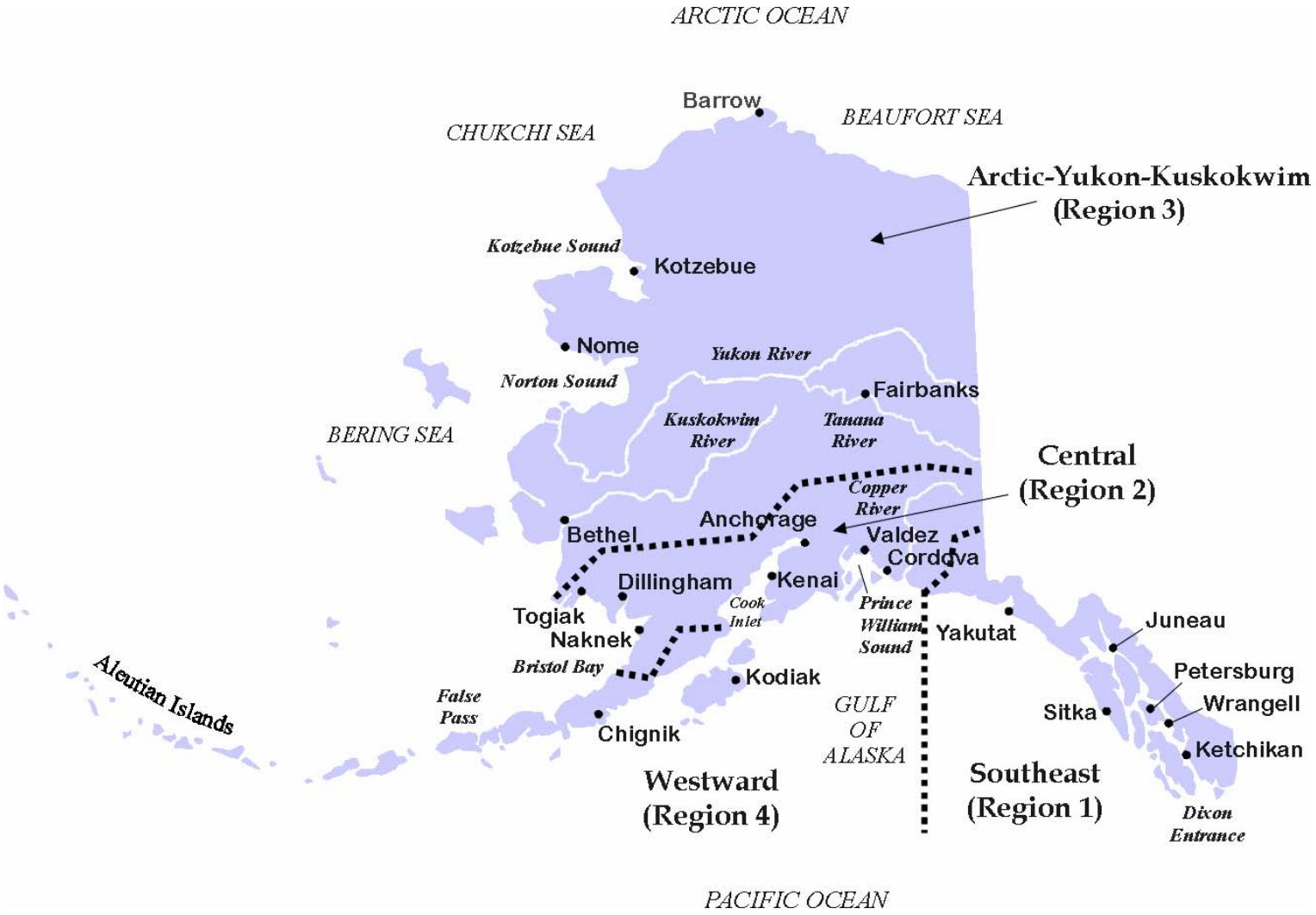

Figure 1. The four fishery management regions (Southeast, Central, Arctic-Yukon-Kuskokwim, and Westward) of the Alaska Department of Fish and Game, Division of Commercial Fisheries.

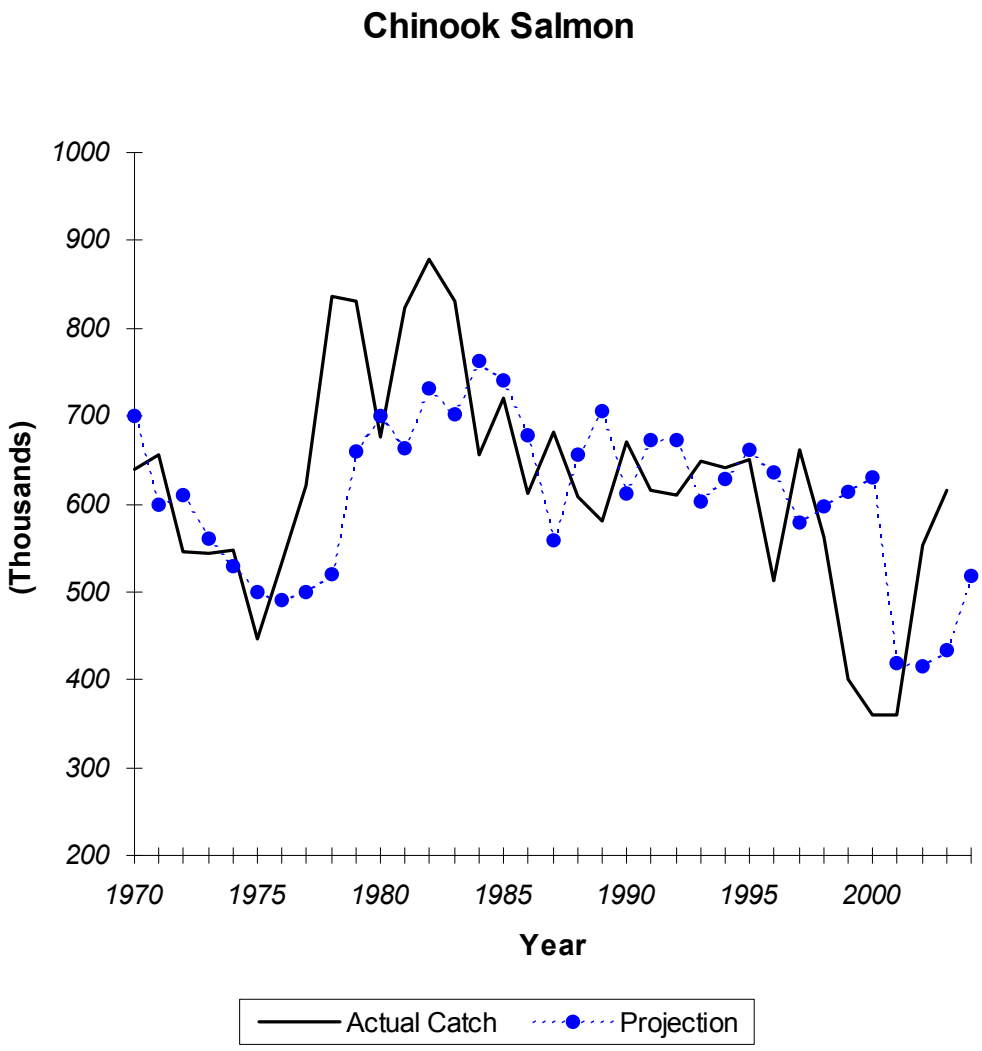

Figure 2. Relationship between actual catch and projected catch in thousands, for Alaskan chinook salmon fisheries from 1970 to 2003, with the 2004 projection.

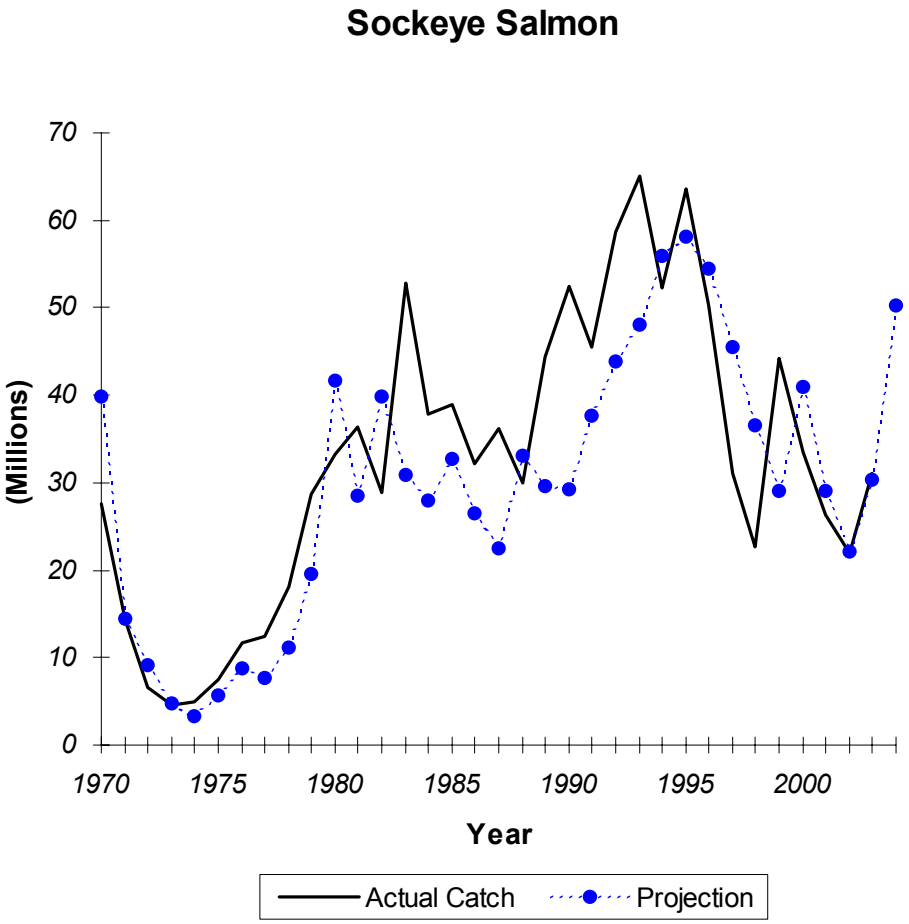

Figure 3. Relationship between actual catch (millions) and projected catch (millions) for Alaska sockeye salmon fisheries from 1970 to 2003, with the 2004 projection.

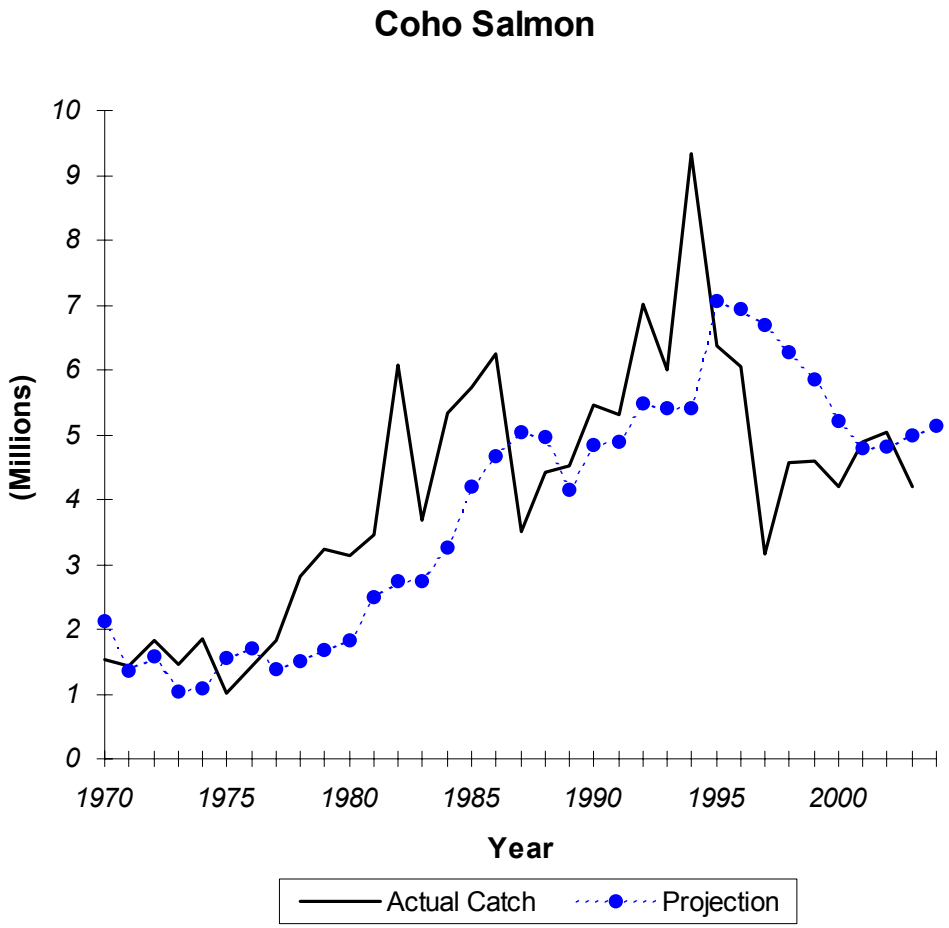

Figure 4. Relationship between actual catch (millions) and projected catch (millions) for Alaskan coho salmon fisheries from 1970 to 2003 with the 2004 projection.

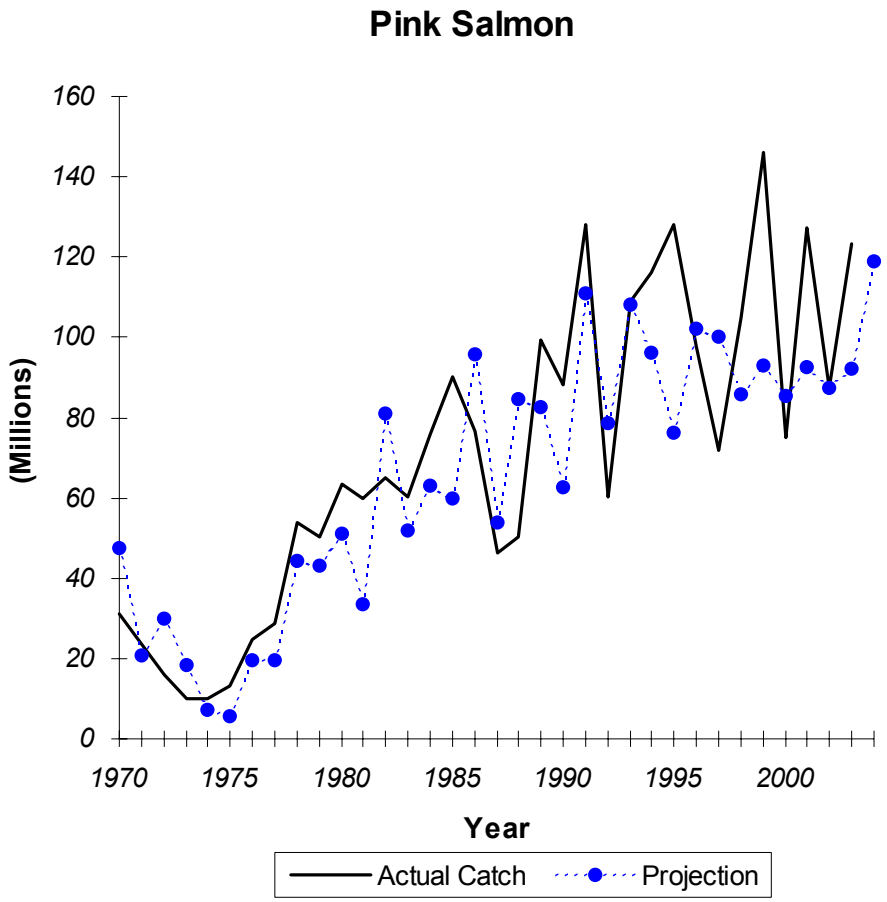

Figure 5. Relationship between actual catch (millions) and projected catch (millions) for Alaskan pink salmon fisheries from 1970 to 2003, with the 2004 projection.

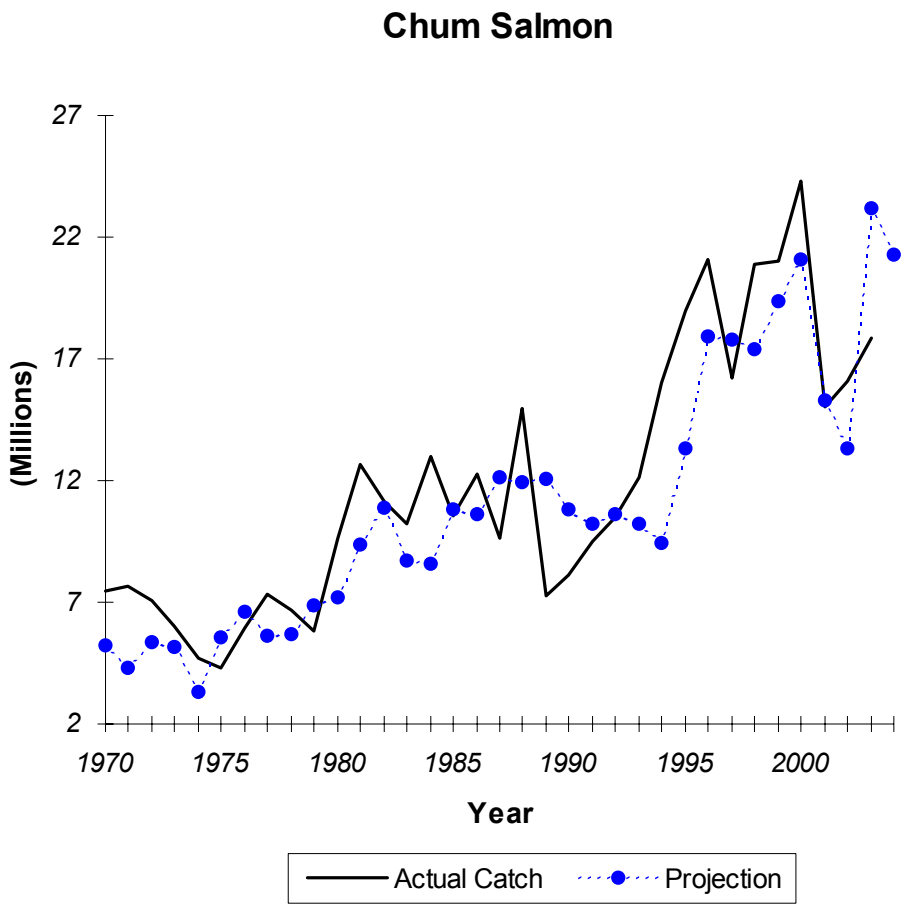

Figure 6. Relationship between actual catch and projected catch in millions, for Alaskan chum salmon fisheries from 1970 to 2003, with the 2004 projection.

APPENDIX

FORCAST AREA: **Southeast Alaska**
SPECIES: **Pink Salmon**

The following categories of pink salmon harvest in Southeast Alaska were obtained by calculating the 20th, 40th, 60th, and 80th percentiles of historical harvest during the 40-year period 1962 to 2001:

Category	Range (millions)	Percentile
Disaster	Less than 10	Less than 20th
Weak	10 to 17	21st to 40th
Average	17 to 30	41st to 60th
Strong	30 to 53	61st to 80th
Excellent	Greater than 53	Greater than 80th

The pink salmon return in 2004 is predicted to be *Strong* to *Excellent*, with a potential total Southeast Alaska harvest of **50 million fish, with a range of** 24 to 76 million fish.

Forecast Methods

The forecast methods that were used for the last six years tended to under-forecast the actual harvest and the prediction ranges have been too narrow. The actual harvest was outside these prediction ranges about half the time (Table 1). For that reason, we have introduced new statistical methods this year that predict future harvests based on prior years' harvests. This forecast does not rely on estimates of total escapement or total run size, as did prior forecasts, because accurate measures of these variables are not currently available. We expect this new method to do a better job of forecasting trends in the harvest until ongoing efforts to improve escapement and total run size information are completed. Because it is strictly based on historical harvests, this new method of forecasting does not directly forecast the amount of fish that might be available for harvest. We note that harvests in recent years (especially in the strong and excellent categories) have been affected by processing capacity.

The forecast of the potential pink salmon harvest in Southeast Alaska in 2004 was based on a time-series technique called *exponential smoothing*. This technique is similar to a running average; recent harvest observations were given more weight in the analysis, while all observations in the past were increasingly down-weighted. All harvests over the past 40 years (Figure 1) were used in the analysis. If x_t, x_{t-1}, ... denotes the observed harvests in year t, t-1, and so on, then the forecast in year t+1 is given by,

$$\hat{x}_{t+1} = cx_t + (1-c)\hat{x}_t \ .$$

Notice that the forecast for year t, that is $\hat{x}_t$, is also a weighted average of the observed catch in year t-1, and the forecast in year t-2. This is a kind of recursive equation that contains all of the data in the series. In this case, we choose a value of c to be approximately 0.27, based on minimizing the sum of past squared errors.

Notice that there are four production periods in Figure 1: the low-production period of the 1960s, the very-low-production period of the early 1970s, the period of increase from the mid-1970s to the early-1990s, and the latter period of high production. The forecast range was based on an estimated 80%

confidence interval, calculated by estimating the forecast error in the exponential smoothing technique over the last 11 years—during the period of high production.

Table 1. Preseason forecast of pink salmon harvests versus actual harvests for Southeast Alaska, from 1994 to 2003 (millions of fish).

	Preseason		Postseason	
Year	Category	Harvest	Harvest	Category
1994	*Strong*	47	58	*Excellent*
1995	*Average*	21	48	*Strong*
1996	*Excellent*	62	65	*Excellent*
1997	*Strong*	37	29	*Average*
1998	*Strong*	31–51	42	*Strong*
1999	*Strong*	31–51	75	*Excellent*
2000	*Strong*	31–51	20	*Average*
2001	*Strong*	31–50	67	*Excellent*
2002	*Strong*	30–52	45	*Strong*
2003	*Strong*	30–52	52	*Strong*
2004	*Strong*	50		

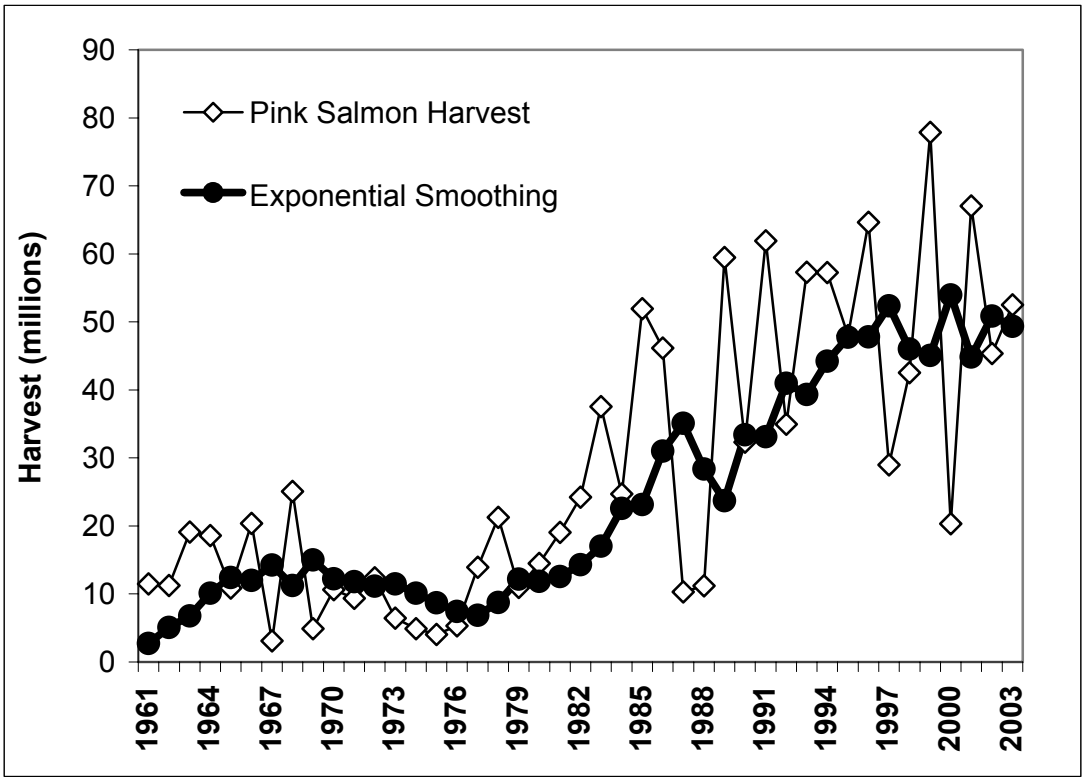

Figure 1. Comparison of annual harvest of pink salmon in Southeast Alaska, and smoothed values of the harvest used in the 2004 forecast model.

Forecast Discussion

Many different statistical approaches all lead to the same general conclusion: pink salmon runs in Southeast Alaska have tended towards very high levels in recent years, and recent harvests have also tended to fluctuate around high levels. Moreover, the fluctuations in harvest have been caused by random, unknown factors in the marine environment, and by changes in the fishing industry. We have tried to present a forecast of next year's harvest using the simplest method we could find that makes the best possible use of our forecast indicators. We believe a simple, easily explained procedure that tracks the overall trend in harvest will produce a better forecast than complicated analyses based on questionable assumptions or based on spurious correlations. This new forecast, had it been used during the prior six years, would have provided slightly higher forecast point estimates and wider forecast ranges than the old methods.

Although it is very hard to predict pink salmon returns from the ocean, the forecast of pink salmon harvest is further complicated by recent large-scale changes in the fishing and fish processing industries. Researchers cannot predict future management actions, fishing conditions, harvest and processing capacity, distribution of the fleet, or product demand that drives the harvest each year. These factors have affected recent harvest levels, and in both 2002 and 2003, our escapement measures indicated that there could have been considerable additional harvest had there been demand for the product. We note that there has been substantial error in past forecasts, with a tendency to under-forecast the harvest. Although we do not have a statistically reliable estimate of total return, the trend in catch has probably under-represented the trend in total run size. One indication of this is that the upper end of the escapement goal range has been exceeded in at least one of the three subregions in Southeast Alaska each year since 1994. Moreover, the upper end of the escapement goal range has been exceeded in all three subregions the last

three years—further suggesting that pink salmon returns to Southeast Alaska have continued to increase over time, even though the trend in harvest level stabilized in the mid-1990s. The department will continue to manage fisheries inseason based on the strength of salmon runs. Aerial escapement surveys and fishery performance data will continue, as always, to be essential in making inseason management decisions.

Other considerations:

1. Brood year escapement indices in 2002 were the 6th highest on record for the region (17.4 million): the 8th highest in Southern (SSE); the 6th highest in Northern Inside (NSEI); and the 6th highest in Northern Outside (NSEO) for years 1960 to 2003. Escapements appear to have been ample to provide a *Strong* to *Excellent* total return in 2004.
2. Winter incubation temperatures throughout Southeast Alaska from November 2002 through February 2003 were above the 40-year average and should not be a significant cause of mortality for the 2004 return (Figures 3 and 4).
3. No early marine fry surveys were conducted in Southeast Alaska in 2003 to index fry abundance; however, anecdotal observations in Southeast indicated fry abundance was very high in some areas.

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Pink and Chum Salmon Project Leader	Biometrician	Fishery Biologist
Ketchikan	Douglas	Douglas

FORECAST AREA: **Prince William Sound**
SPECIES: **Pink Salmon**

Pink Salmon

Preliminary Forecast of the 2004 Run:	Forecast Estimate (thousands)	Forecast Range (thousands)
NATURAL PRODUCTION:		
Prince William Sound General Districts		
Total Run	4,620	1,260 - 7,980
Escapement Goal [a]	2,000	
Harvest Estimate	2,620	0 - 5,980

[a] The escapement goal of 2.0 million pink salmon is the midpoint of the sustainable escapement goal range (1.25 - 2.75 million).

Forecast Methods

The predicted natural run of pink salmon is the average total run for the even years 1994 to 2002. The total run by year was estimated as the total natural contribution to commercial harvests combined with the escapement index calculated as the area under the curve of weekly aerial escapement surveys. The natural pink salmon contributions were estimated by subtraction of hatchery stock estimates based on thermal marked otolith recoveries (1997 to 2003), coded wire tag recoveries (1985 to 1996), or average fry-to-adult survival estimates times fry releases. The prediction method differs from the 1997 to 1999 method that used linear regressions of adult production versus the brood year escapement index. Prior to 1997 forecast methods employed surveys of preemergent fry; however, surveys of preemergent fry have not been conducted since 1995. The forecast range is the 80% prediction interval about the mean.

Forecast Discussion

The department will not be making hatchery pink salmon forecasts in 2004. Forecast methods examined for the 2004 natural run included the linear regression of log-transformed total Prince William Sound (PWS) escapement versus log-transformed total PWS return, a random walk model, a Ricker stock-recruit model, and several run averages using from 2 to 20 years of data. These methods proved to be moderately successful at best when tested against the estimated actual total runs. The 1994 to 2002 even-years average return was used because it had the lowest absolute annual percent error. If this total run forecast is realized, it will be the 11th largest among even brood years 1962 to 2002.

The brood year 2002 pink salmon escapement index (934,177) was lower than the midpoint escapement goal, and ~ 34% below the even years (1975 to 2000) average escapement index. However, three weeks of surveys were missed from some districts because of poor survey weather.

Future enhancements to forecasting accuracy may come from work examining pristine levels in blue mussels, zooplankton abundance and distribution, and juvenile pink salmon size and abundance during their early marine life stage.

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Fisheries Biologist II
PWS Research Biologist
Cordova

FORECAST AREA: **Prince William Sound**
SPECIES: **Chum Salmon**

Chum salmon

Preliminary Forecast of the 2004 Run:	Forecast Estimate (thousands)	Forecast Range (thousands)
NATURAL PRODUCTION:		
Prince William Sound General Districts		
Total Run	568	490 - 646
Escapement Goal [a]	175	
Harvest Estimate	393	315 - 471

[a] The escapement goal of 175,000 chum salmon is the midpoint of the sustainable escapement goal range (100,000-249,000).

Forecast Methods

The forecast of the total natural chum salmon run was calculated as the average of all runs from 1994 to 2003. The total run by year was estimated as the total commercial harvest combined with the escapement index calculated as the area under the curve of weekly aerial escapement surveys. The contributions of natural stock chum salmon were estimated using the average wild stock harvests prior to hatchery production. The forecast range is the 80% prediction interval about the mean run size.

Forecast Discussion

The department will not be making hatchery chum salmon forecasts in 2004. Our ability to accurately forecast natural chum salmon stocks is limited by the small amount of data available. Estimates of wild stock contributions to commercial harvests have been unavailable until 2003. In 2003, natural chum salmon contribution estimates based on thermally marked otoliths were available for the Coghill and Montague Districts. Historical age data from escapements and commercial harvests are unavailable for most districts of PWS. If this total run is realized it will be the 17th largest since 1970.

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PWS Research Biologist
Cordova

FORECAST AREA: **Prince William Sound**
SPECIES: **Sockeye Salmon**

Sockeye Salmon

Preliminary Forecast of the 2004 Run:	Forecast Estimate (thousands)	Forecast Range (thousands)
NATURAL PRODUCTION:		
Prince William Sound - Coghill Lake		
Total Run	398	230 - 997
Escapement Goal	25	
Harvest Estimate	373	205 - 972
Prince William Sound - Eshamy Lake		
Total Run	98	53 - 143
Escapement Goal	30	
Harvest Estimate	68	23 - 113
TOTAL PRODUCTION:		
Run Estimate	496	236 - 1,007
Escapement Goal	55	
Common Property Harvest	441	181 - 952

Forecast Methods

The forecast of the natural sockeye salmon run to Coghill Lake is the total of estimates for five age classes. Linear regression models using log-transformed data were used to predict runs for two age classes: age-1.2 and -1.3 sockeye salmon. The run of these two age classes was predicted from the relationship between returns of that age class and returns of the age class one year younger from the same brood year. For example, the model to predict the run of age-1.2 sockeye salmon in 2004 used the run of age-1.1 sockeye salmon in 2003 as the input parameter. The predicted runs of age-1.1, -2.2, and -2.3 sockeye salmon were calculated as the mean return of that age class in past years. Although catch and escapement numbers, as well as age composition data, are available for Coghill Lake sockeye salmon runs since 1962, escapement numbers prior to installation of a full weir in 1974 are considered unreliable. Therefore, only data collected since 1974 were used to estimate model parameters, calculate individual age class forecasts, and generate 80% prediction intervals. The predicted total run to Coghill Lake was the sum of predictions for individual ages. The 80% prediction intervals were calculated using the mean square error of past forecasts.

The forecast of the natural run to Eshamy Lake is the mean of the runs from the peak year in the four-year cycle. Eshamy Lake escapements have been enumerated at a weir since 1950 except 1987 and 1998. Commercial harvest data are available for the same period, but age composition data are available only for some years since 1962. Only data collected since 1970, excluding 1987 and 1998, were used to calculate the forecast and the 80% prediction interval.

The total Prince William Sound run and common property harvest forecasts were calculated as the sum of the Coghill and Eshamy Lakes midpoint forecasts. The 80% prediction intervals were calculated as the square root of the sum of the 80% prediction intervals for Coghill and Eshamy Lakes.

Forecast Discussion

The department will not be making forecasts for sockeye salmon hatchery stocks returning to Main Bay Hatchery (MBH) in 2004. Coghill Lake has very dynamic limnological characteristics that can significantly impact the sockeye salmon population. Studies conducted in the mid 1980s and early 1990s found that the lake may be a zooplankton limited system. As a result, the biological escapement goal for this system was lowered in 1992 to allow zooplankton populations to recover. Fertilizers were added to the lake (1993 to 1996) in a cooperative project with the U.S. Forest Service to improve the forage base for rearing sockeye salmon juveniles. In 2002, current data were reviewed and the midpoint escapement goal remained unchanged. Also in 2002 and 2003, the department collected limnological data in an attempt to begin monitoring the basic characteristics of the lake. Zooplankton samples are being analyzed and may help in better understanding the complexities of this system. The biological escapement goal for Coghill Lake natural run was met in 2003, and has been met every year since 1995.

The Eshamy Lake natural stock appears to exhibit a four-year cycle, and the 2004 run should be the peak year in the cycle. The spawning escapement goal was met in 2003 with 39,845 sockeye salmon past the Eshamy weir.

The Eshamy Lake natural stock is the largest natural stock contributor to commercial harvests of sockeye salmon in Prince William Sound outside of the Coghill District. The Eshamy Lake natural run has historically contributed to a substantial incidental harvest by the purse seine fishery in the Southwestern District. Although escapements into Eshamy River have been counted at a weir for 50 years, only periodic collection of age, sex, and size data has occurred for the Eshamy and Southwestern District commercial common property sockeye harvests. Contributions to commercial harvests in western PWS of sockeye salmon produced by the Main Bay Hatchery have been estimated by recovery of coded wire tags and thermally marked otoliths. However, not all harvests can be adequately sampled, increasing the uncertainty of total run estimates for all wild and enhanced sockeye salmon stocks in western PWS. Age composition data and weir counts were not collected in 1987 and 1998 due to budget reductions. The return of the Eshamy weir and the start of thermal otolith marking of MBH sockeye salmon should allow much better estimates of Eshamy wild runs in the future.

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FORECAST AREA: **Copper River / Copper River Delta**
SPECIES: **Sockeye Salmon**

Copper River Sockeye Salmon

Preliminary Forecast of the 2004 Run:	Forecast Estimate (thousands)	Forecast Range (thousands)
NATURAL PRODUCTION:		
Total Run	1,530	860 - 2,524
Escapement Goal [a]	530	
Common Property Harvest [b]	1,000	430 - 1,569
HATCHERY AND SUPPLEMENTAL PRODUCTION:		
Prince William Sound Aquaculture Corp. - Gulkana Hatchery		
Hatchery Run	111	63 - 160
Broodstock Needs	20	
Supplemental Escapement [c]	11	
Common Property Harvest [b]	80	35 - 126
TOTAL PRODUCTION:		
Run Estimate	1,641	969 - 2,636
Natural Escapement Goal	530	
Broodstock Needs	20	
Supplemental Escapement [c]	11	
Common Property Harvest [b]	1,080	508 - 1,651

[a] The escapement goal of 530,000 sockeye salmon is the historical average spawning escapement (361,000) of the upper Copper River (spawning escapement range: 300,000 - 500,00) combined with the historical average Copper River delta aerial survey peak count times two (spawning escapement range 55,000 - 130,000). The average Copper River delta peak count of 84,500 is multiplied by two to adjust for surveyor efficiency, i.e., we assume surveyors count 50% of the total fish. No adjustment is made for freshwater residence time.

[b] Includes the harvest from commercial, subsistence, personal use, and sport fisheries.

[c] Hatchery production that will not be harvested to ensure that natural escapement to the upper Copper River is achieved, since natural stocks cannot sustain the higher exploitation levels of hatchery stocks.

Forecast Methods

The forecast of the natural run of sockeye salmon to the Copper River is the total of estimates for six age classes. Linear regression models using log-transformed data were used to predict runs for three age classes: age-1.2, -1.3, -2.2 sockeye salmon. The run for these three age classes was predicted from the relationship between returns of that age class and returns of the age class one year younger from the same brood year. For example, the model used to predict the run of age-1.3 sockeye salmon in 2004 used the run of age-1.2 sockeye salmon in 2003 as the input parameter. Finally, predicted runs of age-1.1, -0.3, and -2.3 sockeye salmon were calculated as the mean return of those age classes since 1961. The 80% prediction bounds for the run and harvest forecasts were calculated using the mean square error of the 1984 to 2003 run or harvest forecasts. Forecast methods for 2004 are similar to forecast methods used after 1998, but differ substantially from earlier methods. Prior to 1998, forecasts were calculated as the product of historical mean return-per-spawner and parent year escapements weighted by age class. Mean return-per-spawner values were estimated from linear regressions of adult production on brood year

escapements. Supplemental production from Gulkana Hatchery remote releases to Crosswind and Summit Lakes was predicted using age specific smolt-to-adult survival estimates from brood years 1995 to 1998. The survival estimates were calculated using coded wire tag recoveries in harvests and enumerated adult escapements. Survival of juveniles released into Paxson Lake was assumed to lie between values estimated for Crosswind and Summit Lake. The average estimated exploitation rate (72%) for 1996 to 2002 was used to estimate the total harvest of Gulkana Hatchery stocks in 2004. The 80% prediction interval for the forecast of supplemental production was calculated using mean square error estimates calculated for total runs.

Forecast Discussion

Forecasts prior to 1998 relied on the relationship between number of spawners and subsequent returns, using return-per-spawner values for parent year abundance similar to that of the dominant age class (age 5) of the forecast year. Because average return-per-spawner values do not reflect recent increased production, and because returns are still incomplete from the most recent brood years, linear regressions of brood-year sibling returns were used to produce the 1998 to 2003 forecasts. Additionally, reliable estimates of survival and contributions from supplemental production for individual brood years have only recently become available through coded wire tag recoveries in harvest and escapements.

Historical estimates of Gulkana Hatchery production are considered imprecise. Improved contribution estimates for brood years 1995 to 1998 indicate large contributions from supplemental production and smolt-to-adult survival estimates for Crosswind Lake releases that averaged ~ 20%. The 2004 contribution of age-5 fish from Gulkana Hatchery will be weak due to poor fry to smolt survival of both Crosswind and Summit Lake remote releases. Only 10,333 smolt were counted out of Crosswind Lake in 1999. The greatly reduced fry-to-smolt survival was probably associated with problems during strontium chloride marking and a longer holding period in hatchery raceways due to ice cover on Crosswind Lake. This was the first large-scale marking of sockeye salmon fry with strontium chloride anywhere in the world.

The 2004 run will be composed primarily of returns from brood years 1999 and 2000. Five-year-old sockeye salmon (brood year 1999) are expected to predominate Copper River delta and upper Copper River runs. Production from the early portion of the natural run may be weak because of low inriver escapements prior to mid June in brood years 1999 and 2000. The inriver sonar estimates on 10 June were only 26% (1999) and 40% (2000) of the 1990 to 1998 average. The low inriver escapements appear to have been matched by low spawning escapements in 1999. Aerial surveys of sockeye salmon spawning systems were significantly lower than the 1983 to 1992 average for almost all systems surveyed.

The total common property harvest range was calculated by subtracting the broodstock and escapement goal from the lower and upper bounds of the total run. The forecast for the 2004 total run is ~ 0.2 million below the 1978 to 2003 average (1.84 million). If realized, the 2004 forecast total run would rank seventeen largest since 1978; just above the 2000 runs. The 1.53 million natural run would be average for runs documented prior to substantial supplemental production, and a 0.11 million Gulkana Hatchery run would be about 80% below the 1997 to 2003 average.

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FORECAST AREA: **Upper Cook Inlet**
SPECIES: **Sockeye Salmon**

Preliminary Forecast of the 2004 Run:	Forecast Estimate (millions)	Forecast Range (millions)
NATURAL PRODUCTION:		
Total Run:	5.2	1.9–8.6
Escapement Goal:	1.5	
Harvest Estimate:	3.7	

Forecast Methods

The major sockeye salmon systems in Upper Cook Inlet (UCI) are the Kenai, Kasilof, Susitna and Crescent Rivers, and Fish Creek. Spawner, sibling, fry, and smolt data, if available, were examined for each system. Four models were used to forecast the return of sockeye salmon to UCI in 2004: (1) the relationship between adult returns and spawners, (2) the relationship between adult returns and fry, (3) the relationship between adult returns and smolts, and (4) the relationship between adult returns and siblings. In most cases, sibling relationships were used. The return of age 1.3 sockeye salmon to the Kenai River in 2004 was forecast using the fry model. The fry-model prediction was based on the abundance of sockeye salmon fry rearing in Skilak and Kenai lakes in the fall of 2000. The abundance of smolts emigrating from Tustemena Lake was used to forecast returns of age 1.2, 1.3 and 2.2 sockeye salmon to the Kasilof River in 2004. This is the third time this model has been used. An approximate eighty percent confidence interval for the total forecasted run was calculated using the squared deviations between past forecasts and actual runs as the forecast variance (mean square error).

Forecast Discussion

In 2003, the commercial harvest of sockeye salmon in UCI was 3.5 million, while the preseason forecast was 2.4 million. The higher than expected commercial harvest in 2003 was largely due to a stronger than expected return of 5-year old sockeye salmon to the Kenai River. In 2003, the total return of sockeye salmon was 3.8 million to the Kenai River, 996 thousand to the Kasilof River, 603 thousand to the Susitna River, 156 thousand to the Crescent River, and 151 thousand to Fish Creek. The forecast return of sockeye salmon in 2003 was 2.04 million to the Kenai River, 677 thousand to the Kasilof River, 397 thousand to the Susitna River, 115 thousand to the Crescent River, and 125 thousand to Fish Creek..

A run of 5.2 million sockeye salmon is forecasted to return to Upper Cook Inlet in 2004 with a harvest by all user groups of 3.7 million sockeye salmon. The forecasted harvest in 2004 is about 0.3 million fish below the 20-year average harvest. A fry model was used to forecast the return of age 1.3 sockeye salmon to the Kenai River. The fry model predicted a return of 2.2 million age 1.3 sockeye salmon to the Kenai River, which is equal to the 20-year average return for this age class. The fry model has provided more accurate forecasts of age 1.3 sockeye salmon to the Kenai River than the sibling model in 5 of the past 7 years, but this year the sibling model forecast of 2.0 million fish was very similar to the fry model forecast. The forecast return to the Kasilof River is slightly below the 20-year average return of 890 thousand. Smolt models were used to forecast the returns of age 1.2, 1.3 and 2.2 sockeye salmon to Kasilof River in 2004. Smolt models for Kasilof River salmon have provided more accurate forecasts than other models over the past 10 years. The smolt populations that will produce the returns of these three age classes in 2004 were slightly below average. The forecast return to Fish Creek is much lower than the 20-year average return of 192 thousand. Age 1.2 sockeye salmon typically comprise 58% of the run to this system. Only 7.1 thousand age 1.2 sockeye salmon are forecast to return to Fish Creek in 2004. This

forecast is based upon a count of only 48 thousand sockeye salmon smolts emigrating from this system in 2002.

Forecast runs to individual freshwater systems of Upper Cook Inlet are as follows:

System	Run	In River Goal
Crescent River	136,000	25,000–50,000
Fish Creek	33,000	20,000–70,000
Kasilof River	727,000	150,000–250,000
Kenai River	3,193,000	750,000–950,000
Susitna River	464,000	90,000–160,000
Minor System	683,000	N/A

Mark Willette
Research Project Leader
Upper Cook Inlet

FORECAST AREA: **Lower Cook Inlet**
SPECIES: **Pink Salmon**

Preliminary Forecast of the 2004 Run:	Forecast Estimate (thousands)	Forecast Range (thousands)
NATURAL PRODUCTION:		
Total Run	1,982	426–11,873
Escapement	370	129–604
Commercial Harvest	1,612	297–11,269
SUPPLEMENTAL PRODUCTION:		
Total Run	2,024	1,244–2,804
Broodstock and Escapement	380	375–386
Commercial Harvest	1,643	868–2,418
TOTAL AREA PRODUCTION:		
Total Run	4,006	2,265–13,928
Broodstock and Escapement	750	509–984
Commercial Harvest	3,255	1,756–12,944

Notes:
All values are rounded to the nearest thousand fish.
Escapement values include an escapement goal shortfall of 56 thousand fish for systems with a forecast in 2003.
Broodstock included escapement goal for Tutka Creek.
Commercial Harvest = Total Run – Escapement/Broodstock.
Commercial harvests of supplemental production include both common property and cost recovery harvests.
Additional harvests may be expected from systems not included in the forecast.

Forecast Methods

The forecast of wild pink salmon returns to 11 harvest areas in the Lower Cook Inlet Management area was based on log-log regression of total return on escapement from 35 to 43 years of observations. An 80 percent confidence range about the forecast of natural production was developed using cross-validation methods. Projected harvest from natural production was obtained by subtracting the escapement goal from the forecasted run for each of our 11 index areas and then summing the resulting values. Forecasts of supplemental production by the Tutka and Port Graham hatcheries was based on marine survival rates of 1.0 and 2.4 percent, respectively. Projected harvest from supplemental production was obtained by subtracting broodstock goals from the supplemental production forecast.

Forecast Discussion

The natural production forecast model was tested using cross-validation methods. The model correctly predicted 37 out of 42 changes in direction of annual run size. In 2002, the last even-numbered year, all 11 of the systems for which a forecast was made had runs within the forecast range. The 2004 forecast for natural production of 1.98 million pink salmon has an 80 percent confidence interval of 426 thousand to 11.87 million fish. Despite the outstanding parent-year escapement, major flooding during the fall of 2002 combined with a recent trend towards lower return per spawner ratios suggest that the lower end of this

range appears more probable than the point estimate. If realized, a natural run of 1.98 million pink salmon would be over 3.5 times the median run size of 561 thousand fish for even-year returns between 1960 and 2002. The pink salmon escapement goal is 370 thousand fish (range 135 thousand to 604 thousand) for systems with a forecast. If the run comes in as forecast, the upper end of the escapement goal range should be met. If the lower end of the forecast range is realized, a combined escapement shortfall of 6 thousand fish is expected for Humpy Creek and Seldovia Bay. The resulting escapement forecast in this case would be 129 thousand pink salmon.

The harvestable surplus of naturally produced pink salmon in the Southern District is projected to be 54.9 thousand fish, 38.2 thousand of which is expected to come from Port Graham Bay. Harvests of 4.1 and 11.6 thousand fish are expected for Humpy Creek and Seldovia Bay, respectively. Supplemental production of pink salmon in the Southern District has contributed from 24% to 90% of the total lower Cook Inlet commercial harvest in recent years. The Tutka Hatchery released nearly 68 million fry in 2003. Given their recent trend in reduced ocean survival rates (1.0%), about 651.9 thousand pink salmon are expected to return to Tutka Bay and Lagoon in 2004 (personal communication, G. Fandrei, Cook Inlet Aquaculture Association). The Port Graham Hatchery released 57.2 million fry in 2003. That facility is assuming a marine survival rate of 2.4%, despite realizing a marine survival rate of 1.2% in recent years, and is expecting nearly 1.4 million pink salmon to return to Port Graham Bay in 2004 (personal communication, P. McCollum, Port Graham Hatchery). The 2004 brood stock goals for the Tutka and Port Graham hatcheries are 178 thousand and 191 thousand fish, respectively. Because cost recovery requirements are dependent upon inseason fish prices, the allocation of hatchery-produced salmon returns between common property and cost recovery fisheries cannot be determined at this time.

In the Outer District, the number of naturally produced pink salmon available for harvest is projected to be 618 thousand fish, with almost 73% of the harvest expected to occur in the Port Dick subdistrict. If realized, the Port Dick harvest would be slightly less than the 2002 harvest of 454 thousand fish, the highest even-year catch since 1964. Harvests ranging from 14 to 86 thousand fish are anticipated from Nuka Island, Windy Bay, Rocky Bay, and Port Chatham.

In the Eastern District, a harvestable surplus of nearly 13 thousand pink salmon is projected for Resurrection Bay. However, commercial fishing specifically directed at pink salmon has not been allowed in that area in recent years due to a combination of erratic production and potential conflicts with the Resurrection Bay Salmon Management Plan (RBSMP), which limits commercial interference with the sport coho salmon fishery.

In the Kamishak Bay District, the number of naturally produced pink salmon available for harvest is projected to be 927 thousand fish, with almost 85% of the harvest expected to occur in the Bruin Bay subdistrict. If realized, the Bruin Bay harvest of 786 thousand fish would be the largest on record for this index area. However, low market value and lack of available buyers have limited the incentive to harvest pink salmon in the Kamishak District in recent years.

Edward O. Otis
LCI Research Biologist
Homer

Lee F. Hammarstrom
Area Finfish Management Biologist
Homer

FORECAST AREA: **Kodiak**
SPECIES: **Pink Salmon**

Preliminary Forecast of the 2004 Harvest	Harvest Forecast (millions)
Wild Stock: STRONG	10.0–14.0
Kitoi Bay Hatchery:	5.9–9.0
2004 KMA Pink Salmon Potential Harvest	15.9–23.0
Wild Stock Harvest Forecast by District:	
AFOGNAK	0.2–0.5
WESTSIDE	7.3–9.5
ALITAK	1.9–2.3
EASTSIDE	0.4–1.0
MAINLAND	0.2–0.7

Forecast Methods

The 2004 Kodiak Management Area (KMA) wild stock pink salmon forecast was developed by considering recent production trends, and evaluating Ricker spawner-recruit models based on Karluk and Ayakulik even numbered brood year escapements and total return. The 2002 brood year escapement indices for the entire KMA and for individual fishing districts were compared to past escapements, subsequent returns, and escapement and harvest averages. Climatological data from the fall of 2002 (spawning period) through the spring and summer of 2003 (outmigration and nearshore residence periods) and observations of fry survival were also considered. An anticipated harvest range for the 2004 wild stock pink salmon return was determined by selection of one of five different harvest magnitude categories.

Harvest categories were delimited by melding harvest quintiles with the forecast categories previously used by management biologists to determine the length of initial fishing periods. This forecasting method has been used since 1999. Categories are shown on the right:

Harvest Category	**Range (millions)**
Very Weak	Less than 3
Weak	3 to 6
Average	6 to 10
Strong	10 to 14
Excellent	Greater than 14

The Kitoi Bay Hatchery pink salmon forecast was developed by applying known fry-to-adult survival rates to the number of fry released in 2003. The average fry-to-adult survival rate from the last 11 stocking years (fish returning from 1993 through 2003) when releases were in excess of 100 million fry was used to generate the lower bound of the forecast range. The average survival rate from the last six stocking years (returns from 1998 to 2003) was used for the middle of the range. Fry releases all occurred on the same date to saturate the release area and lessen predation during these stocking years. The high bound of the forecast range was based on the average survival rate from the two stocking years with the highest even-year returns (1998 and 2002).

Forecast Discussion

Several Ricker spawner-recruit models were constructed based on data from 1970 to 2002 even-year escapements and total return or harvest (KMA pink salmon exhibit odd-numbered or even-numbered year dominance; currently even-year runs tend to be larger than odd-year runs). All produced similar estimates and, after accounting for escapement requirements, yielded projections for a harvestable surplus of pink salmon within the bounds of the STRONG category (10 to 14 million).

The 2002 KMA pink salmon escapement was approximately 8.4 million fish, exceeding the previous record high even-year escapement (7.1 million in 1998) and the KMA aggregated even-year escapement goal (2.39 to 5.99 million). Escapement goals were met or exceeded for each district. Northwest Kodiak and Alitak Bay Districts' pink salmon escapements in 2002 were very strong, well in excess of the district goals. Southwest Kodiak District 2002 escapements were also very high, with the exception of the Ayakulik River pink salmon escapement (approximately 353 thousand), which did not achieve the desired level (400 thousand to 800 thousand). Eastside Kodiak District 2002 pink salmon runs were variable, with very good runs to Kiliuda and Sitkalidak area streams but only mediocre runs elsewhere. Northeast Kodiak and Afognak Districts' 2002 pink salmon runs were weak. Mainland District escapements in 2002 seemed fair to good, but few estimates were made of southern Mainland District escapements.

The effect of climatic conditions on pink salmon spawning, egg-to-fry survival, outmigration, and near-shore survival is unquantifiable. Record setting high rainfall in October and November 2002 may have led to substantial scouring of salmon eggs from streambeds. Sustained cold weather with little snowfall in December 2002 may have led to freezing of eggs in the gravel. Warmer average temperatures in the fall 2002 and spring 2003 may have led to larger size fry and greater survival.

At the Kitoi Bay Hatchery, eggs are incubated in the hatchery until time of emergence (hatch), then the majority of the fry are volitionally released into rearing pens located in saltwater near the hatchery. Fry are then fed until late May and released into the bay all at once. This release technique saturates the release area with fry. Combined with improved rearing strategies, this has led to significant increases in fry-to-adult survival. The Kitoi Bay Hatchery manager reported that a high percentage of the pink salmon egg hatch and volitional fry movement to rearing pens occurred earlier than normal, likely due to the warmer than average temperature of the fresh water intake from local streams to the hatchery incubators.

Approximately 144.8 million fry were fed and released into Kitoi Bay on May 24, 2003 (nearly the same date as in recent years). Upon release, KBH pink salmon fry averaged 0.86 grams, the largest size at release in the past six years (fry over 0.5 grams have significantly improved survival; this is a key element in the KBH rearing strategy). The hatchery return should be from 6.2 to 9.3 million pink salmon, with a point projection of 7.9 million pink salmon. After subtracting broodstock needs (350 thousand), approximately 7.55 million pink salmon should be available for harvest.

The actual KMA pink salmon harvest will likely be influenced by market conditions. Demand for pink salmon is down, as are exvessel prices paid for pink salmon. In 2001 and 2002, some salmon processors in the KMA limited the number of pink salmon they would accept from area fishermen. It is expected that the market for pink salmon will continue to be poor; consequently, the actual KMA pink salmon harvest may be much lower than projected. With lower harvests would come higher than desired escapements, as occurred in 1998 and 2002.

The potential 2004 pink salmon harvest should be approximately 15.9 to 23 million. This forecast run strength will allow weekly fishing period lengths of 105 hours (4½ days) for most of the KMA during the initial general pink salmon fisheries (beginning July 6, 2004). By the fourth week of July, fishing time may be extended or restricted, by section or district, as true run strengths become known.

Nicholas H. Sagalkin Finfish Research Biologist Kodiak	Jeff Wadle Assistant Area Management Biologist, Kodiak	Kevin Brennan Area Management Biologist Kodiak	Drew Aro Kitoi Bay Hatchery Manager Kodiak

FORECAST AREA: **Kodiak, Spiridon Lake**
SPECIES: **Sockeye Salmon**

Preliminary Forecast of the 2004 Run:	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Production:		
Total Run Estimate	337	178–421
Escapement Goal	0	
Harvest Estimate	337	178–421

Forecast Methods

The 2004 Spiridon Lake forecast estimate was based on: 1) 2001 to 2003 smolt estimates, 2) average survival from smolt to adult, and 3) average adult age of returns to Telrod Cove from the 1995 and 1998 stocking years when Saltery Lake sockeye salmon were used as the broodstock.

Smolts emigrating from Spiridon Lake each spring (May to June) are trapped and enumerated. A portion of each day's outmigration are sampled for age (scales) and size data and age composition estimates are used to apportion the seasonal outmigration by freshwater age class. The 2001 smolt outmigration was composed of approximately 1.09 million age 1. smolts and 443 thousand age 2. smolts. Approximately 442 thousand age 1. smolts and 92 thousand age 2. smolts emigrated in 2002, and 229 thousand age 1. and 35 thousand age 2. smolts emigrated in 2003.

The smolt estimates were multiplied by the average smolt-to-adult survival of 34.7 percent (with a lower range of 18.4 percent and upper range of 43.4 percent) to calculate potential adult returns by freshwater age. Smolt-to-adult survival was calculated by dividing the average total adult return by the average number of smolts produced during years when Saltery Lake juveniles were stocked into Spiridon Lake (1995 and 1998). These stocking years were used because all returning adults in 2004 are expected to be from the Saltery Lake broodstock.

The adult Spiridon Lake returns from the 1995 and 1998 stocking years were composed of 1.6 percent 1-ocean, 54.5 percent 2-ocean and 43.9 percent 3-ocean fish. These percentages were multiplied by the potential adult returns by freshwater age to generate numbers of returning fish by ocean age (and year). The results for each age class were summed to estimate the expected total run in 2004.

Forecast Discussion

Barrier falls at Telrod Creek prevent adult sockeye salmon from returning to Spiridon Lake. Therefore, all of the returning adults are available for harvest in the traditional westside fishing areas and the Spiridon Lake Terminal Harvest Area in Telrod Cove. In previous years, 2-ocean fish have been the predominant age class of adults returning to Telrod Cove; however, the 2004 run should be predominated by 3-ocean fish (69 percent). The 2004 run is predicted to be 31 thousand fish greater than the 10-year average (1994 to 2003 average run was 306 thousand sockeye salmon), but 302 thousand fish less than what actually returned in 2003 (639 thousand). The predominant age classes in the run are expected to be age 1.3 (49 percent), 1.2 (25 percent), and 2.3 (20 percent) fish. The run will be composed entirely of Saltery Lake stock returning in late June to early July, peaking in mid to late July and ending by mid August.

Steve Schrof
Finfish Research Biologist
Kodiak

FORECAST AREA: **Kodiak, Ayakulik River**
SPECIES**: Sockeye Salmon**

Preliminary Forecast of the 2004 Run:	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Production:		
Total Run Estimate	361	49–695
Escapement Goal	250	200–300
Harvest Estimate	111	

Forecast Methods

The 2004 Ayakulik sockeye salmon forecast was prepared primarily by investigating simple linear regression models utilizing outmigration year (1967 to 2002) ocean age-class relationships. In constructing and evaluating each of the regression models, standard regression diagnostic procedures were used. Estimates from regression models were only used in cases where the slope of the regression was significantly different from zero ($P < 0.25$). Ocean age two (2-ocean) sockeye salmon were predicted from prior year 1-ocean returns ($P = 2.6\text{x}10^{-6}$), while 3-ocean sockeye were predicted from prior year 2-ocean returns ($P = 1.1\text{x}10^{-13}$). Estimates of variance were calculated from each regression. Both 1-ocean and 4-ocean sockeye salmon were predicted by calculating the median return and prediction intervals were calculated using the 10^{th} and 90^{th} percentiles of the returns. The variances associated with individual regression estimates by age class were summed to calculate 80 percent prediction intervals. Regression and median estimates were summed to estimate the total Ayakulik sockeye salmon run for 2004; 80 percent prediction intervals for the total run were calculated by combining the regression and median prediction intervals.

Forecast Discussion

The 2004 forecast is 135 thousand fish greater than the 2003 forecast (226 thousand) and about 163 thousand fish greater than the actual 2003 run estimate of 198 thousand fish. The 2004 run should be composed of approximately 67 percent 2-ocean fish and 28 percent 3-ocean fish. If realized, this run will be 328 thousand fish less than the recent 10-year average (1994 to 2003) run of 689 thousand fish. The strength of the 2003 Ayakulik sockeye salmon run was the weakest since 1983 (196 thousand). Overall, the confidence in the 2004 Ayakulik forecast is fair, due to the low run size, and hence the relatively low values of the predictor age classes. The projected harvest of 111 thousand fish is based on achievement of the mid-point (250 thousand) of the escapement goal range.

M. B. Foster
Finfish Research Biologist
Kodiak

FORECAST AREA**: Kodiak, Karluk Lake (Early Run)**
SPECIES**: Sockeye Salmon**

Preliminary Forecast of the 2004 Run:	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Production:		
Total Run Estimate	660	421–898
Escapement Goal	150	150–250
Harvest Estimate	510	

Forecast Methods

The 2004 Karluk Lake early-run sockeye salmon forecast was prepared primarily by investigating simple linear regression models utilizing recent brood year (1979 to 1999) sibling relationships for four age classes. In constructing and evaluating each of the regression models, standard regression diagnostic procedures were used. Prediction estimates from regression models were only used in cases where the slope of the regression was significantly different from zero ($P < 0.25$). Ages 1.3, 2.2, 3.2, and 3.3 were predicted from age 1.2, 2.1, 3.1 and 3.2 siblings respectively. The median brood year return by age class was used to represent the age 1.2 and 2.3 components of the run. All other age classes were estimated by summing 13 minor age class run estimates (0.2, 1.1, 0.3, 2.1, 0.4, 3.1, 1.4, 4.1, 2.4, 4.2, 3.4, 4.3 and 4.4) by year (1994 to 2003) and calculating the pooled median contribution. The total run forecast was calculated by summing individual and pooled age class estimates. When the median return by age class was used, the 80 percent prediction intervals were estimated by calculating the 10^{th} and 90^{th} percentiles of the data. The variances associated with individual regression estimates by age class were summed to calculate 80 percent prediction intervals. The median and regression prediction intervals were summed to estimate an overall prediction interval.

Forecast Discussion

The 2004 forecast is about 81 thousand fish greater than the 2003 forecast (579 thousand) and about 165 thousand fish less than the actual 2003 run estimate of 825 thousand fish. The 2004 run should be composed of approximately 60 percent five-year-old fish and 30 percent six-year-old fish. If realized, this run will be 89 thousand fish greater than the recent 10-year average (1994 to 2003) run of 571 thousand fish.

The projected harvest of 510 thousand fish is based on achievement of the low-point of the escapement goal range (150 thousand fish). The predominant age classes in the run should be age 2.2 (54 percent) and 2.3 (19 percent).

Age 2.2 fish have been the predominant age class in each of the past six seasons and are the largest source of uncertainty in the 2004 forecast. In 2003, the return of age 2.1 fish to the early run at Karluk was the highest on record, indicating a large return of age 2.2 fish in 2004. However, the sibling relationship points toward a significantly larger return of age 2.2 fish than available smolt outmigration estimates indicate. Due to this uncertainty, our confidence in this forecast is fair.

Mark Witteveen
Finfish Research Biologist
Kodiak

FORECAST AREA**: Kodiak, Karluk Lake (Late Run)**
SPECIES: **Sockeye Salmon**

Preliminary Forecast of the 2004 Run:	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Production:		
Total Run Estimate	881	441–1,763
Escapement Goal	400	400–550
Harvest Estimate	481	

Forecast Methods

The 2004 Karluk Lake late-run sockeye salmon forecast was prepared by investigating simple linear regression models utilizing recent brood year (1979 to 1999) sibling relationships for two age classes and estimating median runs for four individual age classes. In constructing and evaluating each of the regression models, standard regression diagnostic procedures were used. Prediction estimates from regression models were only used in cases where the slope of the regression was significantly different from zero ($P < 0.25$). A significant sibling regression model was employed to estimate the age 2.3 and 3.3 components of the run from returns of age 2.2 and 3.2 siblings respectively. Following non-significant regression results, the median return by age class was used to estimate the age 1.2, 1.3, 2.2, and 3.2 components of the run. All other age classes were estimated by summing 12 minor age class run estimates (0.1, 0.2, 1.1, 0.3, 2.1, 0.4, 3.1, 1.4, 2.4, 4.2, 3.4, and 4.3) by year (1994 to 2003) and calculating the pooled median contribution. The total run forecast was calculated by summing individual and pooled age class estimates. When the median return by age class was used, 80 percent prediction intervals were estimated by calculating the 10^{th} and 90^{th} percentiles of the data. The variances associated with individual regression estimates by age class were summed to calculate 80 percent prediction intervals. The median and regression prediction intervals were summed to estimate an overall prediction interval.

Forecast Discussion

The 2004 forecast is about 83 thousand fish greater than the 2003 forecast (798 thousand) and about 709 thousand fish less than the actual 2003 run estimate of 1.59 million fish. Median estimates were used for most age classes due to relatively poor sibling relationships. The 2004 run should be composed of approximately 43 percent five-year-old fish and 49 percent six-year-old fish. If realized, this run will be 63 thousand fish greater than the recent 10-year average (1994 to 2003) of 818 thousand fish.

The projected harvest of 481 thousand fish is based on achievement of the lower bound of the escapement goal range (400 thousand fish). The predominant age classes in the run should be age 2.2 (43 percent), 2.3 (33 percent), and 3.2 (16 percent).

Age 2.2 fish have been the predominant age class in five of the past six seasons. The sibling relationship points toward a large return of age 2.2 fish, while smolt outmigration information suggests that the run may return in the lower end of the forecast range. Due to this uncertainty, our confidence in this forecast is fair.

Mark Witteveen
Finfish Research Biologist
Kodiak

FORECAST AREA: **Kodiak, Frazer Lake (Dog Salmon River)**
SPECIES: **Sockeye Salmon**

Preliminary Forecast of the 2004 Run:	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Production:		
Total Run Estimate	244	66–706
Escapement Goal	140	140–200
Harvest Estimate	104	

Forecast Methods

The 2004 Frazer Lake (Dog Salmon River) forecast was prepared by investigating simple linear regression models using smolt and recent brood year sibling relationships for three major age classes. In constructing and evaluating each of the regression models, standard regression diagnostic procedures were used. Ages 1.3 and 2.3 fish were predicted from ages 1.2 and 2.2 siblings, respectively. The forecast of age 2.2 fish was based on the significant relationship between age 2.2 adult returns and age 2. smolt outmigration estimates. Age 1.2 and 3.2 fish were predicted using the 10-year median value. Minor age classes (0.2, 1.1, 0.3, 2.1, 3.1, 1.4, 2.4, and 3.3) were estimated by summing eight individual age class estimates by run year and using the 10-year (1994 to 2003) median value. The prediction intervals for the age 1.2, 3.2 and minor age class components of the forecast were calculated using the 10th and 90th percentiles of the data. The total run forecast was calculated by summing individual age class estimates along with the estimate for the minor age classes. The variances associated with individual age class regression models were summed to calculate 80 percent prediction intervals. The median and regression prediction intervals were summed to estimate an overall prediction interval.

Forecast Discussion

The 2004 forecast is about 61 thousand fish greater than the 2003 forecast (183 thousand) and about 70 thousand fish less than the actual 2003 run of 314 thousand fish. The age class that generally contributes the most to the overall Frazer Lake production (40 percent) is age 2.2. The forecast for age 2.2 fish in 2004 is substantially lower than the 10-year average. The estimated 2003 run to Frazer Lake was greater than forecast, and largely composed of age .1 fish. The number of age .1 fish returning to Frazer in 2003 was much higher than expected. Therefore the largest source of uncertainty in the forecast is the age 2.2 estimate. The sibling relationship points toward a significantly larger return of age 2.2 fish than the smolt relationship. This ancillary information suggests that the actual run may fall between the point estimate and the higher 80 percent prediction interval, but with great uncertainty.

The 2004 run should be composed of approximately 30 percent five-year-old fish and 44 percent six-year-old fish. If this run is realized, it will be 247 thousand fish less than the recent 10-year average run of 491 thousand fish.

The projected harvest of 104 thousand fish is based on achievement of the lower bound of the escapement goal range of 140 thousand to 200 thousand sockeye salmon. The majority of the run should be composed of age 2.2 (26 percent) and 2.3 (41 percent) fish.

Nicholas H. Sagalkin
Finfish Research Biologist
Kodiak

FORECAST AREA: **Kodiak, Upper Station (Early Run)**
SPECIES: **Sockeye Salmon**

Preliminary Forecast of the 2004 Run:	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Production:		
Total Run Estimate	163	101–238
Escapement Goal	25	25–75
Harvest Estimate	138	

Forecast Methods

The 2004 Upper Station early-run forecast was prepared primarily by investigating simple linear regression models using recent brood year sibling relationships for four major age classes. In constructing and evaluating each of the regression models, standard regression diagnostic procedures were used. Age classes 1.2, 1.3, 2.2, and 2.3 were predicted from age 1.1, 1.2, 2.1, and 2.2 siblings, respectively. Similar to the last two years, age 0.3 fish were forecasted using the lowest previously observed return and the associated variance was estimated around the minimum value instead of the average. Minor age classes (0.1, 0.2, 1.1, 2.1, 0.4, 3.1, 1.4, 3.2, 3.3, and 2.4) were estimated by summing individual returning age class estimates by run year and using the 10-year median value (1994 to 2003). The prediction interval for the median forecast was calculated using the 10th and 90th percentiles of the data. The total run forecast was calculated by summing individual age class estimates along with the estimate for the minor age classes. The variances associated with individual age class regression models were summed to calculate 80 percent prediction intervals. The overall prediction interval was calculated as the sum of the 80 percent prediction interval and the prediction interval of the minor age classes.

Forecast Discussion

The 2004 forecast is approximately 38 thousand fish greater than the 2003 forecast (125 thousand) and 63 thousand fish greater than the actual 2003 run of 100 thousand fish. The 2003 run (100 thousand) was within the 80 percent prediction intervals of the forecast (48 thousand to 216 thousand). Individual age class predictions were good; specifically, the age 2.2 and 1.2 returns were forecasted accurately. The 2004 run should be predominantly composed of approximately 35 percent four-year-old fish and 52 percent five-year-old fish. If this run is realized, it will be 41 thousand fish greater than the recent 10-year average run of 122 thousand fish.

The Upper Station early-run sustainable escapement goal (SEG) range is 50 thousand to 75 thousand; however, the Alaska Board of Fisheries has adopted a 25 thousand optimum escapement goal (OEG) in the Alitak Bay District Salmon Management Plan. The projected harvest of 138 thousand fish is based on achievement of the OEG. Similar to the last three years, the predominant age class in the 2004 run should be age 2.2 (37 percent).

Nicholas H. Sagalkin
Finfish Research Biologist
Kodiak

FORECAST AREA: **Kodiak, Upper Station (Late Run)**
SPECIES: **Sockeye Salmon**

Preliminary Forecast of the 2004 Run:	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Production:		
Total Run Estimate	538	421–1,426
Escapement Goal	175	150–200
Harvest Estimate	363	

Forecast Methods

The 2004 Upper Station late-run forecast was prepared by investigating simple linear regression models using recent brood year sibling relationships for two major age classes. In constructing and evaluating each of the regression models, standard regression diagnostic procedures were used. A standard sibling regression model was used to estimate the age 1.3 component of the run from returns of age 1.2 fish. An alternate sibling regression relationship was used to estimate the age 2.2 component of the run from returns of age 1.2 fish. In 2001 and 2002 all age 0. and 1.2 fish returned at levels far below estimates. The 2003 forecast estimates for age 1.2, 0.2, and 0.3 fish were based on the lowest previously observed return for each age class. Returns of these age classes in 2003 reversed the declining trend and were higher than forecast. The 2004 forecasts for age 1.2 and 0.2 fish were based on median returns. A scatter plot of age 0.3 returns shows three clusters of data corresponding to groups of low, moderate, and high levels of returns. The forecast for age 0.3 fish was based on the median of the moderate grouping of returns where the sibling return (age 0.2 fish) was greater than 20 thousand and less than 80 thousand. The prediction interval for the age 1.2, 0.2, and, 0.3 age class forecasts were calculated using the 10th and 90th percentiles of the data. Minor age classes (0.1, 1.1, 2.1, 3.1, 0.4, 1.4, 3.2, 3.3, and 2.4) were estimated by summing nine individual returning age class estimates by run year and using the 10-year median value (1994 to 2003). The prediction interval for the minor age class forecast was calculated using the 10th and 90th percentiles of the data. The variances associated with individual age classes were summed to calculate 80 percent prediction intervals. The median and regression prediction intervals were summed to estimate an overall prediction interval.

Forecast Discussion

The 2004 forecast is more than double the 2003 forecast (236 thousand) and about 125 thousand greater than the actual 2003 run of 413 thousand fish. The age 0. component of this run is forecast to be much larger than observed in recent years. The age 0. forecast is primarily based on the very large number of age 0.2 fish observed in 2003, and the expectation of good returns of age 0.3 fish in 2004. The 2004 run should be composed of approximately 50 percent five-year-old fish (43 percent age 2.2 fish). If this run is realized it will be almost 100 thousand greater than the 10-year average run of 441 thousand fish.

The projected harvest of 363 thousand fish is based on achievement of the middle (175 thousand) of the escapement goal range (150 thousand to 200 thousand).

Nicholas H. Sagalkin
Finfish Research Biologist
Kodiak

FORECAST AREA: **Chignik**
SPECIES: **Sockeye Salmon**

Preliminary Forecast of the 2004 Run:		Forecast Estimate (thousands)	Forecast Range (thousands)
Total Production:			
Early Run (Black Lake)	Total Run Estimate	1,260	480–2,210
	Escapement Goal	350	350–400
	Harvest Estimate	910	
Late Run (Chignik Lake)	Total Run Estimate	1,080	498–1,890
	Escapement Goal	225	225–275
	Harvest Estimate	855	
Total Chignik System	Total Run Estimate	2,340	1367–3,588
	Escapement Goal	575	575–675
	Harvest Estimate	1,770	

These figures include harvests of Chignik-bound sockeye salmon from the Southeastern District Mainland and the Cape Igvak fisheries; approximately 1,440 thousand sockeye salmon are projected to be harvested in the Chignik Management Area.

Forecast Methods

The forecasts for the 2004 early and late Chignik sockeye salmon runs were based on simple linear regressions using sibling relationships, escapements and subsequent year-class returns, or median estimators of age class returns from brood years since 1977. In constructing and evaluating each of the regression models, standard regression diagnostic procedures were used. Regression models were only used in cases where the slope of the regression was significantly different from zero ($P < 0.25$). The early-run age 1.3 and 2.3 returns were estimated based on the abundance of their sibling returns (1.2 and 2.2) in 2003. The late-run age 1.3 and 2.3 returns were estimated using regression relationships based on the abundance of spawners in their parent years. Following non-significant regression results, the median brood year return by total age was used to estimate all other age class components (0.2, 1.1, 0.3, 1.2, 2.1, 2.2, 1.4, 3.2, 2.4, and 3.2) of the run. When regression relationships were used, the variance of the estimate was calculated from the error structure of the regression. When the median returns by age class were used, the 10^{th} and 90^{th} percentiles of the data were used to describe the range of the data. The variances associated with individual estimates were summed to estimate 80 percent prediction intervals, which were then added to the percentile estimates to calculate the forecast ranges.

Forecast Discussion

The 2004 sockeye salmon run to the Chignik River is expected to be 2.34 million fish, which is approximately 360 thousand fish greater than the estimated run of 2003 (1.98 million). The early run is expected to be approximately 270 thousand fish greater than the estimated early run in 2003 of 990 thousand fish. The late run is expected to be approximately 94 thousand fish greater than the estimated 2003 late run of 986 thousand. The 2004 sockeye salmon run to Chignik is expected to be approximately 310 thousand fish less than the recent 10-year average run (2.65 million).

The harvest estimate for the early run of 910 thousand is based on achievement of the Black Lake lower escapement goal of 350 thousand fish while the late run harvest estimate of 855 thousand is based on achievement of the Chignik Lake lower escapement goal of 225 thousand fish through September 15. Harvest estimates for both the early and late run include Chignik bound sockeye salmon harvested in the Cape Igvak Section of the Kodiak Management Area and the Southeastern District Mainland of the Alaska Peninsula Management Area.

Approximately 83 percent of the 2004 early run was estimated using sibling relationships. Using similar methods, the 2003 early run was over-estimated by approximately 40 percent. The majority of the 2004 late run (84 percent) was estimated using relationships between parent escapement and returns for the two major age classes (ages 1.3 and 2.3). Using similar methods, the 2003 late run was over-estimated by about 17 percent.

Available smolt data were analyzed and significant regression relationships were found between the total number of emigrating smolt and subsequent 3-ocean (usually about 80 percent of the run) returns. This estimate was then expanded to account for other ocean ages. In 2003, this method under-estimated the total run by about 9 percent. The smolt-based forecast of sockeye salmon returns in 2004 to Chignik is 3.10 million sockeye salmon, which is substantially (about 772 thousand) higher than that predicted from sibling relationships and median estimates.

The disparity between the smolt forecast and the sibling forecast suggest the actual return may fall in the upper half of the forecast range. Given this ancillary data, our confidence in this forecast is fair.

Kenneth A. Bouwens
Finfish Research Biologist
Kodiak

FORECAST AREA: **Bristol Bay**
SPECIES: **Sockeye Salmon**

Forecast of the 2004 Return:	Forecast Estimate (millions)	Forecast Range (millions)
TOTAL PRODUCTION:		
Total Run	**46.6**	**36–58**
Escapement Goal	11.9	
Commercial Common Property Harvest)[a]	34.7	

[a] The Escapement Goal and Harvest summed do not equal 16.8 million because the Kvichak return is projected to be 0.2 million less than the escapement goal.

Forecasted sockeye harvests for inshore Bristol Bay fishing districts are as follows:	
Naknek-Kvichak	14.0 million
Egegik	11 million
Ugashik	3.2 million
Nushagak	5.4 million
Togiak	0.7 million

Forecast Methods

The forecast for the sockeye salmon run to Bristol Bay in 2004 is the sum of individual predictions for nine river systems (Kvichak, Alagnak, Naknek, Egegik, Ugashik, Wood, Igushik, Nushagak-Mulchatna, and Togiak) and four age classes (ages 1.2, 1.3, 2.2, and 2.3, plus ages 0.3 and 1.4 for Nushagak). Adult escapement and return data from brood years 1973 to 2000 were used in the analyses.

Predictions for each age class returning to a river system were calculated from models based on the relationship between adult returns and spawners or siblings from previous years. Also, models based on the relationship between returns and smolt were examined for Ugashik River. Tested models included simple linear regression, multiple regression, and 5-year averages. In addition, univariate and multivariate time series analysis models were examined. The models chosen were those with statistically significant parameters having the greatest past reliability (accuracy and precision) based on mean absolute deviation, mean absolute percent error, and mean percent error between forecasts and actual returns for the years 2001 through 2003.

The forecast range was the upper and lower values of the 80% confidence bounds for the total run forecast. The confidence bounds were calculated using deviations of actual runs from published run predictions for the 1999 through 2003 returns.

A total of 46.6 million sockeye salmon are expected to return to Bristol Bay in 2004. This prediction is 31 percent higher than the previous 10-year mean (36 million) of returns. All systems are expected to exceed their spawning escapement goals. A run of 46.6 million sockeye salmon can be expected to produce a total harvest of 34.7 million fish if all escapement goals are met. A harvest of this size would be about 60 percent higher than the previous 10-year mean (22 million) harvests (range is 10 million to 44 million).

Forecast Discussion

We excluded some historical escapement and return data to prepare the 2004 forecast. Beginning with the 1973 brood year ($\geq$1979 return year), the number of returning adults produced from each spawner in Bristol Bay showed a dramatic increase across most stocks. As a result, recent Bristol Bay sockeye salmon forecasts have been based on data from this more productive period in order to more accurately

predict returns. Poor sockeye salmon returns to Bristol Bay in 1996 (4 year-old fish only), 1997, and 1998 (offspring from brood years 1992 to 1994) suggested we might be entering a period of productivity more similar to the pre-1978 period. However, the fish from the 1996 to 1998 return years reared in the ocean when temperatures were above average, whereas cooler-than-average ocean temperatures characterized the pre-1978 period. In addition, there has been no consistent statewide signal in salmon productivity despite recent anomalous returns. Recent ocean temperature data and the runs to Bristol Bay in 1999 to 2003 suggest that runs in 2004 may be more characteristic of the period from 1978 to 1995. Hence, we used these data to prepare our forecast.

The greatest source of uncertainty in the 2004 forecast is in predicting the returns of 2-ocean fish (ages 1.2 and 2.2). The strong presence of jacks in the 2003 return (1-ocean fish, the siblings of the age-1.2 and age-2.2 fish returning in 2004) suggests a large return of age-1.2 and age-2.2 fish in 2004 but with great uncertainty. The greatest sources of potential error in actual numbers of fish are the forecasts of age-1.2 fish for Alagnak and Wood Rivers, and the forecasts of age-2.2 fish for Kvichak and Egegik Rivers.

In general, the source of the larger forecast in 2004 as compared to 2003 is the large returns of 1-ocean fish in 2003, suggesting a large return of 3-ocean fish in 2004. We do not know why the Bristol Bay sockeye salmon runs from 1996 to 1998 were poor. The 2000 to 2003 runs to Bristol Bay on a baywide scale were similar to expected suggesting that the poor runs from 1996 to 1998 were anomalies. At this juncture, we still have insufficient evidence to believe that the high production of 1978 to 95 will continue. We are actively working with scientists inside and outside the Department to better understand the reasons for these population trends and develop better techniques for forecasting sockeye salmon runs to Bristol Bay.

Lowell Fair
Bristol Bay Research Project Leader
Anchorage

FORECAST AREA: **Bristol Bay**
SPECIES: **Chinook Salmon**

Forecast of the 2004 Run	Forecast Estimate (thousands)	Forecast Range (thousands)
TOTAL PRODUCTION:		
Total Run	145	119–171
Inriver Run Goal[1]	75	
Additional Sport and Subsistence Harvest	6	
Commercial Common Property Harvest	64	

[a] The Nushagak inriver goal is 75 thousand chinook salmon, which provides for a biological escapement goal of 65 thousand spawners and a harvest of 10 thousand chinook salmon by upriver subsistence and sport fisheries

Forecast Methods

The 2004 Nushagak District chinook salmon forecast is the sum of individual predictions of five age classes (age-1.1, -1.2, -1.3, -1.4, and -1.5). For each age class, up to 10 models were evaluated for use in forecasting abundance. Predictions for each age class were calculated from models based on the relationship between adult returns and spawners or siblings from previous years. Tested models included simple linear regression, multiple regression, and 5-year averages. In addition, univariate and multivariate time series analysis models were examined. The models chosen were those with statistically significant parameters having the greatest past reliability (accuracy and precision) based on mean absolute deviation, mean absolute percent error, and mean percent error between forecasts and actual returns for the years 2001 through 2003. Data sets in the analyses included adult escapement and return data from brood years 1978 to 2000.

A Ricker stock-recruitment model using spawning escapements and total returns was used to forecast age-1.1 abundance. The best age-1.2, age-1.3, and age-1.4 models were based on the relationship between sibling returns in succeeding years (e.g., age-1.2 returns for 2004 based on age-1.1 returns in 2003). The top model for age-1.5 abundance used age-1.4 returns and spawning escapements as predictors.

The forecast range is the upper and lower values of the 80% confidence bounds for the total run forecast. The confidence bounds were calculated using deviations of actual runs from published run predictions for the 1999 through 2003 returns.

Forecast Discussion

Age composition of the forecasted total run is <1% (<1 thousand) age-1.1, 17% (25 thousand) age-1.2, 37% (53 thousand) age-1.3, 44% (64 thousand) age-1.4, and 2% (2 thousand) age-1.5. The 2004 forecasted total run of 145 thousand chinook salmon is 104% of the previous 20-year mean total run of 140 thousand and 98% of the most recent 10-year mean total run of 148 thousand. The projected harvest of 70 thousand chinook salmon is 106% of the previous 20-year mean harvest of 66 thousand and 94% of the most recent 10-year mean harvest of 75 thousand.

Lowell Fair
Bristol Bay Research Project Leader
Anchorage

FORECAST AREA: **Alaska Peninsula, Bear Lake (Late Run)**
SPECIES: **Sockeye Salmon**

Preliminary Forecast of the 2004 Run:	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Production:		
Total Run Estimate	631	307–1,010
Escapement Goal	100	75–100
Harvest Estimate	531	

Forecast Methods

The 2004 Bear River late-run sockeye salmon forecast was prepared primarily by using simple linear regression models utilizing available brood year (1980 to 1999) sibling relationships where significant regression relationships existed. In constructing and evaluating each of the regression models, standard regression diagnostic procedures were used. Regression models were used in cases where the slope of the regression was significantly different from zero ($P < 0.25$). The age 2.2 and 2.3 components of the run were predicted from returns of age 2.1 and 2.2 siblings respectively. All other age classes were estimated by summing 15 minor age class run estimates (0.1, 0.2, 1.1, 0.3, 1.2, 2.1, 0.4, 1.3, 3.1, 1.4, 3.2, 1.5, 2.4, 3.3, and 3.4) by total age, calculating the median contribution of each pooled age class, and summing the pooled medians. The total run forecast was calculated by summing the individual and pooled age class estimates. When a regression relationship was used to predict an individual age class, the variance of the estimate was calculated from the error structure of the regression. When the median returns by total age were used, the 10^{th} and 90^{th} percentiles of the data were used calculate prediction intervals. The variances associated with individual estimates were summed to estimate 80 percent prediction intervals, which were then added to the percentile prediction interval estimates to calculate the forecast range.

Forecast Discussion

The 2004 forecast for the Bear Lake late run is about 78 thousand fish greater than the 2003 forecast (553 thousand), and about 297 thousand fish greater than the actual 2003 run of 334 thousand fish. This equates to a run in 2004 that, if achieved, would be 18 thousand fish less than the recent (1994 to 2003) 10-year average (649 thousand) and 95 thousand fish greater than the most recent (1999 to 2003) 5-year average of 536 thousand. The projected harvest of 531 thousand fish is based on the achievement of the upper end of the escapement goal range (100 thousand fish).

The predominant age classes of the Bear Lake late run have historically been ages 2.2 and 2.3; these ages, on average (brood years 1983 to 1998), have composed approximately 58 percent and 28 percent of the run, respectively. Approximately 89 percent of the 2004 run was predicted from sibling relationships. There was an unusually high number of 1-ocean (jacks) returns in 2003. It is unknown if these indicate high brood year success or if ocean conditions facilitated early maturity. Because of this uncertainty combined with the variable predictive capabilities of the sibling data, our confidence in this forecast is fair.

Kenneth A. Bouwens
Finfish Research Biologist
Kodiak

FORECAST AREA**: Alaska Peninsula, Nelson River**
SPECIES: **Sockeye Salmon**

Preliminary Forecast of the 2004 Run:	Forecast Estimate (thousands)	Forecast Range (thousands)
Total Production:		
Total Run Estimate	489	207–831
Escapement Goal	150	100–200
Harvest Estimate	339	

Forecast Methods

The 2004 Nelson River sockeye salmon forecast was constructed using simple linear regressions of ocean age relationships and median estimators of age class returns. Standard regression diagnostics were employed including analysis of residuals and outlier points. Regression estimates were only used if the slope was significantly different from zero ($P < 0.25$). Regression estimates were used to predict the 2004 3-ocean returns (predicted from 2-ocean returns), using data from the last 10 years. Age 2.2 returns in 2004 were predicted using a median estimator from the last 19 years. All other age classes were estimated by summing 11 minor age class run estimates (0.1, 0.2, 1.1, 1.2, 2.1, 0.4, 3.1, 1.4, 3.2, 1.5, and 2.4) by total age, calculating the median contribution of each pooled age, and summing the pooled medians. The total run forecast was calculated by summing individual and pooled age class estimates. When a regression relationship was used to predict an individual age class, the variance of the estimate was calculated from the error structure of the regression. When the median returns were used, the 10th and 90th percentiles of the data were used to describe the range of the data. The variance associated with the regression estimate was used to estimate 80 percent prediction intervals, which were then added to the percentile prediction interval estimates to calculate the forecast range.

Forecast Discussion

The 2004 forecast for Nelson River is 489 thousand sockeye salmon, which is 227 thousand less fish than the actual 2003 run of 716 thousand sockeye salmon. The 2004 forecast is 12 thousand fish less than the recent 5-year average (1999–2003) of 501 thousand and 28 thousand fish less than the recent 10-year average (1994–2003) of 517 thousand sockeye salmon. The projected harvest of 339 thousand fish is based on the achievement of the midpoint of the escapement goal range (150 thousand fish).

Approximately 37 percent of the 2004 run was forecasted using regression relationships with prior year's returns. Historically, age 2.2 sockeye salmon composed about 50 percent of the Nelson River run. An unprecedented age 2.1 (jack) return in 2003 confounded the 2.2 regression relationship; the number of age 2.1 sockeye salmon that returned to Nelson River in 2003 was almost five times larger than the next largest age 2.1 run. Historic data provides little insight about whether this large age 2.1 run indicates a high age 2.2 run in 2004 or if ocean conditions facilitated early maturity and will provide little predictive power toward the magnitude of the 2004 age 2.2 run. It is possible that the high age 2.1 run in 2003 will equate to a high age 2.2 run in 2004. Because of these uncertainties, our confidence in this forecast is poor.

Kenneth A. Bouwens
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Kodiak

FORECAST AREA: **Arctic-Yukon-Kuskokwim**
SPECIES: **All Salmon**

The Alaska Department of Fish and Game does not produce formal run forecasts for any salmon runs in the Arctic-Yukon-Kuskokwim Region. Salmon run outlooks in the AYK Region are qualitative in nature because of the lack of adequate information with which to develop more rigorous forecasts. Consequently, the commercial harvest outlooks for the AYK region 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. While the commercial harvest outlooks provide for a general level of expectation, the fisheries are managed based upon inseason assessments of the actual runs.

In the AYK region, as in some other areas of the state, salmon production has notably decreased for many stocks. Chinook salmon stocks in the Yukon and Kuskokwim Rivers have been classified as stocks of concerns under the guidelines established in the Sustainable Salmon Fisheries Policy for the State of Alaska. Similarly, chum salmon from the Kuskokwim, Yukon (summer and fall), and Nome Areas have also been classified as stocks of concern. Causes for the loss of productivity have been the subject of much interest and concern, but to date it is unknown whether the decline in productivity can be expected to continue or not. In 2003, there was increased abundance, mostly unexpectedly of chinook, fall chum and coho salmon in the Yukon River and chinook, chum and coho salmon in the Kuskokwim River. Salmon production appeared to be good. Additionally, the Bering Sea trawl bycatch and BASIS study indicate the presence of large numbers of salmon in the Bering Sea in the summer of 2003. Tempering these optimistic trends, AYK Region chum salmon escapements were near record lows in the 2000 parent year.

The commercial harvest outlooks for the year 2004 qualitatively take recent abundance trends into account. Additionally**,** declining salmon markets, particularly for chum salmon flesh since 1994 and salmon roe in 1997, have had a major impact on the commercial fisheries in the AYK Region. A continuation of these market trends in the year 2004 could reduce potential harvests in some areas, and lower exvessel value. In most cases, market conditions have not been accounted for in the harvest outlooks.

The commercial harvest outlook for the year 2004 can be found in the following Table.

Commercial salmon harvest outlook for the AYK Region, year 2004, in thousands of fish:

	SPECIES					
Management Area	Chinook	Sockeye	Coho	Pink	Chum	Fall Chum
Kuskokwim River	5–15	20–40	200–600	0–1	150–300	
Kuskokwim Bay	15–22	60–100	50–100	0–2	25–50	
Kuskokwim Total	20–37	80–140	250–700	0–3	175–350	
Yukon	20–60		0–50		50–150	0–150
Norton Sound	0–1	0	20–40	500–600	10–20	
Kotzebue Sound					25–50	