

1998 LOWER COOK INLET ANNUAL FINFISH MANAGEMENT REPORT



by

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The finfish operations for the Division of Commercial Fisheries, Lower Cook Inlet, employed eight permanent employees and nine permanent-seasonal employees in various area management and research programs during the 1998 season. Appreciation is extended to all personnel for a successful program during 1998.

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ANNUAL MANAGEMENT REPORT
LOWER COOK INLET
1998

COMMERCIAL SALMON FISHERY

INTRODUCTION

The Lower Cook Inlet (LCI) management area is comprised of all waters west of the longitude of Cape Fairfield, north of the latitude of Cape Douglas, and south of the latitude of Anchor Point, and is divided into five fishing districts (Figure 1). The Barren Islands District is the only non-salmon fishing district, with the remaining districts (Southern, Outer, Eastern, and Kamishak Bay) separated into approximately 40 subdistricts and sections to facilitate management of discrete stocks of salmon and herring.

The 1998 LCI salmon harvest of 1.764 million fish (Table 1, Figure 9) was the fourth highest during this decade and was about 12% greater than the 20-year average (Appendix Table 5). The overall harvest represented just over half of the preseason forecast. Unfortunately, the economic forces of worldwide salmon markets continued the depression of salmon prices, especially for pinks, yielding a LCI exvessel value of just over \$2.0 million (Table 7). Nevertheless, the value of the 1998 harvest was the fourth highest during this decade (Appendix Table 2). Seine fishing effort increased from the last two years, with 41 permit holders making deliveries (Appendix Table 1), while 24 set gillnet permits were actively fished, the same as the previous three years.

Once again, LCI commercial salmon harvests in 1998 relied heavily on the success of hatchery and enhanced fish production. Over 85% of the sockeye salmon harvest in both numbers of fish and exvessel value was attributed to joint Alaska Department of Fish and Game (ADF&G), Cook Inlet Aquaculture Association (CIAA), and/or Chugach Regional Resources Commission (CRRC) lake stocking and fertilization projects. These projects were conducted at Leisure,

Hazel, and English Bay Lakes in the Southern District, Kirschner and Bruin Lakes in the Kamishak Bay District, and Bear and Grouse Lakes in the Eastern District. Additionally, sockeye salmon produced by the enhancement project at English Bay Lakes once again provided subsistence harvests for the villages of Nanwalek and Port Graham in the Southern District.

Pink salmon production from Tutka Hatchery, now operated by CIAA, did not reach expectations, with an overall return of just under 1.5 million fish (Table 9), about 40% less than the preseason projection. And, as has been the case since hatchery programs were taken over by private non-profit (PNP) corporations in LCI, a significant portion of the salmon harvest was utilized as hatchery cost recovery to recoup expenses incurred by the various stocking and enhancement projects throughout the management area. Approximately half of the total salmon harvest (Table 7) in numbers of fish was taken by CIAA and CRRC to support the lake stocking programs and Tutka Hatchery operations, representing just over one-third of the exvessel value of the LCI salmon fishery. Natural returns bound for LCI drainages contributed only a very small percentage to commercial harvests in 1998, primarily from Rocky River and East Nuka Bays and South Nuka Island, all in the Outer District.

Several notable factors continued to affect the amount and distribution of seine effort, and ensuing harvest of salmon, in LCI during 1998. The first was the policy adopted in 1994 by major processors regarding tender service. Prior to that time processors routinely stationed a tender (or tenders) in remote districts in anticipation of salmon harvests, even when run strengths and catches were marginal. However, when the practice was abandoned seiners were forced to devise their own means to transport fish from these remote areas to a processing plant in Homer or elsewhere. Due to equipment limitations and the high cost of contracting out, some fishermen were unable to fish in remote areas, while others retained the flexibility to fish these traditional areas because of onboard chilling equipment.

The second element affecting effort and harvest revolved around world wide market situations. Despite slightly higher prices in 1998 compared to recent seasons, prices for all salmon species remained depressed, with that for pinks (the most numerous species in LCI) and chums

especially low. Pricing structure often dictated the fishing strategy of individual fishermen, even to the point of total non-participation. Coupled with the lack of tender service in remote districts, low prices may have kept effort and harvest artificially low.

PRESEASON FORECAST

The projected 1998 LCI all-species salmon harvest of 3.1 million fish was double the most recent 20-year average. The majority of the harvest was expected to come as a result of hatchery and lake stocking enhancement projects involving pink and sockeye salmon. Formal total run forecasts for natural salmon returns other than pink salmon were not prepared because escapement and age-weight-length data are limited for those species. However, catch projections were calculated from relative estimates of parental run size, average age composition data, and recent relative productivity trends. Harvest projections and actual catches for all species in 1998 are listed in the following table:

SPECIES	PROJECTED HARVEST	ACTUAL HARVEST	1978-1997 AVERAGE
Chinook	1,600	1,071	1,338
Sockeye	322,700	284,029	211,087
Coho	14,800	16,653	14,368
Pink	2,787,300	1,457,819	1,253,555
Chum	11,100	4,647	93,836
TOTAL	3,137,200	1,764,219	1,574,905

Relatively strong sockeye returns were anticipated in all areas. Enhanced runs to Leisure, Hazel, and English Bay Lakes in the Southern District, Kirschner Lake in the Kamishak Bay District, and Bear and Grouse Lakes in the Eastern District were expected to comprise the bulk of the sockeye returns. It should be noted that the Grouse Lake return was specifically designated for hatchery cost recovery. Although Chenik Lake in the Kamishak Bay District has benefited from regular fry stocking and intermittent fertilization during recent years, adult sockeye returns in

1998 were once again predicted to be very poor due to the lingering effects of an epizootic of Infectious Hematopoietic Necrosis Virus (IHNV) within the system. As a result, the entire Chenik run was to be protected for escapement. Bruin and Ursus Lakes in the Kamishak Bay District were expected to produce only minimal sockeye returns in 1998 due to a discontinuation of stocking at those systems.

Returns to the Tutka Bay Hatchery were once again expected to provide the majority of the pink salmon, with a forecasted harvest totaling nearly 2.5 million fish. These fish were anticipated as a result of an 89.0 million fry release from Tutka Hatchery in 1997 (Appendix Table 31). Typical ocean survival rates for odd-year runs could be expected to produce an overall adult return approaching 2.5 million fish.

Generally poor 1996 pink salmon escapements to major systems contributed to a harvest projection of 323,000 naturally produced pinks throughout the entire LCI management area this season. Port Dick and Nuka Island in the Outer District were forecasted to provide the largest potential for harvestable surpluses, but fishing effort in these remote districts was questionable.

Significant chum salmon harvests appeared unlikely again in 1998 since all major LCI systems experienced relatively poor escapements during the 1993 and 1994 parent years. Additionally, a lingering trend of weak returns over the past eight seasons suggested that the 1998 chum return would be weak as well.

1998 SUMMARY BY SPECIES

Chinook Salmon

The harvest of chinook salmon, not normally a commercially important species in LCI, was slightly below the 20-year average at 1,071 fish (Table 2, Appendix Table 12). Virtually all of the catch came from the Southern District and can be primarily attributed to enhanced production

at Halibut Cove Lagoon and Seldovia Bay. Set gillnetters accounted for about 89% of the LCI chinook catch, with purse seiners taking the remaining 11%.

Sockeye Salmon

The 1998 LCI sockeye salmon harvest of 284,000 fish (Figure 10, Table 3) exceeded the recent 10-year average (Appendix Table 13) but fell short of the preseason forecast by roughly 12%. Sockeyes accounted for only about 16% of the LCI salmon harvest in total numbers of fish, yet provided nearly two-thirds of the exvessel value of the entire salmon fishery this season (Table 7). The 1998 LCI commercial sockeye harvest was characterized by significant contributions from Southern District enhancement programs at Leisure and Hazel Lakes. As was the case during the past two seasons, non-local stocks were thought to have intermixed with local stocks while migrating through the Southern District terminal harvest areas, providing additional sockeyes for harvest. Elsewhere in LCI, the much-anticipated return to Grouse Lake in the Eastern District once again failed to meet expectations for the third consecutive season.

Returns to enhancement sites, which typically have provided the bulk of the LCI sockeye catch, were considered relatively good in 1998. In the Southern District, harvests of enhanced runs of sockeye salmon returning to Leisure and Hazel Lakes were predicted to total 85,000 fish combined. However, the estimated combined total of 164,000 fish (Figure 12, Appendix Table 15) produced as a result of these two enhancement projects provided 58% of the LCI sockeye total and was nearly double the preseason forecast. This year's harvest figure represents the second highest combined total since adults began returning to Hazel Lake in 1991 (prior to that year, only Leisure Lake sockeyes contributed to the harvests).

Also in the Southern District, the sockeye run to English Bay Lakes achieved an escapement within the desired range for the fourth consecutive year but only the fifth time in the last 20 years. Still, this return provided a harvestable surplus to both subsistence and commercial set gillnetters in the Port Graham Subdistrict. The strong return to this system can be attributed

to the success of an ongoing rehabilitation project originally initiated by ADF&G in the late 1980's and presently being conducted by Chugach Regional Resources Commission (CRRC) in conjunction with the village of Nanwalek.

In the Kamishak Bay District, enhanced returns to Kirschner and Bruin Lakes produced a combined harvest of 27,500 sockeyes (Table 3), nearly achieving the preseason harvest forecast of 30,000 fish. The return to a former enhancement site at Ursus Lake was weak as expected since the stocking program was discontinued at this system. No fishing was allowed at Chenik Lake in the Kamishak Bay District since that return was expected to be poor due to the lingering effects of an outbreak of the naturally occurring viral disease IHN. This outbreak caused increased mortality to young salmon, subsequently resulting in weak adult returns.

At Bear Lake in Resurrection Bay of the Eastern District, a catch of over 22,000 sockeyes exceeded the harvest forecast of 11,000 sockeyes. The return to nearby Grouse Lake, with a projected harvest of 56,000 fish, was disappointing for a third consecutive year as only about 14,000 fish were documented.

Natural runs of sockeye salmon to LCI drainages were considered relatively good, with two of four systems achieving escapement goals and the other two nearly reaching their goals. In the Outer District, escapements at both Delight and Desire Lakes (goal of 10,000 sockeyes each) fell just short, with Desire Lake totaling 7,900 fish and Delight Lake 9,200 (Appendix Table 23). Only a small harvestable surplus (16,000 fish) was taken by the seine fleet in East Nuka Bay (Table 3) despite opening waters around Desire Lake early in the season. Returns to Delusion (Ecstasy) Lakes, a recently formed glacial lake system in East Nuka Bay which supported no documented salmon run prior to the mid-1980's, had a peak aerial escapement estimate of 1,100 sockeye salmon in 1998. Waters of Aialik Bay, including Aialik Lagoon, in the Eastern District were opened to fishing in late June, resulting in a harvest of almost 9,000 sockeyes for the season (Table 3). Still, 4,900 fish entered the system to achieve the upper end of the escapement goal range (Table 3, Appendix Table 23). At Mikfik Lake in the Kamishak

Bay District, no fishing effort on the return occurred during the season and the entire run entered the system to spawn, with the final escapement index estimated at 12,600 fish (5-7,000 goal range).

Coho Salmon

The commercial harvest of 16,653 coho salmon (Table 4) in 1998 was the third highest catch this decade and equaled the recent 10-year average (Appendix Table 17). The majority of the harvest came from hatchery cost recovery operations at Bear Lake and entries into the Seward Silver Salmon Derby, both in the Eastern District. Coho run assessment in LCI is limited, with commercial, sport, and personal use harvests providing the best indicators of run strength. Based on these indicators, returns during 1998 were considered average. However, the combination of low prices and the lack of remote tender service discouraged the majority of the seine fleet from targeting cohos late in the season, especially in the Kamishak Bay District. Thus the commercial harvest may not have been truly indicative of run strengths. Only one aerial survey was flown specifically for coho salmon in September, at Clearwater Slough in the Northshore Subdistrict of the Southern District. The resulting index count of over 600 cohos indicated strong escapement into that system.

Pink Salmon

Returns of pink salmon, usually the dominant species in numbers of commercially harvested fish in LCI, were considered relatively good for an even year, with an overall harvest of nearly 1.46 million fish (Figure 14, Table 5). This number represents the fourth highest commercial catch during this decade and the sixth largest in the last 20 years (Appendix Table 18). The majority was taken in the Southern District (Table 5, Appendix Table 18) as a direct result of Tutka Hatchery production. However, approximately 60% of the Southern District total, or about 793,000 fish, was utilized for Tutka Hatchery cost recovery (Tables 1 and 5), with an additional 153,500 fish taken for hatchery brood stock purposes (Table 9). The estimated overall hatchery return, including escapement into Tutka Creek, brood stock,

commercially harvested fish, and sport harvest, was 1.47 million pinks (Table 9), falling short of the preseason projection of 2.63 million fish. The 1998 survival rate of 1.7% was considered below-average for this facility.

The Outer District produced the greatest contribution of natural pinks to LCI catches, with a total harvest of 102,200 fish (Table 5, Appendix Table 18), coming primarily from directed fisheries in Rocky Bay and at Nuka Island. Aialik Bay in the Eastern District also produced good late season catches of fish which, historically, have been of Prince William Sound origin. In the Kamishak Bay District, no pink harvest occurred again in 1998 despite a significant harvestable surplus identified in Bruin Bay. Pink salmon escapements in all districts of LCI were good for an even year as numerous primary systems achieved escapement goals (Appendix Table 24). Notable exceptions were Humpy Creek, Port Graham River, and Barabara Creek in the Southern District and Windy Left Creek in the Outer District. Lack of remote tender service and low prices undoubtedly affected the directed effort levels for natural returns of pink salmon.

Chum Salmon

The 1998 commercial chum salmon harvest of 4,600 fish (Table 6) represented only about 5% of the 20-year average and marked the tenth successive below-average season in Lower Cook Inlet (Figure 15, Appendix Table 21). The low numbers were anticipated based on the recent trend of weak returns, and conservative fishing schedules were implemented in an effort to secure adequate escapements and reverse the decline in chum salmon numbers. The conservative strategy was hardly necessary, however, as low prices coupled with the lack of tender service in remote districts once again discouraged the fleet from targeting this species. Consequently, a number of systems achieved their minimum escapement goals. One major system, McNeil River in the Kamishak Bay District, attained the lower end of its escapement goal range of 20,000 to 40,000 fish for the second consecutive year but only the second time since 1989 (Appendix Table 25). Systems on the outer Gulf Coast, at Rocky River and Port Dick, failed to achieve minimum chum salmon goals in 1998.

1998 EXVESSEL VALUE

The estimated exvessel value of the 1998 salmon harvest in LCI, not including any postseason adjustments in price paid to fishermen, was approximately \$2.0 million (Table 7, Appendix Table 2), making it the fourth highest since 1989. Purse seine gear in the common property fishery, which normally accounts for the majority of the catch, comprised just over \$1.0 million or half of the overall total (Table 7), while set gillnets accounted for \$198,000 or 10%. An estimated \$738,000, or about 37% of the entire exvessel value of the LCI salmon fishery, was utilized for hatchery cost recovery purposes. Average prices paid to fishermen in 1998, not including any postseason adjustments, were as follows: chinook - \$1.45/pound; sockeye - \$0.96/pound; coho - \$0.36/pound; pink - \$0.16/pound; and chum - \$0.27/pound (Appendix Table 3).

1998 DISTRICT INSEASON MANAGEMENT SUMMARIES

Southern District

Set Gillnet Fishery

An Area H set gillnet permit holder is allowed to fish in both Upper and Lower Cook Inlet, but there are only five beach areas in LCI, all located along the south shore of Kachemak Bay in the Southern District, where set gillnets may be used (Figure 2). The limited area provides only enough productive fishing sites to accommodate approximately 25 set net permits.

The 1998 LCI set gillnet harvest totaled 56,300 fish, equal to the recent 10-year average but about 16% less than the 20-year average (Appendix Table 7). Approximately 46% of the catch was comprised of sockeyes, followed by pinks at 43%. For comparison, these figures are very similar to historical proportions, where typical species composition in the commercial set gillnet fishery over the past decade has been 46% sockeyes, 41% pinks, 6% cohos, 5%

chums, and 2% chinooks. Catches of chinook salmon, at 952 fish, were equal to the 20-year average but represented only about one-fourth of the recent 10-year average. Enhancement efforts directed at recreational fisheries in Seldovia Bay and Halibut Cove Lagoon are primarily responsible for producing the chinooks taken incidentally by commercial gillnets during 1998.

For the fourth consecutive season, both the subsistence and commercial set gillnet fisheries in the Port Graham Subdistrict, including the English Bay Section, were allowed to target sockeyes returning to English Bay Lakes. Because the return appeared strong based on early indicators in June, cost recovery harvests by CRRC were also allowed seven days per week on English Bay sockeyes beginning June 22. Through judicious utilization of cost recovery opportunities by Port Graham Hatchery Corporation (PGHC), along with careful monitoring of escapements, the desired escapement goal of 15,000 sockeyes into English Bay Lakes was achieved (Table 3, Appendix Table 23). Additionally, the commercial set gillnet fishery harvested almost 12,000 sockeyes (Table 3) in the two sections. The harvest and escapement figures continue a trend of increases over previous years and once again demonstrated the potential for even greater returns in future years.

LCI set gillnet fishing effort in 1998 remained above the recent 10-year average. The number of set gillnet permits actively fished this season (24) matched that of the previous three seasons, reversing a downward trend experienced between 1987 and 1994 (Appendix Table 1).

Seine Fishery

Sockeye Salmon

The overall catch of sockeye salmon by all gear types, at 196,300 fish, was the second highest for the Southern District over the last 20 years (Appendix Table 13) and was over 30% greater than the recent 10-year average. Purse seiners in the common property fishery accounted for nearly three-fourths of the sockeye salmon landed in the district in 1998 (Table 1).

As in recent years, waters of China Poot Bay and Halibut Cove Subdistricts, and the outer waters of the Tutka Bay Subdistrict, were opened to seining five days per week beginning Monday, June 22, to target returns to Leisure and Hazel Lakes. Within these subdistricts, however, waters of the China Poot and Hazel Lake Special Harvest Areas (SHA's; Figure 3) were opened only to authorized agents of CIAA at this time, seven days per week, for hatchery cost recovery. They were to be kept closed to the common property commercial fishery until the preseason revenue goal established for each SHA was achieved.

Preseason combined harvest projections for returns to the Leisure and Hazel Lakes stocking projects were estimated at 85,000 fish. The actual commercial harvest of fish returning to the two sites was estimated at approximately 164,000 fish (Figure 11, Appendix Table 15), comprising 58% of the total LCI sockeye salmon harvest (Table 3). Because of the geographic proximity of these two projects, the overlapping area of harvest, and the lack of tagging, no definitive assessment of separate returns to each system can be established. However, fish returning as a result of these two projects undoubtedly contributed to seine catches in the Halibut Cove and Tutka Bay Subdistricts, as well as those in China Poot Bay Subdistrict. It was estimated that personal use dip net fishermen and sport fishermen harvested another 6,100 sockeyes at the head of China Poot Bay based on average catches over the past 10 years. The 1998 total return from both projects was estimated at about 170,000 sockeyes (Appendix Table 15). Although the disparity between the preseason forecast and the actual return cannot be fully explained, higher than average fresh and/or salt water survival was likely responsible.

As outlined in the Trail Lakes Hatchery Annual Management Plan (AMP) prior to the season, the revenue goal necessary to meet operational expenses incurred in LCI sockeye salmon lake stocking projects was set at just over \$127,000. This figure was to be split amongst locations as follows: 60% from combined China Poot and Hazel Lake SHA's, both in the Southern District, and 40% from the Kirschner and Bruin Lakes SHA's in the Kamishak Bay District. No cost recovery was planned at Chenik Lake in 1998 since weak returns were expected. Cost recovery harvests inside the China Poot and Hazel Lake SHA's (Figure 3) were to occur at CIAA's discretion early in the runs since harvests would take place without interference or

competition from the fleet at large. Projected harvests of 23,800 sockeyes from the China Poot and Hazel Lake SHA's were necessary to achieve the combined goal of \$76,300 for these two areas, assuming an average price of \$0.80 per pound and an average weight of 4.0 pounds per fish. As previously described, these SHA's were to remain closed to common property seining until the combined goal established for the two areas was achieved.

CIAA once again contracted the Cook Inlet Seiners Association (CISA) to undertake sockeye cost recovery in LCI for the 1998 season. CISA enlisted volunteers from the fleet, and the first cost recovery harvest in the China Poot SHA occurred on June 29, netting just over 800 fish. The catch was considered good for this relatively early date and indicated a potentially strong return. By that time, a firm contract price for sockeyes had been established at \$0.85 per pound, and with initial average weights running slightly higher than the preseason estimate of 4.0 pounds per fish, the number of fish necessary to achieve the revenue goal was revised downward to a new combined total of approximately 20,000 fish.

Cost recovery harvests continued over the next 10 days in the China Poot SHA as the sockeye run gained strength, while the first (and only) effort in the Hazel Lake SHA on July 2 netted nearly 1,300 fish. By July 9, cost recovery efforts had totaled 20,600 fish, and with higher than expected average weights for sockeyes from both SHA's, the cumulative harvest approached 92,000 pounds. At a price of \$0.85 per pound, this figure exceeded the required revenue goal. As a result, the China Poot and Hazel Lakes SHA's were closed to cost recovery harvest on July 9, and both subdistricts were opened to common property seining seven days per week beginning July 10. A small portion of the China Poot Section near China Poot Creek remained closed to commercial fishing on weekends only in deference to the heavy sport/personal use traffic in the vicinity.

Common property seine catches in China Poot Subdistrict began modestly at the end of June, but run strength started to increase near the end of the first week of July, with catches following commensurately. Common property catches in China Poot Subdistrict peaked on July 10, with a combined harvest of over 23,000 sockeyes taken by about 15-20 vessels in the

two sections. An estimated three-fourths of the total catch that day came from the China Poot Section. China Poot Section daily catches remained steady for the next 10 days at roughly 2,000 – 4,000 sockeyes per day. Hazel Lake catches were more variable over the next 7 – 10 days, then catches in both sections steadily decreased until the end of July. The last landing from both sections was made on August 1. The cumulative commercial catch in the two areas was 79,600 sockeyes (Table 3), with over three-fourths taken in the China Poot Section. Seine effort for sockeyes within adjacent waters of Tutka Bay Subdistrict added an additional 5,700 sockeyes to the commercial seine harvest.

Pink Salmon

Strong pink salmon returns to the Tutka Bay Hatchery contributed to an overall Southern District harvest of 1.315 million fish (Table 5, Appendix Table 18), exceeding the recent 10-year average and representing the fifth highest catch over the past 20 years. However, the hatchery return was disappointing as it fell short of the preseason forecast of 2.63 million fish by about 44%.

Waters of Tutka Bay Subdistrict outside of Tutka Bay proper were open to commercial seining five days per week beginning June 22, as has been the case in recent years. The open waters consisted of those waters offshore of a line running from the “rock quarry” on the north shore of Tutka Bay to the Tutka Bay Lodge on the south shore (Figure 4). Waters within the Tutka Bay SHA (Figure 4) were open to hatchery brood stock and cost recovery harvest by authorized agents of CIAA on a continuous basis beginning June 29, as established in the Tutka Hatchery Annual Management Plan. The plan called for hatchery incubators to be filled to maximum capacity if possible, and excess fish beyond brood stock and natural escapement requirements were to be harvested for cost recovery to help offset operational expenses, estimated at \$424,400 for FY99. A minimum of 160,000 fish (120,000 females) was desired for hatchery brood stock in order to achieve the goal of 125 million eggs, and an additional 6-10,000 pinks were needed to meet the natural spawning escapement goal for Tutka Creek.

At a projected average weight of 2.8 pounds and a preseason contract price of \$0.18 per pound for cost recovery fish, just over one-third of the forecasted hatchery return would be needed to meet the revenue goal. If the return came in as projected, over 1.4 million fish would potentially be available for common property harvest.

The first cost recovery harvest took place on July 3 by one vessel working inside Tutka Lagoon. A second catcher boat, to work waters outside Tutka Lagoon as was the case in some previous years, was kept "on call" should the run attain the strength to justify additional effort. The single primary cost recovery vessel fished on a daily basis throughout the entire month of July. The peak daily harvest occurred on July 8, with a total of over 106,000 pinks taken. Daily catches averaged just under 54,000 pinks during the period July 6 – July 19. All fishing occurred within Tutka Lagoon, and the one vessel contracted by the hatchery was able to maintain a consistent, steady pace that prevented any significant buildups during the season.

By July 19, approximately 799,000 pinks, or about 2.374 million pounds, had been harvested for cost recovery purposes. With the contract price of \$0.18 still in place, CIAA officials indicated that the revenue goal of \$424,400 was actually exceeded. Therefore, waters of Tutka SHA (except for those of Tutka Lagoon) were closed to hatchery fishing beginning July 19, while all waters of Tutka Bay Subdistrict, except for Tutka Lagoon, were opened to commercial seining seven days per week. This strategy allowed the opportunity for seiners to harvest surplus fish while still allowing limited hatchery cost recovery fishing and brood stock collection. One final cost recovery harvest occurred on July 25, resulting in a cumulative hatchery cost recovery catch of 792,500 pinks for the season (Table 9). An additional 153,500 fish were harvested for brood stock.

Commercial seine landings of pinks in Tutka Subdistrict (outside of the SHA) began in early July, averaging nearly 15,000 fish daily between July 3 and July 18. The daily catch jumped to over 45,000 pinks on July 19, when waters open to the seine fleet were expanded to include the SHA outside of Tutka Lagoon. Fishing continued through the end of July, with the peak daily harvest occurring on July 24, when 14 seiners caught 114,700 pinks. On August 6,

waters of Tutka Lagoon were opened to commercial seining on a continuous basis, but no effort occurred at this late date in the season. The total commercial seine catch of pink salmon in Tutka Bay Subdistrict this season amounted to 492,500 fish, while set gillnetters harvested an additional 12,300 pinks (Table 5).

The estimated pink salmon escapement of 17,500 fish (Table 5, Appendix Table 24) into Tutka Creek exceeded the desired range of 6-10,000 fish. As in recent years, this escapement was thought to contain a disproportionately high percentage of males discarded during hatchery sorting operations. The total return of pinks to Tutka Hatchery, including commercial, cost recovery, brood stock, and sport harvest, as well as escapement, was estimated at 1.47 million fish (Table 9), which was about 44% below the preseason forecast.

At Port Graham, the Port Graham Hatchery Corporation (PGHC) was expecting a range of 30,000 to 50,000 pink salmon returning to the facility. Since 45,000 fish were desired for brood stock, the hatchery would require virtually the entire return to meet its egg-take goal. An additional 21,000 wild pinks were forecasted to return to Port Graham River, but with a desired escapement range of 20,000 to 40,000 fish, few wild fish could be harvested if the run materialized. Once the established threshold (6,000 pinks) for wild escapement into Port Graham River was identified by ground survey on August 10, the Port Graham SHA (Figure 7) was opened to the harvest of salmon for brood stock by authorized agents of PGHC seven days per week beginning August 11.

About 12,700 pinks were collected for brood stock purposes. All hatchery harvests occurred in close proximity to the hatchery net pens, where the juvenile pinks had been released, suggesting that the majority of fish harvested were of hatchery origin. Escapement into Port Graham River, estimated at 12,600 pinks, fell short of the desired range of 20,000 to 40,000 fish for the seventh consecutive year. No commercial seine openings were allowed due to the weakness of both the wild and hatchery returns, but the set gillnet fishery in Port Graham Subdistrict did remain open on the regular schedule of two 48-hour periods per week. Final catch for the gillnet fishery in the two sections of the subdistrict totaled only 1,350 pinks (Table 5).

Returns of wild pink salmon stocks to other systems in the Southern District were generally weak as indicated by ground survey escapement counts, therefore no directed openings were allowed. Pink escapement at Seldovia River achieved the desired range, while minimum escapement goals were not attained at Humpy Creek, China Poot Creek, and Barabara Creek (Table 5, Appendix Table 24).

Other Species

Southern District chum salmon returns were poor for a ninth consecutive year. Nonetheless, the chum harvest of 3,950 fish (Table 6) represented the third highest total since 1988 and surpassed the recent 10-year average for the district (Appendix Table 21). Set gillnets accounted for almost the entire total, with the Seldovia Bay Subdistrict accounting for the greatest proportion of the district-wide catch (Table 6). Escapements into Southern District chum systems were generally fair to poor, although the low end of the desired range was achieved at Port Graham River for the second consecutive season (Appendix Table 25).

Although minor in total numbers of fish, the majority of the Southern District chinook harvest usually consists of incidental catches of adult fish returning to three separate enhancement projects. The 1998 Southern District harvest of 1,070 chinooks was the lowest since 1986 (Appendix Table 12). Almost 90% of the chinook catch was taken by set gillnetters. The coho salmon harvest of 2,200 fish was the lowest since 1994 and was less than half the recent 10-year average (Appendix Table 17). The coho harvest was split almost equally between set gillnetters and seiners (Table 1).

Kamishak Bay District

Sockeye Salmon

The entire Kamishak Bay District, with the exception of the Chenik and Paint River Subdistricts, opened to salmon seining by regulation on June 1, with two regular 48-hour

weekly fishing periods established by emergency order. The earliest natural sockeye salmon return to the management area, at Mikfik Creek in the McNeil River Subdistrict, began slowly with an estimated 300 fish spotted during the first aerial survey on June 3. A full week later the number had only increased to 1,300 sockeyes, suggesting that the run might be weak. That hypothesis was dispelled during a survey on June 16, flown under exceptionally good conditions, when nearly 13,000 sockeyes were estimated in fresh water. This figure easily exceeded the escapement goal range of 5,000 to 7,000 fish, and as a result fishing in McNeil River Subdistrict was extended to five days per week beginning June 18. Despite the liberalized fishing schedule, the historically late date discouraged effort as fishermen were unwilling to gamble on fishing this traditionally small run, especially considering the lack of tender service to this remote district. Aerial surveys conducted through June and into July revealed no significant increases in daily estimates, suggesting that fish were only trickling into the system after the peak survey of 12,600 sockeyes on June 16. Uncharacteristically, low water conditions did not appear to delay fish entry into the lake system during the late stages of the run in early July, as is frequently the case. The final escapement index at Mikfik Creek was 12,600 sockeyes (Table 3, Appendix Table 23), while no effort or harvest occurred in the commercial fishery.

With no early effort directed toward sockeye salmon in the McNeil River Subdistrict, seiners would next normally turn their attention to the Chenik or Douglas River Subdistricts during the final days of June. Once again, however, no fishing was expected to occur at Chenik Lake this year due to the lingering effects of the IHNV outbreak in previous years and the subsequent decrease in adult returns. Despite the forecasted weak return, the staff was hopeful that the run would at least approach the escapement goal of 10,000 sockeyes. Unfortunately, a fifth consecutive year of dismal returns was manifested, and even with no fishing effort during the entire season, the total escapement at Chenik Lake was estimated by aerial surveys at only 1,880 sockeyes (Table 3, Appendix Table 23). No effort occurred in the Douglas River/Silver Beach Subdistrict as seiners appeared to be waiting for more lucrative fishing elsewhere in the district.

The next return in the Kamishak Bay District was to nearby Kirschner and Bruin Lakes in the Bruin Bay Subdistrict. Both lakes have been traditional sites of sockeye salmon lake stocking projects. At Kirschner Lake, where a steep falls at tideline precludes escapement into the lake, 30,000 sockeyes were predicted to return. As outlined in the Eklutna Hatchery Annual Management Plan (AMP) prior to the season, the revenue goal necessary to meet operational expenses incurred in LCI sockeye salmon lake stocking projects was set at just over \$127,000. This amount was to be split between the Southern District SHA's (Leisure/Hazel) at 60% of the total and the Kamishak SHA's (Kirschner/Bruin) at 40%. No cost recovery was planned at Chenik Lake in 1998 since weak returns were expected. Projected harvests of 15,900 sockeyes from the Kirschner and Bruin Lakes SHA's were necessary to achieve the revenue goal of \$76,300, assuming an average price of \$0.80 per pound and an average weight of 4.0 pounds per fish.

Preseason management strategy for the Bruin Bay Subdistrict, as outlined in the Eklutna Hatchery AMP, was to open the Kirschner and Bruin SHA's (Figure 6) to hatchery cost recovery fishing on a continuous basis beginning June 22 while keeping both closed to common property seining. This would allow opportunity for CIAA to achieve the sales harvest goal quickly at the beginning of the run. As soon as the goal was met, the two SHA's were to be closed to cost recovery harvest and opened to commercial seining so the fleet could work the areas uninhibited for the remainder of the season.

CIAA had made arrangements prior to the season for a CISA vessel to conduct cost recovery. The first effort occurred in the Kirschner Lake Section on July 14, resulting in an estimated harvest of 10,500 fish. Unfortunately, the inseason price for Kirschner cost recovery sockeyes dropped to \$0.60 per pound due to freshwater marking, thus increasing the number of fish necessary to achieve the revenue goal for the season to slightly over 21,000. A second effort on July 22 netted the remainder of the goal. In response, waters of both SHA's were closed to hatchery cost recovery fishing effective July 24. Because sockeye salmon returning to the Kirschner Lake stocking site are prevented from entering the lake by a steep waterfall at tideline, no escapement is possible and a total harvest is desired. In an effort to provide maximum

opportunity to achieve a 100% harvest, waters of the Kirschner Lake Section of Bruin Bay Subdistrict were therefore opened to commercial salmon seining seven days per week effective July 24. Concurrently, waters of the Bruin Bay Section of Bruin Bay Subdistrict, including waters of Bruin Lake SHA, were opened to seining on the standard fishing schedule of two 48-hour periods per week. This latter, more conservative fishing schedule in waters of the Bruin Bay Section was intended to protect stocks of wild pink and chum salmon destined for Bruin Bay River.

A total of four boats fished the area opened to continuous fishing, focusing their efforts on the Kirschner Lake sockeye return. Only 8,100 sockeyes were landed for the season (Table 3) with the last landing made on July 31. An aerial survey in early August documented over 2,000 sockeyes holding in saltwater near the waterfall at Kirschner Lake. Including these unharvested fish, the total return to Kirschner Lake was estimated at about 30,000 sockeyes, attaining the preseason prediction for the system. An additional 360 fish were estimated via aerial surveys in Bruin Lake Creek, also prevented by a barrier falls from reaching suitable spawning habitat.

Pink Salmon

Preseason pink salmon projections for the Kamishak Bay District were not optimistic, with a minimal harvestable surplus forecasted for Bruin Bay Subdistrict. Aerial surveys bore out this projection as Bruin River was the only major Kamishak system to experience an appreciable return of pinks. The meager returns (excluding Bruin River), combined with low prices and a lack of tender service, resulted in zero effort specifically targeting pinks during 1998. The total harvest for the season was only 1,800 fish (Table 5, Appendix Table 18), all incidentally taken during the sockeye harvests at Kirschner Lake. Of the three major pink systems, Bruin River exceeded its escapement goal by a substantial margin with an estimated total of 135,000 fish, while Sunday Creek in Ursus Cove Subdistrict also attained its goal (Appendix Table 24). Brown's Peak Creek, also located in Ursus Cove Subdistrict, failed to meet its escapement goal with an estimated total of only 7,900 pinks.

Chum Salmon

Cumulative chum salmon catches for the entire Kamishak Bay District totaled only 29 fish, the third lowest harvest on record (Appendix Table 21), once again reflecting the lack of interest brought about by generally low prices paid for this species. A conservative management strategy designed to protect returning chums was hardly necessary since the combination of low prices and lack of tender service discouraged the fleet from targeting this species in any portion of the district. Thus entire runs were allowed to enter their natal streams with little or no accompanying fishing mortality. The 1998 chum harvest occurred incidentally in the sockeye fishery.

Because McNeil River chum runs had failed to achieve the lower end of the desired escapement range for most of this past decade, the McNeil River Subdistrict was closed to commercial fishing beginning June 30 in an effort to provide maximum protection to returning fish in 1998. Weather hampered aerial surveys during the latter part of June and early July, so the first chum salmon of the season were not observed at McNeil River until a survey conducted on July 6. Numbers were low with an estimated 500 fish in fresh water. One week later the index estimate had increased to only 5,000 chums in fresh water, reinforcing the earlier assessment that the McNeil chum return appeared weak. Weather and turbid water conditions precluded surveys for two weeks, and the next survey on July 28 revealed an estimated 9,500 chums, which proved to be the peak daily count for the season. One additional survey in mid-August did not indicate any significant influx of new fish into the system. The relatively low numbers observed during successful aerial surveys may be somewhat misleading as they suggest a weak return, however the “gaps” in the survey schedule due to inclement weather left large time blocks when no monitoring occurred. Analysis of aerial survey data using the standard area under the curve (AUC) method yielded a final estimated escapement index at McNeil River of 23,500 chums (Appendix Table 25). This marked the second consecutive year that the river’s goal of 20,000 to 40,000 chums had been met, but only the second time since 1989.

Aerial surveys elsewhere in the Kamishak Bay District were also hampered by poor weather during the month of August. The limited flights indicated that late-season chum returns to northern Kamishak Bay systems in Ursus Cove, Cottonwood Bay, and Iniskin Bay Subdistricts were variable. Chum escapements into Iniskin River and Ursus Cove systems appeared fair to good while that into Cottonwood Creek was weak, but the recurring theme of low prices and market demand again kept the fleet away. Therefore, these chum runs were unaffected by fishing mortality and entered their natal streams as spawning escapement. Of the three major northern Kamishak Bay systems, only Iniskin River achieved its established escapement goal (Appendix Table 25), while Ursus Cove and Cottonwood Creek failed to reach theirs. In southern Kamishak Bay, limited aerial survey information for the Big and Little Kamishak River systems suggested that those systems also failed to meet escapement goals (Appendix Table 25).

Other Species

Chinook salmon harvests in the Kamishak Bay District historically have been insignificant (Appendix Table 12). On the other hand, coho harvests within the district have at times been substantial, providing fishermen with some lucrative late season catches. Coho assessment in LCI is very limited, but early indications from other areas within LCI suggested average returns. Despite the seemingly average returns in LCI, the lack of tender service and low prices conspired to preclude any effort or harvest (Appendix Table 17) for the second consecutive season in this district.

Outer District

Sockeye Salmon

Outer District sockeye harvests historically have focused on natural returns to the Delight and Desire Lakes systems in East Nuka Bay Subdistrict. A lake stocking project in the Port Dick area during the late 1980's provided additional fish for harvest in the early 1990's, but

stocking was discontinued after 1989 and a small harvest in 1993 was the last documented catch. Preseason projections forecasted a harvest of up to 22,300 sockeyes for the entire Outer District. The actual harvest totaled 16,000 fish (Table 3), over 70% greater than the recent 10-year average (Appendix Table 13).

Aerial surveys, the traditional method of assessing sockeye returns to Delight and Desire Lakes in East Nuka Bay, were supplemented by a counting weir at Delight Lake in 1998. The weir, in the second year of operation, was a continuation of a salmon smolt outmigration enumeration project begun in May. Limnological investigations, initiated to study the potential for enhancement, required a more precise assessment of the adult returns than aerial surveys, which are frequently plagued by poor viewing conditions induced by inclement weather. The weir counts would be especially important for management during any extended periods when aerial surveys could not be conducted.

Aerial surveys began on June 17, documenting sockeyes in freshwater at both systems, with a total of over 1,000 fish at Desire Lake, nearly 700 of which were in the lake itself, with additional jumper activity noted in salt water off the stream mouth. Numbers at Delight Lake were considerably less, and no fish were observed in the lake. Run strength at Desire Lake was considered strong for the early date, and as a result, waters of East Nuka Subdistrict around Desire Lake Creek were opened to seining on a conservative schedule of two 40-hour periods per week. With sockeye run timing at Delight Lake slightly later than that of Desire Lake, waters of East Nuka Subdistrict near Delight Lake Creek were kept closed to protect fish returning to that system.

The next survey on June 22 days was plagued by wind causing surface rippling on both lakes, and no appreciable increase in escapement was detected. One week later a survey showed an increase at Delight Lake, where about 1,000 sockeyes were estimated in fresh water, while numbers at Desire Lake appeared to be lagging and showed only a minimal increase over prior surveys. Commercial seine catches near Desire Lake, although modest, suggested the run was building. Finally on July 7, escapement into Desire Lake showed marked improvement with an

estimate of nearly 4,700 fish, or nearly half of the established escapement goal of 10,000 sockeyes. During the same survey about 1,700 sockeyes were estimated in fresh water at Delight Lake. Since the escapement goal for the latter system was also 10,000 sockeyes, waters of East Nuka Subdistrict near Delight Lake were kept closed to seining.

Escapements at Desire Lake continued to climb as noted in the next survey, conducted under excellent conditions on July 14, when nearly 8,000 fish were estimated in fresh water. Increases at Delight Lake, however, were much smaller with only 3,500 sockeyes estimated in fresh water, reinforcing the justification for keeping the seine fishery closed in nearby waters. Aerial surveys continued through July and into August, but the July 14 estimate at Desire Lake proved to be the peak individual count for the season, with a final escapement estimated at 7,900 sockeyes (Table 3, Appendix Table 23), shy of the system's 10,000-fish escapement goal.

Aerial estimates at Delight Lake never exceeded 5,000 sockeyes in 1998. Weir counts at Delight Lake were a different matter, totaling nearly 7,000 fish when the weir was pulled due to high water on July 22. After this date, monitoring of the return was conducted with the aid of a video camera mounted above the stream near the lake's outlet. Images of fish passage were recorded on video tapes using a time-lapse video cassette recorder (VCR). Tapes were collected during routine visits to Delight Lake, played back on a standard television at the Homer ADF&G office, and visually analyzed for escapement counts. This pilot project was used to test the feasibility of deploying such an arrangement at remote sites where aerial assessment of salmon escapement is made difficult by factors such as inclement weather, dense overstory, etc. The results from the 1998 season at Delight Lake indicated that, in many instances, the use of a video camera to enumerate escapements could be highly successful. The project allowed for continuous monitoring of the Delight Lake drainage after the weir was removed and during the time between aerial surveys. The final escapement count at Delight Lake, from weir counts and video enumeration, totaled just under 9,200 sockeyes (Table 3, Appendix Table 23), nearly achieving the escapement goal of 10,000 fish.

The first seine landing of sockeyes in East Nuka Subdistrict came on June 23 when 2,400 sockeyes were taken, a relatively strong showing for the early date. Although effort was modest, catches averaged nearly 1,000 sockeyes per day fished during the month of July. Because escapements progressed slowly but steadily towards the established goals for Desire and Delight Lake, no inseason changes were made to the original fishing schedule allowing two 40-hour weekly fishing periods in waters near Desire Lake. In August, fishing effort continued at a low level. Significant numbers of pink salmon bound for Desire Lake Creek were beginning to appear in salt water, and seiners began harvesting increasing numbers of this species while pursuing the more lucrative sockeyes. Fishing continued through August, with the sockeye catch steadily dwindling. The final sockeye landing occurred on August 19, bringing the final total to 16,000 fish (Table 3, Appendix Table 14).

A third system of lakes known as Delusion (or Ecstasy or Delectable) Lakes in East Nuka Subdistrict has been monitored over the last decade to document the sockeye return there. Located near the head of the East Arm of Nuka Bay, the two-lake system is relatively new, formed during the late 1970's and early 1980's by a receding glacier. Reviewing charts and maps drawn prior to the mid-1980's substantiated this fact as no lakes are indicated at the site of the present bodies of water. Prior to the 1980's, no salmon were known to utilize the system, but in approximately 1989, during a routine aerial survey, adult sockeye salmon were documented in the system by ADF&G staff for the first time. Each year since then, aerial surveys have revealed sockeye salmon as well as pink salmon in the system. The peak 1998 aerial count of 1,090 sockeyes was recorded during an aerial survey on August 4. Little is known of the origins of this return, although the predominant hypothesis suggests that sockeyes probably strayed from nearby Desire and/or Delight Lake to colonize this new lake system. Sampling of sockeyes in this system was conducted in 1992, 1993, and 1994 by ADF&G personnel, with help from University of Alaska students on site. Otoliths and length measurements indicated primarily large 3-ocean fish (six years old). Additional tissue samples were taken from post-spawning individuals in 1993 and 1994 for inclusion into the genetic baseline data set and future genetic stock identification analysis.

Pink Salmon

Harvest forecasts for pink salmon in the Outer District were fairly optimistic for an even year at 262,000 fish. This was over twice the recent 10-year average, with the greatest potential for harvestable surpluses expected at Nuka Island and Port Dick. The actual harvest of 102,200 pinks (Table 5, Appendix Table 18) was the highest even-year catch for the district since 1990 and the fourth highest even-year catch in the last 20 years. Although numerous areas were open and available to directed effort at pinks, and a number of fishermen expressed a desire to fish, the ubiquitous theme of low prices for this species and lack of tender availability combined to suppress the harvest.

For the first time in seven seasons, the management strategy that had been employed in Port Dick, opening outside waters on a historically early date, was not utilized. This strategy was originally devised using input from fishermen over the winter of 1991-92. Concerns over fish quality led to a plan whereby the outer areas of the subdistrict would be opened on a set calendar date earlier than the traditional opening date, unlike former years when openings were based on stream escapement rates and fish abundance in saltwater. It was hoped that opening areas further away from freshwater systems at an early date would allow the fleet opportunity to harvest higher quality fish before they became freshwater marked, thus increasing their market value. However, weak returns to Port Dick during the previous six years, combined with the depressed pink market, left the management plan essentially untested. Because fishermen were not taking advantage of the earlier opening date, and with no reason to expect differently during 1998, the staff decided to return to the previous management scheme of opening the area based on real-time assessment of returns and escapements.

Aerial surveys in Port Dick began in mid-July, but no pinks were observed. Pinks first appeared in Port Dick (head end) Creek around the fourth week of July, as a ground survey on July 15 detected no fish in fresh water, while the next survey on July 27 documented just over over 300. An aerial survey that same day unexpectedly produced an estimate of nearly 36,000 pinks in salt water at Port Dick, indicating that the run had the potential to meet escapement requirements and

still provide opportunity for substantial commercial harvests. As a result, waters of Port Dick Subdistrict, except those of the North Section, were opened to seining on a schedule of two 48-hour weekly fishing periods beginning July 28. Despite the surprising even-year run strength estimates and a return that surely could have accommodated some level of fishing pressure, the commercial opening of most Port Dick waters attracted no directed effort at pinks destined for the head end during the season.

Pink numbers on the flats at the head end of Port Dick continued to increase over the next week, with an estimate of approximately 85,000 observed during an aerial survey on August 4. Large numbers of pinks were also building in salt water off Island Creek, estimated at 23,000 fish during the same survey. The fishery was therefore liberalized in all waters of Port Dick Subdistrict, including the North Section, to a schedule of five days per week beginning August 5. However, the recurrent theme of low prices for this species and a lack of tender service in remote districts kept fishermen away. Even with no fishing effort directed at head end pinks, the actual escapement into Port Dick Creek did not manifest itself in the magnitude suggested by the aerial surveys. Still, the peak daily fresh water survey of nearly 36,000 pinks, recorded by the ground survey team on August 14, was considered exceptionally strong for an even year. Factoring in stream life over the course of the survey season produced a final escapement estimate of 57,000 pinks (Table 5, Appendix Table 24), representing the highest even-year escapement on record but within the desired escapement goal range of 20,000 to 100,000 fish.

At nearby Island Creek in Port Dick, pinks began to stage in salt water off the mouth of the stream at the end of July. The buildup increased significantly over the next several days, and by August 4, 23,000 pinks were estimated in saltwater near the creek during a routine aerial survey. Since the chum salmon run to Island Creek was effectively over by this time, waters of Port Dick North Section could be opened to fishing on a liberal schedule of five days per week (as mentioned above) beginning August 5. Only minimal effort occurred and the subsequent harvest of a scant 2,400 pinks proved to be the final total for the season in the entire Port Dick Subdistrict (Appendix Table 20). As was the case at the head end of Port Dick, the low effort level allowed virtually the entire pink return to enter Island Creek as escapement, with a resultant

escapement estimate of nearly 84,000 fish (Appendix Table 24). This figure represented an all-time record for the system and was seven times the minimum desired goal.

At Nuka Island, pink salmon were documented in fresh and salt water at South Nuka Island Creek during the first aerial survey of the season at that location on July 14, considered fairly early by historical standards. The next survey about two weeks later showed an increase to an estimated 2,800 fish in fresh water and an additional 8,600 pinks in salt water. Aerial survey estimates the very next day indicated that the run was continuing to build. As a result, waters of Nuka Island Subdistrict near South Nuka Island Creek were opened to seining on a schedule of two 48-hour periods per week beginning August 3. Waters along the west side of Nuka Island were kept closed to protect the much smaller pink returns to those systems. By August 4 the return had built to an estimated 16,000 pinks in salt water and 7,000 pinks in fresh water. Commercial landings resulted in a pink harvest of over 41,000 fish from this statistical area for the season (Table 5). Final escapement into South Nuka Island Creek was estimated at 14,000 pinks (Table 5, Appendix Table 24), easily achieving the minimum goal of 10,000 fish.

The Rocky River pink salmon return began to show promise during the first aerial survey of the system on July 27 when over 10,000 fish were estimated in fresh water, with additional new fish entering the system from nearby salt water. By the last day of the month, the fresh water escapement estimate had risen to 31,000 pinks, nearly two-thirds of the desired goal of 50,000 fish. The next survey on August 4 produced an estimate of an astounding 108,000 pinks in fresh water, far in excess of the 50,000-fish goal. As a result, waters of Rocky Bay Subdistrict were opened to seining five days per week beginning August 5. Modest effort resulted in a harvest of 35,000 pinks (Table 5), while the final escapement estimate for Rocky River was 165,000 fish (Table 5, Appendix Table 24), the second highest total since statehood.

Elsewhere in the Outer District, pink salmon returns to Port Chatham were considered very strong, with estimated escapements exceeding 22,000 pinks (Appendix Table 24). The area was opened to seining for two 48-hour periods per week beginning July 27 based on the strong showing of fish, but effort was only modest and a harvest of 9,400 pinks resulted (Table 5). In

East Nuka Subdistrict, the pink harvest was primarily incidental catch during the Desire Lake sockeye salmon fishery. Harvests totaled just over 14,000 pinks (Table 5, Appendix Table 18). No estimate of escapement was generated for Desire Lake Creek.

As expected, the even-year phenomenon manifested itself in weak pink returns to Windy Bay, where no commercial openings were allowed in 1998. Despite the lack of fishing pressure, estimated escapements totaled just over 19,000 pinks in Windy Left Creek and nearly 13,000 in Windy Right Creek (Table 5, Appendix Table 24). The latter figure fell within the desired range for that system, but the Windy Left escapement was less than the desired minimum of 30,000 pinks.

At this time, the long-term effects of extensive logging on fishery resources in Windy Bay are unclear. The ground survey team reported that nearly all trees in the prescribed 66-foot riparian buffer strip are now down. High winds apparently caused the majority of uncut trees in this strip to fall across or into the creek. The limited buffer strips obviously were not wide enough in this Outer Gulf coastal area to prevent damage caused by commonly high winds (hence the local name) or preclude the subsequent "domino effect" from blowdowns.

Chum Salmon

Chum salmon numbers have experienced dramatic declines in the Outer District since the peak harvest years of the late 1970's and early 1980's. Large returns were once again not expected in 1998 due to a succession of poor returns over the past several seasons. No specific commercial openings targeting chum salmon occurred this season, with a final harvest of 600 incidentally caught fish (Appendix Table 21). Over half of the catch was taken during the pink fishery in Rocky Bay.

Escapements into the three monitored chum salmon systems in the Outer District were weak, with all failing to achieve their goals. Port Dick (head end) Creek fell short of its 4,000 chum escapement goal by 2,200 fish (Appendix Table 25). Island Creek chum escapement totaled

3,400 fish, less than half of the lower end of the escapement goal range of 10,000 to 15,000 fish, while Rocky River escapement amounted to only 700 chum salmon, far short of the goal of 20,000.

Eastern District

Sockeye Salmon

The Eastern District had potential for harvestable surpluses of sockeye salmon in Aialik and Resurrection Bay Subdistricts during 1998, with a district-wide preseason projection of over 73,000 fish. However, the third consecutive failure of the enhanced Grouse Lake run to achieve preseason expectations in Resurrection Bay resulted in a total catch of about 44,000 sockeyes (Appendix Tables 13 and 14) in the Eastern District. The 1998 catch was greater than the previous year's harvest of 34,000 fish but nearly identical to annual harvests in 1995 and 1996. Over three-fourths of the total was taken as hatchery cost recovery at the Bear and Grouse Lakes weirs (Table 1).

At Bear Lake, near Seward in the Resurrection Bay Subdistrict, sockeye enhancement activities by CIAA resulted in a projected return ranging as high as 19,000 fish assuming optimum survival of various smolt and fry releases. This number was the same as the actual return in 1997. Based upon the expected long-term increase of sockeyes returning to this system, a Resurrection Bay Management Strategy was developed during the winter of 1991-92. The plan allows the seine fleet to begin fishing on the Bear Lake sockeye run at a relatively early date in the outer reaches of Resurrection Bay in order to promote product quality. In addition, several modifications to the plan, first implemented by emergency order in 1996, were once again utilized during the past two seasons. The first change increased fishing time from two 40-hour periods per week to a single five-day period (Monday through Friday). Based on experience over the past two seasons, this increase would allow greater opportunity to harvest sockeyes without jeopardizing the escapement goal for Bear Lake, set at 5,000 to 8,000 fish in the Trail Lakes Hatchery Annual Management Plan. The second change posted closed waters markers at

the mouth of the Resurrection River to better define the river's mouth and the fishing boundaries, which had been problematic prior to 1996. Finally, an area of closed waters along the west side of Resurrection Bay between Caines Head and the city of Seward was implemented in order to protect returning chinook salmon, which are allocated entirely to the sport fleet and are illegal to retain in the commercial fishery.

The entire Resurrection Bay Subdistrict, up to a point one mile due south of Cape Resurrection and Aialik Cape, was opened to seining by emergency order beginning on May 18, the third Monday of May. Formerly these waters were opened on the second Monday in May, but experience had demonstrated that sockeyes did not begin arriving in Resurrection Bay in appreciable numbers until the end of the month. Despite presumption of an early run timing for this enhanced run (since brood stock utilized for the project had a documented run timing peaking in early June), the first three years of adult returns from 1992 through 1994 actually trickled in over the course of two months. Between 1995 and 1997, with larger numbers of fish returning, the majority of the run appeared in waters at the head of Resurrection Bay during the first two weeks of June.

In 1998, fishermen were not eager to wet their nets when the area first opened, realizing that the conservative forecast would likely equate to few fish on the grounds. Two weeks elapsed before the first landing occurred, and even then fish concentrations were meager. By the end of that first week of actual fishing, less than 300 fish had been landed, essentially foretelling the rest of the common property season for Bear Lake sockeyes. Effort remained low, and although sporadic landings were made during the month of June, a total of only three fishermen participated. The final landing came on July 7, with a cumulative total of only 1,200 sockeyes caught by seiners in Resurrection Bay (Table 3).

Escapement rates at CIAA's Bear Creek weir finally began to increase in mid-June, having been slow up until that point. Cost recovery efforts were initiated at that time, and with little mortality from the commercial fishery, the majority of the return was available to CIAA. The return continued until about mid-July, with the escapement goal of of 8,000 sockeyes (Appendix Table

23) into Bear Lake being met and an additional hatchery cost recovery harvest of approximately 20,000 sockeyes. The cumulative Bear Lake sockeye return totaled just under 30,000 fish, still substantially more than the forecasted level of 19,000.

With an expected run timing later than Bear Lake fish, Grouse Lake sockeyes first began to show up at the fresh water weir around mid-July, but numbers were small. During the latter part of July the run (and cost recovery harvests) remained steady but never built to levels suggested by the preseason projection. A small spike in the return appeared at the weir around mid-August but began to taper off after that. Fish continued to trickle in until the end of September, with the final harvest taking place on September 27. Although estimated at around 17,000 sockeyes, the total return to Grouse Lake was not accurately determined since harvests for Bear Lake and Grouse Lake were combined in the fish ticket database. Due to poor quality, over 4,000 fish harvested for cost recovery were donated to dog mushers or completely discarded because of a lack of buyers. The disappointing return was far short of the preseason forecast of 53,000 fish, but reasons for the shortfall are unclear.

At Aialik Lake in the Aialik Subdistrict, aerial surveys began on June 17 with an estimate of 430 sockeyes present in fresh water, considered good for that early date. Realizing that effort would likely be low, and with a minimum desired escapement goal of only 2,500 fish, the staff decided that a conservative opening of Aialik Bay waters could be allowed without jeopardizing the return. Therefore, waters of Aialik Bay, including Aialik Lagoon, were opened to seining for two 40-hour periods per week beginning June 22. But the next two surveys on June 22 and 29 revealed only a minimal increase in the fresh water escapement to about 800 fish, causing concern that the fishery opening may have been premature. Fortunately, effort and resultant catches were low, as expected, posing little threat to the escapement requirements.

Commercial catches in Aialik Subdistrict peaked at the end of the second week of July, while an aerial estimate of escapement on July 14 had jumped to 3,400 sockeyes. Fishermen continued to harvest fish into August, with a total of 8,600 sockeyes (Table 3, Appendix Table 14) taken

during the course of the season. Final escapement into Aialik Lake was estimated at 4,900 fish (Table 3, Appendix Table 23).

Pink Salmon

A harvestable surplus of over 24,000 pinks was forecast in Eastern District waters for 1998, but this projection was questionable due to weak returns in some recent years. Although surveys of Resurrection Bay systems were limited to on-grounds estimates in mid-August, results and final escapement estimates suggested that returns ranged from good to poor, depending on individual systems. At Bear and Salmon Creeks, where the combined pink escapement goal is 15,000 fish, a total of 13,200 pinks was estimated (Appendix Table 24). The figure for Thumb Cove, with a goal of 4,000, was estimated at just over 21,000 pinks, while at Humpy Cove (2,000 fish escapement goal) 1,200 fish were estimated. Tonsina Creek produced an estimate of only 2,300 pinks, an increase over the previous three years but still less than half of the 5,000 fish escapement goal. Due to the variability of returns and the limited assessment, no openings for pinks were allowed in Resurrection Bay and therefore no harvest occurred.

Aialik Subdistrict, originally opened to fishing five days per week on June 25 for sockeye salmon, was never closed after the sockeye run was effectively over. During some recent years, the subdistrict was allowed to remain open despite knowledge that fishermen were fishing the outer areas later in the season, targeting pink salmon bound primarily for Prince William Sound. The staff elected to leave the area open again in 1998 because the relatively modest historical catches would not likely threaten either local or non-local stocks. The first significant pink catches this year came during the first week of August, and landings continued for about another week. Total harvest for the season in Aialik Subdistrict was 39,800 pinks (Table 5).

Other Species

Chum salmon are the only other commercially important species in the Eastern District, but catches during the previous four years have been dismal. This season's chum harvest amounted

to 51 fish (Table 6, Appendix Table 21), with all fish taken incidentally in Aialik Bay during the pink salmon fishery. An estimated escapement of 3,200 chums was observed in Tonsina Creek (Table 6).

Coho salmon are not normally a commercially important species in the Eastern District but are an integral component of an enhancement project, originating from Bear Lake, which benefits sport fishermen in area waters. All coho salmon entered into the Seward Silver Salmon Derby are subsequently sold to a commercial processor by the city of Seward, organizer of this sport fishing derby. Therefore, these catches are considered “commercial harvests” and are listed in the commercial catch tables to document this fact. In 1998, a total of nearly 2,600 cohos were entered into the Seward Silver Salmon Derby (Table 4). In addition, a portion of the returning adults from this project are harvested at the Bear Creek weir by CIAA as cost recovery for expenses incurred. Although CIAA normally sells most of these fish to a commercial processor(s), many of the fish were unmarketable due to excessive fresh water marking. They were subsequently donated to various individuals, many of whom were dog mushers. Total hatchery harvest from the Bear Creek weir (including brood stock and mortalities) was 10,700 cohos (Tables 1 and 4), comprising nearly two-thirds of the entire LCI coho catch this season. An additional 300 fish were allowed into Bear Lake as escapement (Table 4). Total commercial catch throughout the entire Eastern District amounted to about 14,400 cohos (Table 4, Appendix Table 17).

SALMON ENHANCEMENT AND REHABILITATION

Introduction

Fisheries enhancement has played a major role in LCI salmon production for two decades. Natural adult salmon returns to the LCI area continue to demonstrate wide fluctuations, often the result of environmental impacts such as flooding or ice scouring on spawning grounds. Since their inception in the mid-1970's, enhancement and rehabilitation projects have made significant

contributions to both commercial and sport fishing harvests. These contributions have historically ranged from 24% to 90% of the entire LCI commercial salmon harvest and are expected to remain high in future years.

Projects initiated by the ADF&G and presently being undertaken by CIAA and/or CRRC provided an estimated 84% (1.48 million salmon) of the total 1998 LCI commercial harvest of 1.764 million fish. The Leisure/Hazel, English Bay, Kirschner, Bear, and Grouse Lakes sockeye salmon enhancement projects produced nearly 63% (177,700 fish) of the total LCI sockeye harvest of 284,000 fish in 1998. Tutka Lagoon Hatchery production accounted for 89% (1.297 million fish) of the 1998 LCI commercial pink salmon harvest of 1.458 million fish.

Using average weights per fish and average prices per pound in LCI, the estimated contribution of ADF&G/CIAA/CRRC-produced salmon was 71% (\$1.43 million) of the \$2.00 million total value of the 1998 LCI commercial salmon harvest. About 37% (\$0.74 million) of the total exvessel value of the fishery was utilized for hatchery cost recovery purposes (Table 7). A brief description of the current enhancement projects in LCI follows.

Tutka Lagoon Hatchery

The Tutka Lagoon Salmon Hatchery/Rearing Facility was constructed in 1976 with an initial production capacity of 10 million salmon eggs, but expansion over time, including major renovation work during the winter of 1993-94, has increased its capacity to the present level of approximately 150 million eggs. Pink salmon have been the primary species produced at the hatchery, while secondary chum enhancement was discontinued in favor of recent efforts directed toward sockeye salmon. Although the hatchery now has a sockeye egg capacity of 1.8 million eggs, and raceways to accommodate the resulting fry, efforts to incubate and rear sockeye smolts have been plagued by the IHN virus, resulting in an indefinite suspension of the sockeye program.

In 1998 the adult pink salmon produced by Tutka Lagoon Hatchery totaled approximately 1.47 million fish (Table 9). No attempt was made to identify the contribution resulting from natural spawning in Tutka Creek. The estimated 1.7% overall survival rate was identical to the average for combined fry releases/adult returns to this facility during the 1990's. The commercial harvest, including cost recovery, of 1.297 million pink salmon from Tutka Bay and Lagoon (Table 9), accounted for approximately 99% of the pink salmon landed in the Southern District and 89% of the entire LCI commercial pink salmon harvest. Pinks taken for hatchery cost recovery purposes from the Tutka Bay Subdistrict totaled 792,500 fish, worth approximately \$430,830 and exceeding CIAA's revenue goal of \$424,400. Approximately 90.0 million short-term reared pink salmon fry were released into Tutka Bay in 1998 (Appendix Table 31), the second highest on record.

Leisure and Hazel Lakes Sockeye Salmon Stocking

Leisure Lake, also called China Poot Lake, historically was a system barren of sockeye salmon. A study initiated in 1976 involved the stocking of hatchery-produced sockeye salmon fry to determine optimum stocking levels prior to and after lake enrichment through fertilization. Because a barrier falls below the lake prevents upstream migration and precludes any adult spawning, it is desirable to harvest all returning adult fish in the terminal harvest area, China Poot Bay. Beginning in 1988, a similar sockeye stocking program was initiated at Hazel Lake, which empties into Neptune Bay and is located approximately three miles south of Leisure Lake. Since the initiation of these projects, more than 1.5 million adult sockeyes were estimated to have returned as a result of these stocking programs (Appendix Table 15), making significant contributions to the commercial and recreational sockeye harvests in the Southern District.

Because of the close proximity of the two terminal harvest areas, and the absence of a mark/recovery program, adult returns to Leisure and Hazel Lakes cannot be separately identified through sampling within the commercial catches and are therefore presented as a combined total. The total sockeye return to Leisure and Hazel Lakes in 1998 was estimated to be 170,500 fish (Figure 11, Appendix Table 15), about twice the 1979-97 average and nearly 60% greater than

the recent 10-year average. It should be noted that the historical figures reflect returns to Leisure Lake only prior to 1991. The commercial harvest (including cost recovery) of 164,000 fish comprised 84% of the Southern District sockeye harvest and about 58% of the total LCI sockeye salmon harvest.

Just over 2.0 million sockeye salmon fry were released into Leisure Lake in 1998 (Appendix Table 31), continuing the program of high-density stocking utilized during the previous season. This scheme was used from 1984 through 1993, followed by an absence of stocking in 1994 due to an IHN virus outbreak at Crooked Creek Hatchery, and then two consecutive years of reduced-density stocking for this system in 1995 and 1996. At Hazel Lake, 1.3 million sockeye fry were stocked in 1998 (Appendix Table 31).

Halibut Cove Lagoon Chinook Salmon Enhancement

The chinook salmon enhancement project at Halibut Cove Lagoon involves the release of chinook salmon smolts, with the objective of increasing sport fishing opportunities in Kachemak Bay. This is the oldest and one of the most popular sport fishing enhancement projects in LCI, operating continually with an annual release of smolts since 1979. Although adult returns from the Halibut Cove Lagoon stocking program are not intended for commercial harvest, there is incidental harvest of these chinook salmon in the commercial set gillnet and seine fisheries. The long-term estimated incidental harvest of enhanced chinook salmon by commercial fishermen in Halibut Cove Subdistrict has been approximately 30% of the total return. Figures for this incidental harvest during 1998 were not available but were thought to be near the historical average.

Chenik Lake Sockeye Salmon Stocking

Chenik Lake, located in Kamishak Bay, historically was an excellent sockeye producer prior to the 1940's when annual runs approached 150,000 fish. Since that time, however, sockeye runs

declined dramatically, forcing a complete closure of the Chenik area fishery beginning in 1952. By the mid-70's the average annual return to this system was less than 500 fish.

In 1978 ADF&G initiated a program to re-establish the sockeye runs and subsequently increase commercial fishing opportunities in the Kamishak Bay area. Sockeye fry from Crooked Creek Hatchery were annually stocked in Chenik Lake through 1996, and a partial migrational barrier at the intertidal mouth of Chenik Creek was modified to allow easier fish passage. Beginning in 1987, lake enrichment occurred through the experimental application of liquid fertilizer, but not on an annual basis. Increased sockeye escapements in the early 1980's augmented production, and the Chenik area was reopened to commercial fishing. Subsequent returns accounted for up to 50% of the total LCI commercial sockeye harvest in some years, approaching the historical record high runs of the 1930's.

However, adult returns in recent years have been reduced by the lingering effects of Infectious Hematopoietic Necrosis Virus (IHNV), a disease commonly affecting both juvenile salmon and trout. IHNV was documented in the Chenik system during the 1991, 1992, and 1993 smolt outmigrations, and is suspected of causing increased mortality to juvenile sockeyes, thereby reducing the adult returns. A thorough investigation of the relationship between the Chenik Lake sockeye stocking project and the IHNV problem was initiated during the winter of 1992-93, ultimately resulting in a staff recommendation to reduce fry stocking densities from peak levels occurring in 1989 and 1990. In 1998, the sockeye return to Chenik Lake was the fifth consecutive sub-par run, with no commercial harvest and a documented escapement of only 1,880 adults (Figure 12, Appendix Table 16).

Between 1991 and 1996, the outmigration of sockeye smolts at Chenik Lake was monitored through the use of a weir and live trap. However, due to the low adult returns and smolt outmigrations during the past few years, operation of the smolt weir in 1997 and 1998 could not be justified.

Factors relating to IHNV epizootics are very complex and currently not well understood. Although remotely possible that stocked sockeye salmon fry were the source of the virus, a more likely cause is that Chenik Lake has become a reservoir for IHNV released from the sex products of naturally spawning adult sockeyes or their decomposing carcasses. It has been hypothesized that the tremendous population declines experienced by the sockeye stock at Chenik Lake in the late 1930's and 1940's may have resulted from IHNV epizootics caused by record high escapements of up to 53,000 adults in the 1930's.

Unfortunately, there is no known practical onsite treatment of IHNV other than perhaps decreasing fry stocking densities, which was begun in 1993 with a reduction to just over one million sockeye fry (Appendix Table 31). This experiment was inadvertently stretched to its maximum limit by default in 1994 when no hatchery-produced fish were released into the system. The fry from Crooked Creek Hatchery which were slated for stocking at Chenik Lake that year were destroyed due to an outbreak of the IHN virus at the hatchery facility. It should be noted that this was the first documented incidence of IHNV at the Crooked Creek facility in its 23 years of operation. Stocking resumed in 1995 with the release of 1.13 million sockeye fry into Chenik Lake, while just under 1.0 million fry were stocked in 1996 (Appendix Table 31).

It was thought that cutting back the adult escapement would also help to decrease transmission of IHNV into the littoral zone of Chenik Lake. Adult escapement into Chenik Lake, monitored via aerial surveys in 1998, totaled only 1,880 fish, the sixth consecutive year in which the escapement has fallen substantially short of the 10,000 fish goal (Appendix Table 23). The escapement shortfall, when combined with the discontinuation of supplemental stocking, equates to reduced fry production, which in turn should theoretically benefit the system by reducing the potential for IHNV epizootics.

The aforementioned schemes of reduced adult escapements and decreased stocking levels have successfully reduced the incidence of IHN in the system as evidenced by the healthy smolt leaving the lake from 1994 - 1996. Unfortunately, the numbers of outmigrating smolts during that time were miniscule relative to the stocking levels, and measures taken thus far have failed

to achieve the expected increase in production at Chenik Lake. As a result, CIAA could no longer justify the expense of stocking Chenik Lake and decided to discontinue the project after the 1996 season. The Department and CIAA will continue to include Chenik Lake in future enhancement considerations, but new information will undoubtedly be required before any additional work is undertaken.

English Bay Sockeye Salmon Rehabilitation

The English Bay Lake system has the only significant stock of sockeye salmon native to the Southern District of LCI. Unfortunately, the English Bay sockeye returns declined to their lowest recorded levels in the last half of the 1980's decade. Sockeye escapement estimates between 1985 and 1993 ranged from 2,500 to 8,900 fish; all but one of these years (1993) was well below the 20-year average of 7,800 fish (Appendix Table 23). The decline of the English Bay sockeye run resulted in a very restrictive management strategy for this area. The commercial, sport, and subsistence fisheries were closed during the sockeye run for most years mentioned. Efforts to rehabilitate this depressed stock were initiated by ADF&G with an egg take in 1989 and the subsequent release of 350,000 sockeye salmon fry in 1990 (Appendix Table 31). Chugach Regional Resources Commission (CRRC), in cooperation with the village of Nanwalek (formerly English Bay) and the Bureau of Indian Affairs, has since taken over this enhancement project and continued egg collections, fry stockings, and operation of a smolt/adult enumeration weir.

Whereas the escapement figures for English Bay Lakes prior to 1994 were only considered index counts based on aerial surveys, escapements beginning with the 1994 season have been monitored through the use of a counting weir, operated by CRRC. The cumulative total that first year numbered 13,800 sockeyes (Appendix Table 23), the highest return since 1982 and the first year since 1984 in which the minimum desired goal of 10,000 fish was achieved. In 1995 and 1996, the weir totals were 22,500 and 12,400, respectively, with the former representing the highest figure over the past 20 years.

Optimum escapement for this system recently has been estimated to be less than the published maximum goal of 20,000 sockeyes (Edmundson et al. 1992). A plan to tightly control spawning escapement into the lake by harvesting those fish surplus to the maximum desired goal of 15,000 was adopted by ADF&G staff, representatives of CRRC, and village residents from Nanwalek during meetings held over the winter of 1995-96. Based on a preseason forecast of up to 60,000 returning adults in 1998, the subsistence, commercial, and sport fisheries in the Port Graham Subdistrict were once again allowed to target English Bay sockeyes from the beginning of the run. Prior to 1996, those fisheries had been kept closed until run strength could be assessed.

Both the commercial and subsistence set gillnet fisheries were open to fishing on the standard two 48-hour periods per week in 1998, with the commercial fishery starting on the first Monday in June by regulation. The return seemed to track well with the optimistic preseason projection based on early weir counts and catches, so no restrictions were imposed on the commercial or subsistence fisheries. Because the run appeared to be gaining strength, a Special Harvest Area (SHA) was opened in a limited section of fresh water downstream from the counting weir, allowing Port Graham Hatchery Corporation (PGHC) to conduct cost recovery harvests seven days per week beginning on June 22. By July 1, escapements had increased to 10,000 sockeyes, while cost recovery had netted an additional 3,600 fish, continuing to support the assessment of a strong return.

Although the return peaked near the end of June and early July, it continued through the month of July. The enumeration weir was dismantled on July 31, with a final escapement count totaling 15,432 sockeyes (Table 3, Appendix Table 23), slightly exceeding the desired goal. Commercial and hatchery harvests in the English Bay Section totaled over 14,000 sockeyes (Table 3). Since subsistence set gillnet harvests in the Port Graham Subdistrict were presumably comprised of a high percentage of English Bay sockeyes, the total return was estimated to approach 30,000 with the addition of these fish.

Due to the devastating fire that completely destroyed the Port Graham hatchery and cannery in January, 1998, including all the incubating pink and sockeye salmon, no sockeye fry were released into English Bay Lakes this season. An estimated 1.41 million sockeye eggs were collected from brood stock taken in English Bay Lakes during 1998. These eggs were incubated during the winter of 1998-99 in the former coho salmon module at the Port Graham Hatchery, which was located away from the pink and sockeye modules and therefore survived the aforementioned fire.

Bear Lake Sockeye Salmon Enhancement

Bear Lake, located at the head of Resurrection Bay in the Eastern District, has been the target of sockeye salmon enhancement efforts over recent years. Since 1962, this system has also been the centerpiece of a Sport Fish Division coho salmon enhancement program, part of which included limiting the escapement of sockeye salmon into the lake. As a result, only a small remnant run of naturally spawning sockeye salmon remained at Bear Lake. In an effort to produce increasing numbers of adult sockeyes without adversely affecting coho salmon production, as mandated by Board of Fisheries policy, CIAA undertook a sockeye stocking program beginning in 1989 with the release of 2.2 million sockeye fingerlings. Since then, additional releases of fry, fingerlings, and accelerated growth (“zero check”) smolts have occurred, ranging from 0.2 to 2.4 million juvenile sockeye salmon each year (Appendix Table 31).

The first year of adult returns in 1992 was discouraging, with a total of less than 2,000 fish, but returns increased during each of the following three seasons. The return in 1996 was almost identical to that of 1995, totaling nearly 53,000 sockeyes, the highest to date. The 1997 return, forecasted to produce a harvestable surplus of up to 35,000 sockeyes, was not as strong as expected, with a total return estimated at around 27,000 fish.

Despite a liberal five-day-per-week fishing schedule this year, which allowed substantial harvest opportunity for the fleet, seine harvests for the season amounted to only 1,200

sockeyes in Resurrection Bay. Fishermen had difficulty locating significant schools of fish, and word of the meager catches early in the season discouraged many boats from even attempting to fish. The low seine harvest was not necessarily indicative of the overall run strength, however, as CIAA cost recovery harvests at the Bear Lake weir totaled over 21,000 sockeyes. The harvests, when combined with an escapement of 8,400 fish into Bear Lake, pushed the total return of sockeyes to over 30,000 fish. Approximately 265,000 sockeye fry were released into Bear Lake during 1998 (Appendix Table 31), while 2.8 million sockeye eggs were collected for incubation over the 1998-99 winter at Trail Lakes Hatchery in Moose Pass.

Grouse Lake Sockeye Salmon Enhancement

A relatively new sockeye enhancement project at Grouse Lake in Resurrection Bay of the Eastern District was expected to produce an adult return of up to 53,000 fish. However, the failure of the first two years' returns in 1996 and 1997 left the 1998 forecast questionable. All returning fish were designated for hatchery cost recovery in accordance with the Trail Lakes Hatchery Basic Management Plan. Brood stock for this project, from Packers Lake on Kalgin Island in Upper Cook Inlet, were selected for late run timing characteristics so as not to overlap with the earlier Bear Lake sockeye return. Unfortunately and for unknown reasons, the Grouse Lake run once again was extremely disappointing in 1998, with only about 13,400 adults documented. Based on the disappointing returns the past three seasons, it is unclear at this time whether the Grouse Lake enhancement project will be continued in place or moved to a different location in the future. CIAA has been actively investigating alternative fry release sites, closer to salt water, in order to increase the product quality of returning adults. In 1998, just over 2.0 million sockeye fry were released into Grouse Lake (Appendix Table 31).

Other Sockeye Salmon Lake Stocking

One other LCI lake was stocked in 1998 with sockeye salmon fry produced by Eklutna Hatchery. Approximately 234,000 fry were stocked at Kirschner Lake (Appendix Table 31) in

the Kamishak Bay District, site of an ongoing fry stocking project since 1987. Four other lakes, evaluated through pre-stocking studies conducted between 1986 and 1989, and which were regularly stocked through 1996, were again not stocked in 1998 as those enhancement programs have been discontinued. The four lakes included Bruin Lake, Ursus Lake, Upper Paint Lake, and Lower Paint Lake, all in the Kamishak Bay District (Appendix Table 31).

The ninth year of adult sockeye returns to Kirschner Lake occurred in 1998. Additional fish, albeit in very small numbers, returned to nearby Bruin Lake, also previously stocked with sockeye fry. The overlapping harvest areas, and the absence of any tagged fish, precludes separation of the returns for purposes of enumeration. The total combined return to Kirschner and Bruin Lakes was estimated at about 30,000 sockeyes, equaling the preseason forecast for the Kirschner system. Of the total, only 360 sockeyes escaped the commercial fishery and were documented via aerial surveys in Bruin Lake Creek, prevented from reaching the lake by a barrier falls in the creek. Over 2,000 unharvested sockeyes were documented in salt water at Kirschner Lake during August aerial surveys, unable to reach the lake due to the steep falls at tide line. The Kirschner Lake system has remained one of the steadiest producers of LCI stocked lakes since the inception of the program at that site.

Paint River Fish Pass

The Paint River system in the Kamishak Bay District contains at least 40 kilometers (25 miles) of potential salmonid spawning and rearing habitat. Currently the Paint River system is barren of salmon because of a waterfall at tide line that was impassable prior to 1993. ADF&G and CIAA initiated feasibility studies for a fishway in 1979. CIAA received State and Federal grant funds to build the fishway, completing construction in the fall of 1991. ADF&G Commissioner Carl Rosier declared the fish pass officially operational in January 1993.

To test the feasibility of developing a sockeye salmon return to the fish pass project site, the Paint River Lakes were first stocked with sockeye fry in 1986 and annually from 1988 through 1996, except in 1994 when no fry were available (Appendix Table 31). Because adult returns

from these plantings have been negligible, CIAA discontinued fry stocking after the 1996 season.

A peak of nearly 1,900 adult sockeyes was observed during aerial surveys of the Paint River mouth and Akjemguiga Cove during 1998, a new record high for the system but still the eighth consecutive year of meager returns to this enhancement site. Because of the small numbers of returning fish, the fish pass was not opened to migrating salmon and no freshwater escapement occurred.

Port Graham Hatchery

In an effort to supplement natural fish production and provide increased employment opportunities in the native village of Port Graham, the Port Graham Hatchery Corporation (PGHC) applied for and received a permit to operate a private non-profit (PNP) hatchery in 1992. Port Graham is located approximately 21 nautical miles southwest of Homer on the south side of Kachemak Bay (Figure 2). The hatchery had conducted experimental egg-takes and fry releases via a scientific/educational permit from 1990 through 1992, while these activities have since been permitted in the Port Graham Hatchery Basic and Annual Management Plans (BMP/AMP). Adult returns to the hatchery failed to appear in both 1992 and 1993 despite predictions of at least moderate returns. Because no fry were released in 1993, both the forecast and actual return for 1994 were zero. The 1995 pink return to Port Graham Hatchery was forecasted at 20,000 to 50,000 fish, with the actual return totaling an estimated 20,000 pinks, while only 2,700 fish returned in 1996, when the preseason forecast called for 7,000 to 10,000 returning pinks. In 1997, returns finally achieved the preseason forecast of 80,000 to 200,000 pinks, with a total run size estimated at about 130,000 fish. Despite a forecast of 30,000 to 50,000 fish returning in 1998, the entire return, which was solely harvested for hatchery brood, totaled less than 13,000 pinks (Table 5).

The PNP permit for PGHC allows pink salmon brood stock collection from a natural run in the Port Graham River, at the head of Port Graham. However, the Port Graham River pink

run historically has experienced significant natural fluctuations in escapements despite conservative fishing schedules, causing some concern for protection of the natural stocks. Consistent with the priority of managing for natural stocks (AS 16.05.730), a brood stock collection schedule based on the desired natural escapement into Port Graham River as well as historical escapement levels has been developed to offer maximum protection to the wild pink salmon stock during years of weak returns. Harvest of returning hatchery stocks could potentially occur in commercial purse seine and set gillnet fisheries as well as a subsistence set gillnet fishery in Port Graham. Hatchery fish undoubtedly intermix with wild stocks bound for the Port Graham River. Management decisions attempt to address the effects of these various fisheries to protect natural stocks until adequate escapement into Port Graham River can be confirmed. A small natural return of chum salmon to Port Graham River also occurs, and since this run has been depressed in recent years, management measures also strive to protect this species as well.

The approved Port Graham Hatchery BMP designated a Special Harvest Area (SHA) to allow for brood stock collection and cost recovery harvest (Figure 8). The SHA was designed to provide a migration corridor on the northeast side of the bay for wild stocks traveling to Port Graham River at the head of the bay, thus affording some limited protection to the natural spawning stocks of pink and chum salmon. In accordance with the egg removal schedule set forth in the AMP, waters of the Port Graham SHA were opened to hatchery harvest for brood stock purposes seven days per week beginning August 11, immediately after the threshold escapement of 6,000 pinks into Port Graham River was identified by the Department ground survey crew. At the same time, an aerial survey documented over 4,000 pinks staging in the area of the hatchery net pens, suggesting fish of hatchery origin. The effort and catch rates from the harvest were monitored to determine overall run strength, while sex ratios were also collected by PGHC to provide data regarding run timing. Escapement into Port Graham River was tracked by Department ground and/or aerial surveys. Since 45,000 pinks were desired for brood stock, the entire hatchery return would likely be required to meet these requirements, while a surplus for common property harvest was unlikely.

From the outset of brood stock collection, which occurred entirely in close proximity to the hatchery net pens as fish appeared to be homing there, the hatchery return appeared weaker than anticipated. This proved true as harvest efforts for the season netted a total of less than 13,000 pinks for brood stock (Table 5), far less than the 30,000 to 50,000 pinks originally projected. An additional 600 pinks were taken in the commercial set gillnet fishery in Port Graham Subdistrict (Table 5).

Unfortunately, the return of wild stock pinks to Port Graham River never gained sufficient strength to achieve the escapement goal of 20,000 to 40,000 fish, ending with a cumulative estimate of 12,600 fish (Appendix Table 24). Although the staff was concerned about pink escapement throughout the course of the season, the staging pattern of the majority of pinks (within the SHA and especially concentrated around hatchery net pens) suggested that they were of hatchery origin. Undoubtedly hatchery fishing efforts within the SHA resulted in some harvest of wild fish, however the staff believes this number to be relatively small and that the majority of the wild return was allowed to enter Port Graham River as escapement.

Although all efforts prior to 1993 were directed towards pink salmon, sockeye salmon production has also been underway at the Port Graham Hatchery. The facility has incubated sockeye salmon eggs collected from English Bay Lakes, destined for release back into that system, since 1993. Eggs from this collection site were formerly incubated at Big Lake Hatchery near Wasilla.

In an effort to rehabilitate depressed coho salmon stocks in Port Graham River, a Permit Alteration Request (PAR) by PGHC was approved in 1995 to produce approximately 25,000 presmolts for stocking in the upper portion of Port Graham River. PGHC began to monitor the smolt outmigration from that system in 1996 and collected eggs from adults beginning in 1996. These eggs were incubated at the Port Graham hatchery and subsequently released into Port Graham River. The first adult returns from this stocking program are expected in 1999. However, the project was discontinued after the 1998 release and its future is currently uncertain.

In January of 1998, a devastating fire completely destroyed the Port Graham Cannery, which also housed the pink and sockeye salmon incubation modules for the Port Graham Hatchery. All eggs for these two species being incubated at the facility were lost and therefore were not available for release in 1998. Because the coho salmon module was housed separately from the cannery, that portion of the facility remained intact and the eggs in it remained safe. Since the coho program was discontinued after the 1998 releases, the coho module was converted to pink and sockeye incubation so that those projects could continue after eggs were collected at the end of the 1998 field season. Construction of the new cannery and hatchery facility began in early 1999, with a completion date targeted for the sometime during the summer.

1999 COMMERCIAL SALMON FISHERY OUTLOOK

Sockeye Salmon

Adult sockeye salmon harvests in LCI during 1999 could approach 400,000 fish, over 40% greater than the 284,000 fish landed in 1998 and also well above the average annual catch of 249,000 sockeyes during the last decade. If realized, this harvest would be the second highest ever for sockeye salmon in LCI, lower only than that of 1996. Over three-fourths of the total sockeye harvest should be a result of continuing enhancement and lake stocking projects in LCI. However, this projection could be somewhat misleading in that about 40% of the entire harvest is projected to return to Grouse Lake in Resurrection Bay and is therefore allocated specifically for hatchery cost recovery in accordance with the Trail Lakes Hatchery Basic Management Plan.

Beneficial results of Leisure Lake fertilization should once again become evident in 1998, with an expected return of about 62,000 sockeyes to China Poot Bay. An additional 42,000 sockeyes are expected to return to Neptune Bay based on annual stocking rates and historical survival.

No harvest is expected to occur at Chenik Lake in 1999. An IHNV epizootic apparently caused significant mortality to juvenile sockeyes and reduced the numbers of emigrating smolt from the system in recent years. The 1994 - 1998 adult returns appear to have displayed the most significant effects of the IHN outbreak as escapements into Chenik Lake have ranged from 800 to 3,000 fish during those years. All available information suggests that the 1999 return likely will be poor as well. Additionally, informal predation studies conducted during previous seasons indicated that resident lake trout in Chenik Lake could play a major role in juvenile sockeye salmon survival.

Kirschner Lake in the Kamishak Bay District is expected to produce only 10,000 adult sockeyes in 1999. Stocking in other Kamishak Bay systems, such as Bruin, Ursus, and Paint River Lakes, has now been discontinued, and these systems are expected to produce only minimal harvestable sockeye returns in 1999.

The 1999 enhanced sockeye return to Bear Lake (eighth year of enhanced returns) is expected to produce a harvest of 39,000 fish, up slightly from the previous year's actual return. The fourth year of enhanced sockeye returns to Grouse Lake, also near Seward in Resurrection Bay, is expected to be considerably greater than recent years' returns, with estimates ranging up to 157,000 sockeyes. Since brood stock for this project was specifically selected for late run timing, it is hoped that the Grouse Lake return will peak in late July or early August and therefore not overlap with the much earlier run timing of Bear Lake sockeyes. As previously stated, the Grouse Lake return is designated entirely for CIAA hatchery cost recovery and no common property harvest of these fish is anticipated.

Natural sockeye run projections for LCI are based solely on average historical harvests and could be expected to contribute up to 88,000 fish to commercial catches in 1999. Despite not reaching expectations during recent years, natural sockeye runs have been improving, with a concurrent improvement in spawning escapements to most systems. The Southern District is expected to contribute the most to the harvest of natural stocks, while additional catches could

come from the East Nuka Bay systems of Delight and Desire Lakes in the Outer District, Aialik Lake in the Eastern District, and Mikfik Lake in the Kamishak Bay District.

Pink Salmon

Harvest of pink salmon in Lower Cook Inlet during 1999 could reach 3.8 million fish, with enhanced production expected to provide 80% of the total. If achieved, the harvest figure would represent a new record for LCI. However, if prices for this species continue to remain depressed, and tender service in remote districts is again erratic, it is unlikely that the harvest forecast will be attained even if returns are strong. Tutka Hatchery, in the Southern District, is expected to contribute up to 3.1 million pinks to commercial harvests. With a hatchery revenue goal of \$385,600 set for 1999, a significant portion of the pink return will undoubtedly be available for common property harvest.

Natural spawning escapement levels into most major LCI systems were generally good in 1997, contributing to a harvest projection of 726,500 naturally produced pinks throughout the entire LCI management area. Outer District systems are expected to harbor the greatest potential for harvest with a combined projection of over 382,000 pinks, returning primarily to Port Dick, Windy Bay, and Nuka Island drainages.

Chum Salmon

Based solely on recent years' average harvests (after 1988), the total LCI commercial chum salmon catch could be as high as 10,000 fish during 1999. The LCI chum harvest will consist exclusively of natural production since chum salmon enhancement is no longer conducted in LCI. Despite optimism for chum salmon during recent years, actual harvests during the past nine seasons have failed to meet the preseason projections by substantial amounts, suggesting that the average used to generate the forecast may be overly optimistic for 1999 as well.

Chinook and Coho Salmon

No formal harvest forecast is prepared for chinook or coho salmon in LCI. However, average annual harvests since 1980 indicate that about 1,300 chinook and 15,000 coho salmon can be expected to contribute to LCI commercial harvests in 1999.

The following table summarizes the projected harvest figures by species in the Lower Cook Inlet management area during 1999:

Species	Harvests of Enhanced Returns	Harvests of Natural Returns	Total Harvest
Chinook	^a	^a	1,300 ^a
Sockeye	312,000	87,700 ^b	399,700
Coho	^a	^a	14,800 ^a
Pink	3,062,000 ^c	726,500	3,788,500
Chum	0	10,400 ^b	10,400
TOTAL	3,374,000	824,600	4,214,700

^a Commercial harvest forecasts of chinook and coho salmon represent average harvests since 1980 and are comprised of a combination of naturally-produced fish as well as fish produced from enhancement programs in LCI; no attempt is made to separate the two components.

^b Harvest forecasts for naturally-produced sockeye and chum salmon are simply average commercial harvests since 1980 and 1989, respectively.

^c Includes common property plus cost recovery harvests.

SUBSISTENCE AND PERSONAL USE SALMON NET FISHERIES

KACHEMAK BAY PERSONAL USE FISHERY

The Southern District (Kachemak Bay) fall coho salmon gillnet fishery dates back prior to statehood under varying names, being known as a "personal use" fishery during the years 1986-1990, 1993, and 1995-1997, and as a "subsistence" fishery in 1991, 1992, and 1994. Numerous court rulings have affected the status of this fishery over the past 15 years, causing it to change in status between the two categories. The most recent court action, after the 1994 fishery, reestablished the "subsistence" and "non-subsistence" areas originally created by the

Alaska Board of Fisheries in 1992, and because most of Kachemak Bay was included in a “non-subsistence” area, the subsistence fishery and the regulations governing it were no longer valid. The Board responded by re-adopting personal use regulations governing this fishery into permanent regulation for the 1995 season and rescinding the subsistence regulations formerly governing the fishery. Those personal use regulations have remained in effect since that time.

The target species in the Kachemak Bay gillnet fishery is coho salmon. Returning fish are a mixture of natural stocks primarily bound for the Fox River drainage at the head of Kachemak Bay and enhanced runs bound for the Homer Spit fishing lagoon and, formerly, Fox Creek near the head of Kachemak Bay. The regulations governing the fishery are found in the Personal Use Coho Salmon Fishery Management Plan (**5 AAC 77.549**), which directs the Department of Fish and Game to close the fishery when an estimated 2,500 to 3,500 coho salmon are harvested. Included in this guideline harvest range is the requirement that any cohos taken during the Seldovia area subsistence salmon fishery be included as part of the personal use guideline.

All regulations from the previous year’s fishery remained essentially unchanged for the 1998 personal use fishery. The published regulatory season for the fishery was August 16 through September 15. Legal gear was limited to a single set gillnet not exceeding 35 fathoms in length, 45 meshes in depth, and 6 inches in mesh size. Nets were not permitted more than 500 feet from the mean high water mark, and a net could not be set offshore of another net. A permit from the Homer office was required, with an Alaska resident sport fishing license necessary to obtain a permit. The seasonal limit was 25 salmon per head of household and 10 additional salmon per each dependent. There were two scheduled 48-hour fishing periods each week, from Monday 6:00 a.m. until Wednesday 6:00 a.m. and Thursday 6:00 a.m. until Saturday 6:00 a.m. Between 1991 and 1997, years of intensive management, the total fishing time allowed in this fishery was between 48 and 144 hours, or one to three regularly scheduled fishing periods.

No coho salmon harvest was reported from the early August Seldovia subsistence fishery, therefore the guideline harvest range remained at 2,500 to 3,500 fish for the personal use fishery. Because August 16 fell on a closed weekly period (Sunday), the 1998 fishery actually began on the morning of August 17, the next regularly scheduled weekly period.

As has been the case during recent personal use fisheries in LCI, the Department requested voluntary daily reporting from each permit holder during the fishery. Based on those voluntary reports through the first 48 hours of fishing, early reports from the second fishing period, and fishery performance data from the previous seven years, the staff estimated that the guideline harvest range would not be achieved by the end of the second (48-hour) open fishing period which ended at 6:00 a.m. Saturday, August 22. The fishery was therefore allowed to open for a third period beginning at 6:00 a.m. Monday, August 24.

As catch reports came in from the third weekly period, it surprisingly appeared that the guideline would not be attained when the period ended at 6:00 a.m. Wednesday, August 26. Despite an apparently strong coho run (based solely on observations in local sport fisheries), and after a week and a half of gillnet fishing, the reported personal use harvest seemed to be inexplicably lagging. Recent years' fisheries had all been closed by this time, leading to the assumption that the actual harvest was simply being under-reported. The relatively late date heightened the staff's concern for natural coho runs since their run timing is generally later than hatchery returns. Despite a reported harvest below the GHIL, the staff maintained a conservative stance with respect to wild stocks and announced that only one additional (fourth) 48-hour fishing period would be allowed. At the end of that period at 6:00 a.m. Saturday, August 29, the fishery was closed for the remainder of the 1998 season.

A total of 227 permits was issued for the 1998 fishery (Appendix Table 26). A total of 214 permit holders (94%) reported their catches by phone or returned permits. Of this number, 142 permit holders (63%) actively fished, 72 (32%) did not fish at all, and the remaining 13 permit holders (6%) did not report. A total of 212 permit holders (93%) actually returned their permits. Based on permits actually returned and voluntary catch reports, the harvest was

estimated to be 1,461 coho salmon, 167 pink salmon, 20 sockeye salmon, 135 chinooks, and 5 chums (Appendix Table 26). The coho total represents just over half of the lower end of the guideline harvest range of 2,500 to 3,500 fish.

The duration of the 1998 Southern District personal use fishery (192 hours of fishing time) was the longest since intensive management was implemented in 1991. The number of permits issued was slightly less than the previous three years and was the lowest total since 1977 (Appendix Table 26). Actual fishing effort was similarly down, representing only about one-third of the peak level experienced in 1990 and the lowest since 1977. The coho harvest of 1,461 fish was, remarkably, the lowest total in almost 25 years.

Factors contributing to the longer duration of the fishery compared to other years this decade were twofold. First, 1998 represented the first season since 1985 that no adult coho salmon from the Caribou Lake stocking project, located at the head of Kachemak Bay, augmented the personal use catches. That stocking program was eliminated after 1994, which resulted in reduced numbers of adult cohos returning to Caribou Lake in 1997 and none during this past season. Second, run timing of naturally-produced cohos generally is later than that of enhanced fish, occurring near the end of August, thus the natural component of the gillnet catch during the first two weeks after opening tends to be diminished in most years.

The low coho harvest in the 1998 personal use fishery was not expected. Prior to the season, the lack of Caribou Lake cohos was predicted to slightly lengthen the time necessary to reach the GHL but not preclude achieving it. During the fishery, good catches were anticipated based on the strong coho return, as evidenced by informal observations in local sport fisheries. Sport and commercial catches are normally utilized as indicators of run strength, but as has become commonplace in recent years, commercial catches in Lower Cook Inlet did not accurately reflect the strength of the 1998 coho return due to a lack of directed effort. Additionally, coho returns to the adjacent Upper Cook Inlet management area were reportedly strong. This information, as well as previous experience managing this fishery, led the staff to believe that a harvest within

the guideline range should easily have been achieved by the end of the third (48-hour) fishing period.

Voluntary inseason reports and postseason permit returns proved that the harvest was far below expectations, with the most fishing success occurring in that area adjacent to the Homer Spit "enhancement lagoon". Other areas that normally produce reasonable catches, especially the north shore of Kachemak Bay from Mud Bay to Swift Creek, reported smaller harvests compared to prior years. Even though coho returns to the Homer Spit enhancement lagoon were strong, the uncertainty of the wild returns was cause for concern since the run timing for these fish is slightly later than the enhanced fish returning to the Spit. Acting conservatively, the staff reasoned that fishing after August 29th could result in an unacceptably high harvest rate on wild cohos, subsequently reducing the numbers available for escapement. Given the lack of real-time coho escapement information, a cautious approach was adopted.

The 1998 catch of 135 chinook salmon (Appendix Table 26) was lower than the previous two seasons but still much greater than the long-term average. The primary reason for this above-average chinook harvest was due to greater numbers of adult fish returning to the enhancement lagoon on the Homer Spit as a result of a relatively new "late run" stocking project. Initiated in 1992, this project specifically selected brood stock for late run-timing characteristics in an effort to expand and prolong sport fishing opportunities for chinooks on the Homer Spit. The late run timing of returning adults overlapped the personal use season dates and, consequently, resulted in increased gillnet catches of chinook salmon, particularly along the Homer Spit.

The 1998 fishery once again demonstrated the extreme popularity of the east side of the Homer Spit as the most sought after fishing area, undeniably due to the coho enhancement project at the Homer Spit fishing lagoon. Prior to enhancement, the Spit was considered only average in terms of harvest productivity. The Spit's easy road access and the enhanced coho return have combined to incite fishermen to clamor for fishing sites on the Spit, a situation which resulted in numerous violations during some previous gillnet fisheries. This was once again the case in 1998. The last time that FWP issued significant citations during this fishery

was in 1994, and the time lapse since then seemed to diminish concern about being cited for non-compliance in the 1998 fishery. Pre-fishery cautionary warnings contained in summary handouts were apparently not sufficient to deter violations this season. Additionally, the opening of local moose hunting season, August 20, was a higher priority for FWP officers, reducing enforcement effort. Experience in managing this fishery has demonstrated that uniformed FWP officers on the Homer Spit during an open period command a great deal of respect from participants, inducing generally good compliance with the regulations. The presence of non-uniformed Fish & Game personnel simply does not generate the same level of compliance, resulting in an increased number of complaints this season.

One aerial survey of Clearwater Creek, the major coho index stream at the head of Kachemak Bay, was conducted in early September to gauge escapements. An estimate of nearly 700 cohos generated during that survey was considered quite good. Heavy rains in the area prior to and after that time precluded additional surveys.

The reduced harvest levels over the past two seasons, as well as the discontinuation of the Caribou Lake stocking project, compelled Department staff to submit a proposal to the Alaska Board of Fisheries shortening the personal use season length. The staff felt that eliminating fishing after August 28 would provide adequate protection to the wild cohos due to their traditionally later run timing, yet still would allow opportunity for personal use fishermen to harvest surplus cohos. After hearing both public and staff testimony, the Board did not adopt the staff's proposal but instead decided to reduce the guideline harvest level from the present range of 2,500 to 3,500 cohos to a new range of 1,000 to 2,000 cohos. In effect this should adequately address conservation concerns about wild cohos as the new GHIL likely will be achieved within the first two weeks after the fishery opens.

The fishery in 1999 is expected to be similar to that of 1998. Once again, there will be no contribution of coho salmon from Caribou Lake, near the head of Kachemak Bay, due to a lack of stocking at this former enhancement site. Fishing effort and participation in 1999 is expected to be similar to recent years but could be affected by other alternative fisheries

elsewhere in Cook Inlet. Although limited as an inseason management tool, voluntary catch reports will once again be employed to help determine an appropriate closure time for the 1999 fishery. Based on experience gained during the past eight years' fisheries, especially the last two, it should be possible to keep the harvest within the new guideline harvest range of 1,000 to 2,000 cohos.

NANWALEK/PORT GRAHAM SUBSISTENCE FISHERY

One of two subsistence fisheries in LCI during 1998 occurred near the villages of Nanwalek (formerly English Bay) and Port Graham, located approximately 21 nautical miles southwest of Homer on the south side of Kachemak Bay (Figure 2). Most fishing occurs within close proximity to the respective villages and targets sockeye salmon returning to the English Bay Lakes system. Some additional fishing also occurs in Koyuktolik ("Dogfish") Bay, located about seven nautical miles south of English Bay, targeting non-local stocks of chinook salmon as well as local stocks of chum salmon.

The sockeye salmon run to English Bay Lakes was severely depressed for much of the last decade, with returns failing to achieve the minimum escapement goal for nine consecutive years between 1985 and 1993. Recent returns have been bolstered as a result of a rehabilitation/enhancement project initiated by ADF&G and subsequently taken over by the Chugach Regional Resources Commission (CRRC) on behalf of the village of Nanwalek. For the third straight year in 1998, the sockeye return was projected to produce harvestable surpluses, therefore the commercial, subsistence, and sport fisheries were all allowed to remain open in order to target on this return. An enumeration weir operated by CRRC monitored escapement inseason as has been the case since 1994. The subsistence fishery was allowed to remain open on the regular schedule of two 48-hour periods per week for the entire season as the sockeye escapement goal for English Bay Lakes never appeared to be in jeopardy.

The Port Graham and Nanwalek subsistence catch calendars are annually issued and tallied by ADF&G's Subsistence Division, but this data for 1997 and 1998 was unavailable at the time of publishing. Historical subsistence harvests from both these areas prior to 1997 appear in Appendix Tables 28 and 29.

SELDOVIA AREA SUBSISTENCE SALMON GILLNET FISHERY

A set gillnet fishery in the waters near Seldovia (Figure 2) on the south side of Kachemak Bay in 1998 was the third year of LCI's newest subsistence salmon fishery. Established by the Alaska Board of Fisheries at their LCI meeting in the fall of 1995, the fishery was designed to primarily target non-local stocks of chinook salmon as they transited these waters. In considering seasons and bag limits, the Board carefully restricted the fishery to reduce potential interception of enhanced chinook salmon bound for a popular stocking site in the Seldovia small boat harbor. These enhanced fish were intended to principally benefit sport fishermen and were not considered "customary and traditional" for subsistence purposes.

Regulations in the fishery included a "split" season, the first occurring from April 1 through May 30 and the second occurring during the first two weeks of August. A guideline harvest limit of 200 chinook salmon was established for the early season, while the annual possession limit was set at 20 chinooks per household. During the April/May season, fishing was allowed during two 48-hour periods each week, while in August the fishery was only open during the first two weekends of the month. Waters open to fishing included those along the eastern shore of Seldovia Bay as well as a short stretch of water outside of Seldovia Bay proper just west of Point Naskowhak (also called the "outside beach"). Gear was limited to set gillnets not exceeding 35 fathoms in length, 45 meshes in depth, and six inches (stretched) mesh size, identical to gear regulations governing the nearby Port Graham/English Bay subsistence fishery. A permit issued by the Department was required prior to fishing, and catches were to be recorded on the permit and also voluntarily reported to the Department's Homer office in season so that cumulative harvest totals could be monitored.

A total of 20 permits was issued for the early season, while three permits were issued for the August season (Appendix Table 30). Although permit holders are required to report their catches inseason, very few actually do. At the close of each season, nearly all permits were returned to the Department as required by regulation, and catches were determined from records on each permit. For the early season, only 10 of 19 permit holders (50%) actively fished, nine (45%) did not fish, and the remaining permit holder (5%) failed to return his/her permit. Total reported catch was 132 chinook salmon and 61 sockeyes (Appendix Table 30). In the late season, only three permits were issued, one of which actively fished, but no harvest was reported. The chinook and sockeye harvest figures for 1998 are both increases from the previous two years and can be directly attributed to a longer season, which was implemented for the first time this year. The Board of Fisheries adopted a 10-day extension for the early season, from May 20 to May 30, in 1997, but not in time for that year's fishery. The extra time equated to more chinook and sockeye salmon in Seldovia area waters, subsequently increasing subsistence harvests.

The fishery in 1999 is expected to be very similar to that of 1998. Because the fishery is still relatively new, fishermen are still learning the most productive fishing sites and successful techniques. However, the longer duration of the early season could result in harvests that may approach or exceed the guideline harvest limit in 1999.

COMMERCIAL HERRING FISHERY

INTRODUCTION

Similar to salmon management, the LCI herring management area is divided into five separate fishing districts, with commercial herring fishing historically occurring in all but the Barren Islands District (Figure 1). Herring fishing began in the Southern District in 1914 as a gillnet fishery within Kachemak Bay. Eight saltries, six near Halibut Cove, were operating during the peak of the fishery. Fishing with purse seines began in 1923, and after three subsequent

years of average annual harvests approaching 8,000 short tons (st), herring populations, along with the fishery, collapsed.

The next LCI herring fishery began in 1939 and was centered in the Resurrection Bay and Day Harbor area of the Eastern District. This was a purse seine fishery with the product used exclusively for oil and meal reduction. Peak harvests occurred from 1944 through 1946, averaging 16,000 st each year, but stocks sharply declined thereafter, apparently due to overexploitation.

Japanese markets for a salted herring roe product resulted in development of a sac roe fishery in the 1960's. Market demand and the relatively high prices paid to fishermen caused rapid expansion of the fishing fleet and harvest. Although Department management and research efforts lagged behind the rapid growth of the fishery, conservative management strategies and guideline harvest levels were established in response to historical overexploitation of the herring fisheries statewide.

1998 SEASON SUMMARY

A total of only 331 st of Pacific herring was landed in the Kamishak Bay District during 1998 (Tables 10 and 11), representing the lowest total for this fishery during the past two decades (Appendix Table 32). The herring sac roe harvest was less than one-fifth of both the actual 1997 harvest of 1,746 st and the 1998 preseason forecast of 1,780 st. Estimated exvessel value of the 1998 harvest was \$70,000 (Appendix Table 33).

Of the 74 LCI herring permits issued, an estimated 50 permit holders actively participated in the 1998 fishery but only 20 made deliveries (Table 10). A total of eight processors/buyers registered to buy herring in LCI, with six actually taking fish this season. Roe recoveries as reported on fish tickets averaged 8.5% for the sac roe harvest (Appendix Table 33).

Due to invariably poor weather and water clarity, aerial surveys rarely provide reliable estimates of total biomass returning to Kamishak District Bay waters. As a result, an age-structured-analysis (ASA) model has been used for the past six years to forecast herring abundance for Kamishak Bay, as well as to “hindcast” previous years’ total abundance. This model incorporates a variety of heterogeneous data sources including: times series of commercial catch age composition; total run age composition; and aerial survey biomass estimates from years with adequate survey conditions and coverage. The model simultaneously minimizes the differences between expected and observed return data for each of its components, updates hindcasts of previous years’ abundance, and returns a forecasted estimate of the following year’s return. The ASA model estimated the total 1998 return at 7,700 st (Appendix Table 35), the second consecutive year with an abundance less than 8,000 st. In the commercial fishery, the ages 4-6 year classes dominated samples (Table 11), while the exceptionally strong 1988 cohort, which had been the primary component in the fishery for many years, continued to decline.

No sac roe herring fishery occurred in the Southern District in 1998 as fish were never present in sufficient numbers to allow a harvest. The Outer and Eastern Districts also were not opened to purse seining in 1998. The historical predominance of young (age-3 and age-4) fish, roe recoveries historically below 10%, and the exploratory nature of the fishery, have discouraged interest by processors and fishermen in these two districts.

ASSESSMENT METHODS

Aerial surveys were conducted throughout the herring spawning season to determine relative abundance and distribution of herring in the Kamishak Bay and Southern Districts. Data collection methods were consistent with those used since 1990. Numbers and distribution of herring schools, location and extent of milt, and visibility factors affecting survey results were recorded on index maps for each survey. Standard conversion factors of 1.52 st (water depths of 16 ft or less), 2.56 st (water depths between 16 and 26 ft), and 2.83 st (water depths greater than

26 ft) per 538 square feet were used to convert estimated herring school surface areas to biomass.

Survey conditions in the Kamishak Bay District were relatively good from mid-April through mid-May, but weather deteriorated thereafter and precluded further surveys for the remainder of the season. A total of 14 comprehensive surveys were completed in the Kamishak Bay District, but only four surveys were flown during the month of May, the last on May 13. Surveys would normally continue into late May and early June. Three surveys were completed in the Southern District, while no comprehensive surveys of the Outer and Eastern Districts were conducted this season.

In the Kamishak Bay District, commercial landings were sampled to determine age, size, and sexual maturity of herring. In addition, test fishing by volunteer purse seine vessels was conducted to collect samples for roe recovery analysis prior to the fishery. This test fishing data was incorporated into postseason analysis to help interpret aerial survey biomass data. For the third consecutive year, post-fishery herring samples were also collected throughout the district by a chartered commercial purse seine vessel during the month of May to further aid in understanding the dynamics of the Kamishak Bay herring stocks. Throughout the nine-day period beginning on May 11, the vessel made a cumulative total of ten sets in and near Iniskin Bay, outside Oil and Cottonwood Bays, and off the Rocky Cove Reef, resulting in the collection of nearly 3,000 fish for AWL samples. Additional surveillance was conducted with hydroacoustic gear in waters between Oil Bay and Rocky Cove. Analysis of the samples confirmed significantly higher percentages of younger age fish, particularly ages-4 and -5, compared to those collected around the time of the commercial fishery in late April. The additional information gathered during these postseason sampling efforts provided age-class data that was useful in generating the 1999 herring forecast.

SPAWNING POPULATIONS

Kamishak Bay District

During the 1998 season aerial surveys to estimate biomass in the Kamishak Bay District were conducted from April 15 through May 13, with herring first observed on April 21. The highest daily biomass observation was made on May 13 with an estimate of 939 st. Test fishing documented a relatively high percentage of older age (240 g) fish in the first samples collected on April 20, but sample size was relatively small as no large concentrations of fish could be located. An increase in younger fish became apparent in the May (post-fishery) samples as percentages of ages-4 and -5 were higher than those collected around the time of the commercial fishery in late April.

As stated previously, the 1998 run was estimated at 7,700 st (Table 11, Appendix Table 35) using the ASA model because the number and effectiveness of aerial surveys were low again this season. Postseason data analysis from pre- and post-fishery test fishing sources as well as commercial harvests showed that age-5 fish comprised the bulk of the biomass this season at 35% of the total by weight (Table 11), followed in order of abundance by age-6 fish (20%) and age-4 fish (13%). The formerly dominant 1988 (age-10) year class of herring continued to decline, representing about 6% of the return by weight. Nearly three-fourths of the entire return was composed of fish younger than age-7 while only about 1% was older than age-10 (Figure 16, Table 11). It must be emphasized that these figures represent overall biomass spanning the time period between mid-April and the end of May, since samples were obtained at the time of the fishery as well as during the month of May. Prior to 1996, age composition samples usually were limited to the time period surrounding the commercial fishery in late April, thus making overall age composition estimation more difficult. Late season sampling efforts during the past three seasons confirmed the influx of younger fish, as was observed in earlier years.

Thirteen sightings of spawning activity occurred during surveillance flights, considered quite numerous by historical standards but cumulatively amounting to only about two linear miles of

spawn. Due to the often sporadic schedule of surveillance flights, however, no correlation between documented spawning and herring abundance was attempted. Therefore the high number of spawn sightings this year is not considered indicative of a strong herring return.

Southern District

Three aerial surveys of the Southern District were flown between May 6 and May 21, nearly all conducted under fair to good conditions. The 1998 run biomass, estimated as the sum of all daily biomass estimates, was only 178 st. This estimate should be considered extremely conservative due to the low number of surveys. The peak individual biomass survey (101 st) occurred on May 14, with the majority of herring once again observed in Mallard Bay. Peak surveys in areas where herring historically have been observed were as follows: Mallard Bay, 93 st on May 14; and 30 st east of the Homer Spit/Mud Bay on May 6. No sampling was conducted in the Southern District this season.

Outer and Eastern Districts

No aerial surveys of the Outer and Eastern Districts were conducted during the 1998 season. The size of the area and the characteristically poor weather in the Gulf of Alaska, which precludes surveys on a regular basis, makes aerial biomass estimation in these districts impractical. However, incidental observations of herring in June during the early part of the salmon season confirmed the presence of herring in these two districts again this year.

COMMERCIAL FISHERY

Kamishak Bay District

Spotter pilots and fishermen first located and fished the Kamishak Bay District herring populations in 1973, but after several years of commercial harvests in the late 1970's herring

abundance severely declined and the district was completely closed beginning in 1980. Herring stocks appeared to quickly rebound in response to the closure, and the fishery was reopened in 1985. Since then, the fishery has been regulated to achieve a 10% to 20% exploitation rate mandated by the Alaska Board of Fisheries.

By 1989, fishing efficiency had evolved to a level where intensive regulatory management was required to ensure maximum value of the harvest and maintain the guideline harvest level while protecting younger age fish. Management strategy during the 1990's in the Kamishak Bay District has stabilized the harvest at an average of just under 2,550 tons, or about 40% of the record high catch of 6,132 st set in 1987 (Appendix Tables 32 and 33).

Preseason management strategy in 1998 called for a guideline harvest level (GHL) of 1,780 st (after subtracting a 200 st allocation for the Shelikof Strait food and bait fishery) based on a 10% exploitation of the forecasted biomass mandated by the Kamishak Bay Herring Management Plan. Although management prior to 1990 allowed the fishery to open on a specific calendar date, since that time industry technicians have been asked to evaluate test fish samples for roe recovery prior to commercial harvests to help maximize product quality and value.

Management staff traveled to Kamishak Bay aboard the state's *R/V PANDALUS* on Thursday, April 15, reaching the grounds in late afternoon. An aerial survey was also conducted that day under good conditions, but no herring were observed. Water temperatures were well above normal at 3.9 degrees C., and climatological conditions seemed accelerated with very little snow along the coastline and only isolated shore ice. Shortly after the staff arrived the weather deteriorated, precluding aerial surveys and test fishing activities for several successive days.

When the weather finally abated on April 20, test fishing began by volunteers from the fleet and the first samples of the season were collected from just south of Contact Point. Analysis of the samples conducted by industry technicians indicated mature roe averaging 10.6% (ranging up to 12.0%), immature roe averaging 0%, and an average weight of 240 grams. Based on these

results, the fleet was put on one-hour advance notice effective at 8:00 a.m. Tuesday, April 21, to allow the Department to act quickly once a substantial biomass of fish was located.

Preliminary age composition analysis revealed that nearly 45% of the fish in the test samples were ages-8 to -10, followed by age-5 and then age-6 fish. Although the sample size was very limited, herring present in the district appeared to be older-aged fish, which the management strategy attempts to target for harvest. The samples also suggested that spawning was imminent and that smaller (younger) fish already were beginning to appear on the grounds. It was assumed that further delay of a fishery opening could result in reduced roe recoveries due to an increase in the incidence of younger-aged (immature) fish and/or an increase in the number of spawnouts. Additionally, the current weather pattern and tide stage was favorable for fishing, aerial spotting, and tender pumping activities. Therefore, on April 21 at 8:00 a.m., a 30-minute fishing period was announced for Management Areas 5, 6, and 7 (Figure 8) commencing by field announcement some time between 8:55 and 9:05 a.m. The field announcement on SSB and VHF radio was used to alleviate the possibility of early sets.

As the opening began, the fleet converged into a small area inside Contact Point near the mouth of Bruin Bay where the fishing took place. Only about 15-20 commercial spotter aircraft were present during the opening. The 30-minute fishing period resulted in a catch estimated at only 166 st from 11 deliveries. Average mature roe recoveries were estimated at 9.6% with weights ranging from 220 to 250 grams. The fleet was advised that a second opening was not being considered that day in order to allow time for test boats to range out and collect additional samples and hydroacoustic observations. An aerial survey of the district that evening revealed a total estimated biomass of 400 st, most of which was observed near the mouth of Bruin Bay.

Since the catch of 166 st represented only about 10% of the preseason guideline harvest level of 1,780 st, 1,614 st remained available for harvest. A large biomass of herring had yet to appear in the district, but active spawning was documented in several locations during the aerial survey. Although data from the first opening, as well as observations by the staff and the fleet, indicated there was probably insufficient volume to achieve the GHL, another opening at that point seemed

advantageous since further delay of the fishery could result in reduced product value due to low roe recoveries from spawnouts. A second opening remained consistent with the management plan, as it appeared that additional harvest would not target younger fish. Because the Kamishak Bay herring run timing is generally protracted, beginning in late April and lasting into early June, it seemed probable that the older fish present on the grounds represented only a small segment of the overall 1998 return. However, any delay before allowing another opening increased the risk of harvesting younger-aged fish. Additionally, the current weather pattern and tide stage was still favorable for fishing. Therefore, another opening, encompassing the entire Kamishak District, was announced for the next day, April 22.

This second opening was to be longer than the first, from 9:00 a.m. until 11:00 a.m., and was considered "exploratory". The fleet of approximately 50 purse seine vessels on the grounds was easily capable of catching the remaining harvest quota (1,614 st) in less than two hours. However, the relatively small biomass present in the district was expected to limit the catch to within the desired harvest range. The staff reasoned that the larger fishing area would provide an opportunity to collect additional biological information without the risk of exceeding the GHL. It would also afford the fleet adequate time and area to locate marketable fish and provide spotter aircraft and fishing vessels extra time to exercise caution.

Catch reports from the two-hour fishing period on April 22 totaled just 138 st from 15 deliveries, putting the cumulative catch from both days of fishing at an estimated 400 tons. At 2:00 p.m. the fleet was advised to stand down for the remainder of the day given the high male counts and relatively low roe recoveries (9.0%) from the second opening. It was also announced that a fishery opening the next day, April 23, was unlikely given the small biomass present in the district. The disappointing results of the second opening, as well as reports confirming the presence of herring in the Togiak District, prompted much of the fleet to depart the Kamishak District that same evening.

Nevertheless, aerial surveys and test fishing activities resumed on April 23. Industry technicians reported average roe recoveries of 9.5% with a mean weight of 220 grams from a sample set

north of Amakdedori Creek, while two more sets around Nordyke Island produced only spawnouts and juveniles. These results suggested that potential roe recoveries from herring currently on the grounds were only marginally acceptable to meet industry standards, and that older age components of the run no longer remained dominant.

Information collected over the next two days from additional aerial surveys and from test-fishing boats searching the area between Douglas Reef and Contact Point indicated that few new fish were present in the district. Given the prolonged warm water temperatures (as high as 6 degrees C. at Nordyke Island), the calm sunny weather, and the building tide series, the staff concluded that if a significant biomass of large older-aged fish were available, there should have been clear indications of their presence. Instead, age composition data suggested that the inshore migration of younger recruit-aged fish was accelerated compared to typical years, and that the preseason forecast of older-aged fish was overly optimistic.

By the morning of April 25, only about six fishing vessels and two or three tenders remained on the fishing grounds. With the low catch per unit effort (CPUE) from 2.5 hours of fishing, the small remaining fleet, and the available tender capacity, it became apparent that the GHL would not be achieved. Based upon all the available information, and given the Department's time and budget constraints, the staff determined that additional openings were not warranted. It was therefore announced that the Kamishak Bay District was closed for the remainder of the 1998 season.

Post-fishery compilation of fish ticket information showed a total harvest of only 331 st of herring harvested by 20 different permit holders (Table 10, Appendix Table 33), which includes fish harvested and sold by the Department in May (33 st) as part of the post-fishery research and sampling program. Overall roe percentage averaged 8.5%. By date, 160 st were harvested in 30 minutes of fishing time on April 21, while just 137 st were taken during two hours of fishing on April 22. Age-weight-length analysis from the commercial harvest showed samples dominated by ages-5, -6 and -4 fish (41%, 18%, and 12%, respectively), followed in descending proportional order by ages-10, -8, and -7 fish (Table 11). The estimated exvessel value of the 1998 catch was

\$60,000 to \$75,000 (Appendix Table 33) based on an estimated sac roe average price of \$200 to \$250 per ton. This exvessel value represents the lowest in the fishery's history.

A single Department of Public Safety, Division of Fish and Wildlife Protection (FWP) enforcement vessel, the *P/V BURTON*, was stationed on the grounds for the 1998 herring fishery. One FWP officer from the Homer detachment, as well as two stationed aboard the *P/V BURTON*, actively monitored the fishery, with no major violations documented and only a few minor infractions, such as lack of crewmember licenses, noted. No doubt the conspicuous enforcement efforts of FWP during recent seasons in the Kamishak Bay herring fishery has discouraged blatant disregard for the regulations.

By Alaska Board of Fisheries directive, the Kamishak Bay District herring fishery is managed with the intent of harvesting 10% to 20% of the available biomass. Although the harvest failed to achieve the preseason guideline, the overall exploitation in 1998 was approximately 3% - 6% of the estimated total biomass, based on a total catch of 331 st and an estimated escapement biomass of 5,000 - 10,000 st (Table 11, Appendix Table 35).

Southern District

Management strategy for the Southern District sac roe fishery was changed in 1989 to allow for a limited harvest of 150 to 200 st for the purposes of obtaining age, weight, length and roe recovery information. Sac roe herring had not been fished in the Southern District since 1979 when poor stock conditions forced an area-wide closure. Only one other fishery has occurred since that time, when 171 st of herring averaging 8.9% roe recovery were harvested by 10 vessels in a single 2.5-hour opening in Mallard Bay during 1989 (Appendix Table 32).

After the completion of the Kamishak Bay herring fishery, management attention was directed toward the Southern District on May 6 when the first aerial survey was flown. Surveys continued through May 21, but a commercial harvest of sac roe herring was once again not

allowed in the Southern District in 1998 because abundance estimates failed to document sufficient quantities of herring to warrant an opening.

Outer and Eastern Districts

During the early years of sac roe herring fishing in LCI, seining within the Outer and Eastern Districts primarily occurred in Resurrection Bay. Following a period of suspected over-exploitation, herring stocks throughout LCI generally declined after 1973. Concern over this decline prompted the Alaska Board of Fish and Game in 1974 to establish a 4,000 st quota for all of LCI, with the Outer and Eastern Districts each allocated 1,000 st. The quotas were never utilized since stock abundance continued to decline, and the Outer and Eastern Districts were closed to fishing from 1975 through 1984.

In 1985, the sac roe fishery was allowed to resume in the Outer and Eastern Districts on a very conservative basis, even though no noticeable change in spawning biomass had been observed. Because of reduced stock abundance and extreme vulnerability to fishing, guideline harvest levels were set at 150 to 200 st for each of the four fishing areas created within these two districts. Fishing effort in 1985 was minimal and the majority of the harvest (216 st; Appendix Table 32) once again occurred in Resurrection Bay.

Only limited and sporadic harvests have occurred in these two districts since 1985, with the majority of both the herring harvest and the observed biomass during the past nine years comprised of age-3 and age-4 fish. Unlike the Southern and Kamishak Bay Districts, samples from the Outer and Eastern Districts have contained up to 14% age-2 (sexually immature) herring. Although sampling has been very limited in recent years, no discernible shift to older age herring has ever been observed, suggesting the possibility that the Outer and Eastern Districts may be feeding and rearing grounds for juvenile fish of Prince William Sound origin.

Despite significant opportunity for exploratory fishing on a daily basis in the Outer and Eastern Districts during 1991 and 1992, the predominance of juvenile herring and the history of

marginally acceptable roe recoveries from fish caught in these areas has contributed to a lack of interest by fishermen and processors. These conditions prevailed during the years 1993 through 1998 and, consequently, the Outer and Eastern Districts were not opened to purse seining in any of the past six seasons.

HERRING OUTLOOK AND MANAGEMENT STRATEGY FOR 1999

Kamishak Bay District

Since herring biomass has been declining in Kamishak Bay during recent years and may now be below the regulatory threshold of 8,000 tons for which a commercial harvest can occur, the sac roe fishery in the Kamishak Bay district will remain closed for the 1999 season. Current assessment of stock size is 6,000 to 13,000 st, while no indication of exceptionally strong recruitment into the spawning population occurred in 1998. Although the 1993 cohort appears relatively strong at 38% of the forecasted biomass (Table 11, Figure 16), it is estimated to be only one-third to one-quarter the size of the very strong 1988 cohort that supported the commercial fishery throughout most of the 1990's. The resource, and hence the commercial fishery, is best served by protecting the remaining spawning population in order to rebuild it to a harvestable level. Anecdotal information collected by research vessels targeting other species in LCI during 1998 suggested relatively high densities of juvenile (age-1) herring, but these observations cannot be used to predict the length of time necessary to rebuild the herring stocks.

As mentioned earlier, an age-structured-analysis (ASA) model has been used to forecast Kamishak herring abundance and set harvest guidelines for the ensuing season. This assessment technique uses information on age composition of the catch and run, as well as estimates of survival and recruitment, to follow trends in herring abundance. Actual herring biomass estimates from this type of analysis depend heavily upon the availability of periodic, independent measure of total spawning biomass to properly scale abundance trends. The Department uses aerial survey information to provide these independent measures of herring biomass.

Unfortunately, the routinely harsh weather and water conditions in Kamishak Bay do not lend themselves to this particular method of assessment. Six seasons have passed since the Department has collected what can be considered a truly good aerial survey index of herring abundance. This lack of consistent aerial survey data raises the level of uncertainty inherent to the forecasting process. While attempts have been made to compensate for missing aerial survey data by enhancing the quality of other data, assessments for both 1997 and 1998 apparently overestimated actual spawning biomass. Low commercial harvests, well short of harvest projections, were made in both these years despite district-wide openings. Although factors such as storms and price disputes also may have attributed to poor catches, declining herring abundance appears to be the primary cause.

Without a commercial fishery in 1999, the Department's ability to collect age composition information will be greatly reduced. The Department is planning to conduct test fishing with a chartered commercial seine vessel throughout the duration of the 1999 run, but available funding may be limited and some volunteer assistance from the commercial fleet could be sought. The Department will also attempt to conduct comprehensive aerial surveys throughout the spawning season, from mid-April to early June, as conditions permit.

Other Districts

Based on recent trends in herring abundance and age structure in the Southern, Outer, and Eastern Districts of LCI, no commercial herring harvests are anticipated in these areas during 1999. Sufficient quantities of herring in the Southern District must be documented before a commercial opening is considered. Monitoring of the Southern District herring stocks will occur as in the past through the use of aerial surveys in conjunction with test fishing samples collected on an opportunistic basis. The Outer and Eastern Districts will only be opened to fishing if adequate evidence suggesting commercial quantities of adult herring becomes available. Any potential fishery in these districts will be considered "exploratory" in nature and will be managed accordingly.

COMMERCIAL AQUATIC PLANT HARVEST

A formal request to commercially harvest kelp from Kachemak Bay was received in February of this year. Chesloknu Foods, a company owned and operated by Seldovia Village Tribe, applied for a permit to take a small quantity of "Bull Kelp" (*Nereocystis leutkeana*) for the purpose of market testing select food products utilizing this kelp species as an ingredient. The proposed area of harvest was from kelp beds near the mouth of Fourth of July Creek, just west of Seldovia Bay, with an alternative site off Seldovia Point. Both areas support large Bull Kelp beds with few other species present.

The request for a total of 500 lbs. (wet weight) was expected to satisfy initial product test requirements. The proposed harvest method was to simply cut and harvest the upper portion of the plant from a skiff. The lower portion would be left attached to the substrate, theoretically allowing the plant to live and continue growing. The proposed harvest time was mid-late May, selected primarily so as to enter the market with the finished product in June of 1998. Additionally, local knowledge from village tribal members suggested that the kelp is not harvestable until after mid-May. Apparently the early season kelp was thought to be of the highest quality and, hence, most preferred for food.

After reviewing the proposal, a kelp harvest permit was issued under conditions of state regulations regarding aquatic plants (**5AAC 37.100**). Harvesting was allowed under the terms of an experimental permit, the first such permit issued in LCI for the commercial harvest of Bull Kelp. Permit conditions and restrictions, which were based upon telephone conversations and letters from the applicant, in conjunction with a very limited literature review, were as follows:

- 1) The harvest limit was 500 lbs. wet weight.
- 2) Harvesting would only take place within the Seldovia Subdistrict (241-17) in the Southern District of LCI. Harvest locations would be identified on an appropriate nautical chart, being as specific as possible about the exact location.

- 3) While harvesting, the plants would not be removed from the bottom and care would be taken to keep from straining the plants, which could dislodge the holdfast.
- 4) Detailed harvest records would be maintained showing daily weight of the kelp harvest. Additionally, fish tickets would be submitted for each sale or shipment of kelp (or kelp product). Fish tickets would be submitted to the Homer area office within seven days of the date of harvest.
- 5) Harvesting was permitted between May 15 - July 31. No harvesting could occur where herring were spawning or where herring eggs were attached to the kelp or surrounding substrate.
- 6) Harvesting would be done by hand from skiffs in random swaths parallel to the beach to minimize disruption of the plants from wave action. The outer fringe (seaward) plants would be avoided while harvesting to help ensure a navigational aid and provide a wave buffer for the bed.
- 7) Commercial Fisheries management staff in the Homer ADF&G office would be notified prior to beginning the actual harvest.
- 8) A brief summary report of the project including total harvests, harvest locations, techniques, market interest, and prices would be submitted within 30 days of attaining the harvest limit or by August 30, whichever was earlier.
- 9) All appropriate licensing would be completed with the Commercial Fisheries Entry Commission for vessels and crewmembers.
- 10) It was the responsibility of the applicant to contact other State or Federal agencies regarding other regulations or restrictions that may apply to the proposed operation.

The applicant's final report stated that 500 lbs. of Bull Kelp was harvested in three trips: 156 lbs. on June 26, 146 lbs. on July 21, and 198 lbs. on July 31. An open commercial skiff was used to randomly hand cut individual kelp fronds 2 - 3.5 ft. below the bulb (pneumatocyst), taking care not to pull the holdfast loose. It was estimated that harvesters were 98% successful at achieving the latter objective. Attempts to attach markers or tags to the remaining portion of the cut frond were unsuccessful because tide and/or wind pressure on the skiff dislodged the

holdfast while attempting to attach the marker. After several unsuccessful attempts to attach tags, the effort was discontinued.

During the June 26 harvest it was noted that all kelp was large and often covered with "light growth". The skin of the plant also appeared old and rough. During the July 21 harvest, a large number of "new" plants was observed and apparently very few of the "old" kelp plants that had been harvested in June remained. The harvesters had to search to find plants large enough in diameter to suit the stated purpose. The new kelp was reported to be growth free, smooth, and more tender. By the last harvest on July 31, the new kelp had exhibited very rapid growth during the interim 10 days, being much larger in diameter. Based on these findings, it was suggested that the first harvest probably occurred on 1997 growth, while the last two harvests were from 1998's "new growth". Given the first year's experience, the applicant's final report indicated the intent to apply for another permit to harvest Bull Kelp in 1999, preferably adjusting the harvest dates to late July - August.

As with other experimental or developing fisheries, the Department currently has no funding available to develop and manage this new fishery. Therefore, the permit only allowed kelp harvests in two areas of the Seldovia Subdistrict for the 1998 calendar year to meet the stated purpose of testing market demand for kelp products. There was no guarantee that an annual or long-term permit would be issued for the proposed harvest if tests proved feasible and larger amounts of kelp were subsequently required. It should be noted that the Department had recently determined that no new fisheries would be allowed to develop prior to codification of a statewide Developing Fisheries Policy, scheduled for review by the Alaska Board of Fisheries later in the year. This policy, if adopted, would most certainly affect the proposed commercial kelp harvest in Kachemak Bay.

Because of limited time and funding, no staff time was allocated to monitor this harvest. A cautious management approach was adopted requiring strict accounting of harvest periods, methods, and areas. Until funds become available for surveying harvest areas, estimating

annual biomass, and monitoring and examining effects of the harvest on the standing crop, aquatic plant harvest in Kachemak Bay must be regulated on a small-scale experimental basis.

1998 ALASKA BOARD OF FISHERIES ACTIONS

The Alaska Board of Fisheries met between November 13 and 18 in Homer to consider changes to existing regulations governing LCI subsistence, commercial, sport, and personal use fisheries. Only four proposals were submitted for commercial salmon fishing, three for subsistence salmon fishing, one for personal use gillnet salmon fishing, one for commercial herring fishing, and one for personal use herring fishing. All proposals were submitted by members of the general public except the one for personal use salmon fishing, which was submitted by Department staff. One of the commercial salmon proposals was withdrawn by the proposer prior to the meeting and was not considered by the Board. Table 12 summarizes the nature of the proposals, authors, and Board of Fisheries resultant action on each.

Two of the three proposals pertaining to the Seldovia subsistence salmon fishery were rejected by the Board. Both rejected proposals (#35 and #36) sought to increase the area open to subsistence fishing near Seldovia, but the Board determined that reasonable opportunity for subsistence fishing was already afforded by existing regulations and that additional area was unnecessary. The Board adopted the third subsistence proposal, which sought to require a subsistence permit holder to operate only a net marked with his/her own name.

Of the commercial salmon proposals, two were specifically directed at reducing the catch of chinook salmon in the commercial set gillnet fishery near enhancement projects. The first (#43), delaying the opening of the set gillnet fishery in Halibut Cove Subdistrict from the first Monday in June to June 10, was rejected by the Board because the traditional opening date had been long established prior to the onset of chinook enhancement at nearby Halibut Cove Lagoon. The second (#44), restricting the maximum mesh size for gillnets fishing in Halibut Cove and Seldovia Bay Subdistricts, was adopted by the Board with amendments. The original proposal

sought a maximum mesh size of 5¼" for the two aforementioned subdistricts only, but the Board instead chose a maximum mesh size of 6" and imposed the restriction on all areas open to commercial set gillnet fishing in the Southern District.

The final commercial salmon proposal (#45), seeking to allow drift gillnetting in waters of Resurrection Bay in the Eastern District, was unanimously rejected by the Board. This proposal has been submitted numerous times over the past decade and has failed each time.

The Department's single personal use proposal (#39), seeking to shorten the Kachemak Bay coho salmon set gillnet season by 18 days, was submitted by the staff due to the discontinuation of the Caribou Lake coho stocking program and the subsequent concern that a longer fishery could threaten wild stocks. The proposal was amended by the Board and subsequently adopted. The amended language left the season length intact (August 16 - September 15) but reduced the guideline harvest level from its present range of 2,500 to 3,500 cohos to a new range of 1,000 to 2,000 cohos.

Finally, both proposals dealing with herring were adopted by the Board. The first (#47) sought to allow dip nets as a legal gear type for personal use herring in all of Cook Inlet. The second (#48) sought to establish a standard method of measure for catch weight and roe percentage in the Cook Inlet commercial sac roe herring fishery.

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Table 1. Commercial, hatchery, and derby salmon catches in numbers of fish by species, district, and gear type, Lower Cook Inlet, 1998.

<i>District</i>		Chinook	Sockeye	Coho	Pink	Chum	Total
	<i>Gear Type</i>						
Southern							
Commercial:							
	Set gillnet	952	26,131	1,057	24,403	3,754	56,297
	Purse seine	118	143,350	1,186	498,090	201	642,945
Hatchery:							
	Purse seine	0	20,579	0	792,548	0	813,127
	Weir	0	6,202	0	1	1	6,202
	Total	1,070	196,262	2,243	1,315,042	3,956	1,518,573
Outer							
Commercial:							
	Purse seine	0	15,991	45	102,172	611	118,819
Eastern							
Commercial:							
	Purse seine	1	9,797	1,094	38,829	51	49,772
Hatchery:							
	Weir	0	34,477	10,717	0	0	45,194
Derby ^a :							
	Hook & Line	0	0	2,554	0	0	2,554
	Total	1	44,274	14,365	38,829	51	97,520
Kamishak							
Commercial:							
	Purse seine	0	8,112	0	414	20	8,546
Hatchery:							
	Purse seine	0	19,390	0	1,362	9	20,761
	Total	0	27,502	0	1,776	29	29,307
<hr/>							
	LCI Total	1,071	284,029	16,653	1,457,819	4,647	1,764,219
	Percent	0.06%	16.10%	0.94%	82.63%	0.26%	100.00%
1978-97							
	Average	1,338	211,807	14,368	1,253,555	93,836	1,574,905

^a Derby catches are fish entered into the Seward Silver Salmon Derby which are subsequently sold to a commercial processor, therefore these catches are considered part of the LCI "commercial harvest".

Table 2. Commercial chinook salmon catches, and escapements in numbers of fish by subdistrict, Lower Cook Inlet, 1998.

Subdistrict/System	Catch	Escapement ^a	Total Run
SOUTHERN DISTRICT			
Halibut Cove	426		426
China Poot Bay	28		28
Neptune Bay	3		3
Tutka/Kasitsna Bays	159		159
Barabara Creek	34		34
Seldovia Bay	332		332
Port Graham	12		12
English Bay	76		76
SOUTHERN DISTRICT TOTAL	1,070		1,070
OUTER DISTRICT TOTAL	0		0
EASTERN DISTRICT			
Aialik Bay	1		1
EASTERN DISTRICT TOTAL	0		0
KAMISHAK BAY DISTRICT TOTAL	0		0
TOTAL LOWER COOK INLET	1,071		1,071

^a Chinook escapement in Lower Cook Inlet is very limited; no escapement surveys are conducted.

Table 3. Commercial sockeye salmon catches (including hatchery cost recovery) and escapements in numbers of fish by subdistrict, Lower Cook Inlet, 1998.

Subdistrict/System	Catch	Escapement ^a	Total Run
SOUTHERN DISTRICT			
Northshore Subdistrict			
Clearwater Slough		6	
Helicopter Creek		20	
Total Run			26
Humpy Creek		408	408
Halibut Cove	62,301		62,301
China Poot Bay			
Common Property Fishery	61,154		
Hatchery Cost Recovery	19,294		
China Poot Creek		380 ^b	
Total Run			80,828
Neptune Bay			
Common Property Fishery	18,488		
Hatchery Cost Recovery	1,285		
"Waterfall" Creek		12	
"Oxbow" Creek		325	
Total Run			20,110
Tutka/Kasitsna Bays & Tutka Creek	8,480	439	8,919
Barabara Creek	1,288		1,288
Seldovia Bay	6,038	8	6,046
Port Graham	3,652		3,652
English Bay			
Common Property Fishery	8,080		
Hatchery Cost Recovery	6,202		
English Bay Lakes		14,136 ^c	
Hatchery Broodstock		1,296	
Total Run			29,714
SOUTHERN DISTRICT TOTAL	196,262	17,030	213,292
OUTER DISTRICT			
Koyuktolik (Dogfish)		1	1
Port Chatham	5	1	6
Windy Left		2	2
Port Dick			
Head End		6	
Island Creek		1	
Total Run			7

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Table 3. (page 2 of 2)

Subdistrict/System	Catch	Escapement ^a	Total Run
OUTER DISTRICT (continued)			
East Arm Nuka Bay (McCarty Fiord)	15,986		
Delight Lake		9,154 ^d	
Desire Lake		7,880	
Delusion Lake		1,090	
Total Run			34,110
OUTER DISTRICT TOTAL	15,991	18,135	34,126
EASTERN DISTRICT			
Aialik Bay & Aialik Lake	8,568	4,900	13,468
Resurrection Bay North			
Common Property Fishery	1,229		
Hatchery Cost Recovery	30,172		
Hatchery Discards/Donations	4,305		
Bear Lake Escapement		6,487 ^c	
Hatchery Brood Stock		1,944	
Bear/Salmon Creeks		1,094	
Lost Creek		900	
Grouse Creek		840	
Total Run			46,971
EASTERN DISTRICT TOTAL	44,274	16,165	60,439
KAMISHAK BAY DISTRICT			
Ursus Cove Lagoon Creek		1,000	1,000
Kirschner Lake			
Common Property Fishery	8,112		
Hatchery Cost Recovery	19,390		
Total Run			27,502
Bruin Bay			
Bruin Lake Creek		360 ^b	
Bruin Bay River		405	
Total Run			765
Chenik Lake			
Amakdedori Creek		4,140	
Chenik Creek/Lake		1,880	
Total Run			6,020
Paint River		1,870 ^c	1,870
McNeil Cove (Mikfik Creek/Lake)		12,630	12,630
KAMISHAK BAY DISTRICT TOTAL	27,502	22,285	49,787
TOTAL LOWER COOK INLET	284,029	73,615	357,644

^a Escapement estimates derived from limited aerial surveys. Numbers represent unexpanded aerial live counts.

^b No freshwater escapement, prevented by barrier falls.

^c Weir counts.

^d Weir counts and video images.

^e No freshwater escapement, ladder not opened during 1998.

Table 4. Commercial coho salmon catches (including hatchery cost recovery and sport derby sold to commercial processors) and escapements in numbers of fish by subdistrict, Lower Cook Inlet, 1998.

Subdistrict/System	Catch	Escapement ^a	Total Run
SOUTHERN DISTRICT			
Northshore Subd./Clearwater Slough		662	662
Halibut Cove	918		918
China Poot Bay	290		290
Neptune Bay	38		38
Tutka/Kasitsna Bays	691		691
Barabara Creek	196		196
Seldovia Bay	76		76
Port Graham/Port Graham River	11		11
English Bay	23		23
SOUTHERN DISTRICT TOTAL	2,243	662	2,905
OUTER DISTRICT			
East Arm Nuka Bay (McCarty Fiord)	45		45
OUTER DISTRICT TOTAL	45		45
EASTERN DISTRICT			
Aialik Bay	1,094		1,094
Resurrection Bay North			
Hatchery Cost Recovery	4,993		
Hatchery Discards/Donations	5,724		
Sport Derby	2,554		
Bear Lake (weir counts)		300	
Hatchery Brood Stock		463	
Total Run			14,034
EASTERN DISTRICT TOTAL	14,365	763	15,128
KAMISHAK BAY DISTRICT TOTAL	0		0
TOTAL LOWER COOK INLET	16,653	1,425	18,078

^a Coho escapement estimates in Lower Cook Inlet are very limited; only one escapement survey was conducted during 1998, number represents unexpanded aerial live count.

Table 5. Commercial pink salmon catches (including hatchery cost recovery) and escapements in numbers of fish by subdistrict, Lower Cook Inlet, 1998.

Subdistrict/System	Catch	Escapement ^a	Total Run
SOUTHERN DISTRICT			
Humpy Creek		17,492	17,492
Halibut Cove	2,417		2,417
China Poot Bay/Creek	2,312 ^b	5,653	7,965
Neptune Bay	957		957
Tutka/Kasitsna Bays			
Common Property Fishery	504,759		
Hatchery Cost Recovery	792,542		
Hatchery Brood Stock		153,580	
Tutka Lagoon Creek		17,473	
Total Run			1,468,354
Barabara Creek	3,298	2,840	6,138
Seldovia Bay & River	7,398	31,535	38,933
Port Graham			
Common Property Fishery	598		
Hatchery Brood Stock		12,706	
Port Graham River		12,559	
Total Run			25,863
English Bay	761 ^b		761
SOUTHERN DISTRICT TOTAL	1,315,042	253,838	1,568,880
OUTER DISTRICT			
Dogfish Bay		6,695	6,695
Port Chatham	9,435	22,162	31,597
Chugach Bay		24,551	24,551
Windy Bay			
Windy Right Creek		19,522	
Windy Left Creek		12,934	
Total Run			32,456
Rocky Bay	35,003		
Scurvy Creek		260	
Rocky River		164,961	
Total Run			200,224
Port Dick	2,387		
Port Dick (head end) Creek		57,082	
High Tech Creek		1,343	
Well Flagged Creek		638	
Slide Creek		39,281	
Island Creek		83,585	
Total Run			184,316

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Table 5. (page 2 of 2)

Subdistrict/System	Catch	Escapement ^a	Total Run
OUTER DISTRICT (cont'd)			
Nuka Island/South Nuka Island Creek	41,101	14,000	55,101
East Arm Nuka Bay (McCarty Fiord)	14,246		
Delight Lake		300	
Desire Lake		6,156	
Delusion Lake		1,991	
Total Run			22,693
OUTER DISTRICT TOTAL	102,172	455,461	557,633
EASTERN DISTRICT			
Aialik Bay	38,828	350	39,178
Resurrection Bay North	1		
Bear/Salmon Creeks		13,230	
Grouse Creek		180	
Sawmill Creek		1,118	
Spring Creek		646	
Tonsina Creek		2,327	
Humpy Cove		1,180	
Thumb Cove		21,032	
Total Run			39,804
EASTERN DISTRICT TOTAL	38,829	40,153	78,982
KAMISHAK BAY DISTRICT			
Inisksin Bay			
North Head Creek		106	
Sugarloaf Creek		109	
Total Run			215
Ursus Cove/Brown's Peak Creek		7,869	7,869
Rocky Cove/Sunday Creek		24,029	24,029
Kirschner Lake	1,776 ^c		1,776
Bruin Bay & River		134,887	134,887
Kamishak/Douglas Reef		1,954	1,954
KAMISHAK BAY DISTRICT TOTAL	1,776	168,954	170,730
TOTAL LOWER COOK INLET	1,457,819	918,406	2,376,225

^a Escapement estimates are derived from periodic ground or aerial surveys with stream life factors applied.

^b China Poot and English Bay catches include 6 and 1 pinks respectively caught during hatchery sockeye salmon cost recovery.

^c Kirschner Lake pinks include 414 taken during common property fishing and 1,362 taken during hatchery sockeye cost recovery operations.

Table 6. Commercial chum salmon catches and escapements in numbers of fish by subdistrict, Lower Cook Inlet, 1998.

Subdistrict/System	Catch	Escapement ^a	Total Run
SOUTHERN DISTRICT			
Humpy Creek		101	101
Halibut Cove	71		71
China Poot Bay	15		15
Tutka Bay	852		852
Barabara Creek	422		422
Seldovia Bay & River	1,789	3,058	4,847
Port Graham & River	463	5,092	5,555
English Bay	344 ^b		344
SOUTHERN DISTRICT TOTAL	3,956	8,251	12,207
OUTER DISTRICT			
Dogfish Bay		9,760	9,760
Port Chatham	127	494	621
Windy Bay			
Windy Right Creek		606	
Windy Left Creek		482	
Total Run			1,088
Rocky Bay & River	327	700 ^c	1,027
Port Dick	145		
Port Dick (head end) Creek		1,840	
High Tech Creek		82	
Well Flagged Creek		12	
Slide Creek		367	
Middle Creek		2,427	
Island Creek		3,446	
Total Run			8,319
Nuka Island/Petrof River	0	462	462
East Arm Nuka Bay	12		12
OUTER DISTRICT TOTAL	611	20,678	21,289
EASTERN DISTRICT			
Aialik Bay	51		51
Resurrection Bay North	0		
Sawmill Creek		66	
Spring Creek		292	
Tonsina Creek		3,224	
Total Run			3,582
EASTERN DISTRICT TOTAL	51	3,582	3,633

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Table 6. (page 2 of 2)

Subdistrict/System	Catch	Escapement ^a	Total Run
KAMISHAK BAY DISTRICT			
Iniskin Bay	0		
Iniskin River		18,626	
Sugarloaf Creek		651	
North Head Creek		440	
Total Run			19,717
Cottonwood Bay & Creek	0	2,316	2,316
Ursus Cove	0		
Brown's Peak Creek		394	
Ursus Lagoon Right Creek		1,584	
Ursus Cove Lagoon Creek		3,036	
Total Run			5,014
Rocky Cove/Sunday Creek	0	713	713
Kirschner Lake	29 ^d		29
Bruin Bay & River	0	9,439	9,439
McNeil River	0	23,530	23,530
Kamishak/Douglas Reef	0		
Big Kamishak River		7,122	
Little Kamishak River		9,728	
Douglas Reef Creek		586	
Total Run			17,436
Douglas River/Douglas Beach Creek	0	4,061	4,061
KAMISHAK BAY DISTRICT TOTAL	29	82,226	82,255
TOTAL LOWER COOK INLET	4,647	114,737	119,384

^a Escapement estimates are derived from periodic ground or aerial surveys with stream life factors applied.

^b English Bay catches include 1 chum taken during hatchery sockeye cost recovery operations.

^c Rocky River escapement considered minimal estimate; due to the large numbers of pinks in the system, visual enumeration of chums via aerial surveys was nearly impossible.

^d Kirschner Lake catches include 9 chums taken during hatchery sockeye cost recovery operations.

Table 7. Exvessel value^a of the commercial salmon catch in numbers of dollars by species, gear type, and harvest type, Lower Cook Inlet, 1998.

	Chinook	Sockeye	Coho	Pink	Chum	Total
COMMON PROPERTY - PURSE SEINE						
No. of Fish	119	177,250	2,325	639,505	883	820,082
Pounds	1,116	772,919	17,844	2,052,179	7,194	2,851,252
Price/lb.	\$0.68	\$1.00	\$0.55	\$0.13	\$0.19	
Value	\$759	\$772,919	\$9,814	\$266,783	\$1,367	\$1,051,642
COMMON PROPERTY - SET GILLNET						
No. of Fish	952	26,131	1,057	24,403	3,754	56,297
Pounds	12,397	150,068	8,365	96,119	27,299	294,248
Price/lb.	\$1.58	\$1.01	\$0.66	\$0.14	\$0.29	
Value	\$19,587	\$151,569	\$5,521	\$13,457	\$7,917	\$198,051
HATCHERY - PURSE SEINE & WEIR						
No. of Fish		80,648	10,717	793,911	10	885,286
Pounds		369,797	92,073	2,396,615	84	2,858,569
Price/lb.		\$0.86 ^b	\$0.15 ^b	\$0.18	\$0.17	
Value		\$299,713 ^b	\$6,728 ^b	\$431,391	\$14	\$737,860
SPORT FISHING DERBY^c - HOOK & LINE						
No. of Fish			2,554			2,554
Pounds			22,993			22,993
Price/lb.			\$0.65			
Value			\$14,945			\$14,945
TOTAL ALL GEARS						
No. of Fish	1,071	284,029	16,653	1,457,819	4,647	1,764,219
Pounds	14,053	1,292,784	141,275	4,544,913	34,577	6,027,602
Price/lb.	\$1.45	\$0.96 ^b	\$0.36 ^b	\$0.16	\$0.27	
Value	\$20,346	\$1,224,201 ^b	\$37,008 ^b	\$711,631	\$9,298	\$2,002,484

^a Exvessel value is calculated from average prices, which are determined only by fish ticket information and may not reflect retroactive or postseason adjustments.

^b Average price and value for sockeyes and cohos include only those fish actually sold and does not include hatchery fish that were donated or discarded.

^c Fish entered into the Seward Silver Salmon Derby are subsequently sold to a commercial processor and are therefore considered "commercial harvest".

Table 8. Emergency orders issued for the commercial, personal use, and subsistence salmon and herring fisheries in Lower Cook Inlet, 1998.

Number/ Issue Date	DESCRIPTION
2-F-H-001-98 April 21	Opens Management Areas 5, 6, and 7 in the Kamishak Bay District to commercial sac roe herring seining for approximately one-half hour commencing by an ADF&G field announcement some time between 8:55 p.m. and 9:05 a.m., Tuesday, April 21, 1998. The fishery will close at 9:30 a.m. Management Areas 5, 6, and 7 include those waters south of 59° 26.82' N. latitude and west of 153° 37.0' W. longitude.
2-F-H-002-98 April 22	Opens the entire Kamishak Bay District to commercial sac roe herring seining for approximately two hours commencing by an ADF&G field announcement some time between 8:55 p.m. and 9:05 a.m., Wednesday, April 22, 1998. The fishery will close at 11:00 a.m.
2-F-H-003-98 May 15	Opens those waters of Resurrection Bay in the Eastern District enclosed by a line from Aialik Cape south to a point one mile due south of Aialik Cape, then northeast to a point one mile due south of Cape Resurrection, then north to Cape Resurrection, to commercial salmon seining on a weekly schedule of five days per week, from Monday 6:00 a.m. until Friday 10:00 p.m., effective Monday, May 18, 1998, until further notice. All waters along the west shore of Resurrection Bay west of a line from the old military dock pilings north of Caines Head to a regulatory marker near the Seward Airport will remain closed to seining.
2-F-H-004-98 May 29	Establishes two 48-hour weekly fishing periods in the Kamishak Bay District commercial salmon seine fishery, which opens by regulation on June 1, 1998. These periods shall be from Monday 6:00 a.m. until Wednesday 6:00 a.m. and from Thursday 6:00 a.m. until Saturday 6:00 a.m.
2-F-H-005-98 June 18	Extends weekly commercial salmon seine fishing time in the McNeil River Subdistrict of the Kamishak Bay District to seven days per week effective at 6:00 a.m. Friday, June 19, 1998, until further notice. Traditional closed waters markers at McNeil Lagoon will be in effect for this opening. In addition, this emergency order also opens waters of Aialik Subdistrict, including Aialik Lagoon, in the Eastern District, and those waters of East Nuka Subdistrict in the Outer District between the latitude of the entrance to James Lagoon at approximately 59° 33' 30" N. latitude, and the regulatory markers near the Parks Service tent camp at approximately 59° 37' 30" N. latitude, to commercial salmon seining on a schedule of two 40-hour periods per week, from Monday 6:00 a.m. until Tuesday 10:00 p.m. and from Thursday 6:00 a.m. until Friday 10:00 p.m., effective 6:00 a.m. Monday, June 22, 1998, until further notice. Waters south of the entrance to James Lagoon, as well as waters north of the

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Table 8. (page 2 of 5)

Number/ Issue Date	DESCRIPTION
2-F-H-005-98 June 18 (continued)	regulatory markers by the Parks Service former tent camp, remain closed to fishing. Traditional closed waters markers near the mouth of Desire Lake Creek will be in effect for this opening.
2-F-H-006-98 June 19	<p>Designates and establishes Special Harvest Areas (SHA) for the Cook Inlet Aquaculture Association (CIAA) in the Paint River, Bruin Bay, and China Poot Subdistricts of the Lower Cook Inlet (LCI) management area. It also designates and establishes an English Bay SHA for the Port Graham Hatchery Corporation (PGHC) in the English Bay Section of Port Graham Subdistrict, located in the Southern District of the LCI management area. This emergency order closes the Kirschner and Bruin Lakes SHA's to the common property salmon seine fishery, while concurrently opening waters of the Kirschner Lake, Bruin Lake, and Paint River SHA's in the Kamishak Bay District, and the China Poot and Hazel Lake SHA's in the Southern District, to the harvest of salmon seven days per week by authorized agents of CIAA effective at 6:00 a.m. Monday, June 22, 1998, until further notice. This emergency order also opens the English Bay SHA to the harvest of salmon seven days per week by authorized agents of PGHC effective at 6:00 a.m. Monday, June 22, 1998, until further notice.</p> <p>This emergency order also opens portions of the China Poot, Tutka Bay, and Halibut Cove Subdistricts, all within the Southern District, to commercial salmon seining five days per week, from Monday 6:00 a.m. until Saturday 6:00 a.m., effective 6:00 a.m. Monday, June 22, 1998, until further notice. In the China Poot Subdistrict, commercial seining shall be allowed five days per week only in those waters outside (offshore) of a line beginning at a marker on the mainland near the "Godfrey Cabin" west of Neptune Bay at approximately 59° 32' 38" N. latitude, 151° 25' 42" W. longitude, then to Lancashire Rock, then to the navigational light on Gull Island, then to Moosehead Point, effective June 22. In the Halibut Cove Subdistrict, seining shall be allowed only in waters outside of Halibut Cove Lagoon beginning June 22 on a five days per week basis. In the Tutka Bay Subdistrict, commercial seining is restricted to those waters seaward of a line extending from the "rock quarry" on the north side of the bay at approximately 59° 30' 14" N. latitude, 151° 28' 14" W. longitude, to the Tutka Bay Lodge on the south side of the bay at approximately 59° 28' 31" N. latitude, 151° 28' 55" W. longitude, five days per week effective 6:00 a.m. Monday, June 22, 1998.</p>
2-F-H-007-98 June 26	Designates and establishes a Special Harvest Area (SHA) for the Cook Inlet Aquaculture Association (CIAA) in Tutka Bay Subdistrict within the Southern District of Lower Cook Inlet. This emergency order also designates and establishes a SHA for the Port Graham Hatchery Corporation (PGHC) in the Port Graham Subdistrict within the Southern District of Lower Cook Inlet.

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Table 8. (page 3 of 5)

Number/ Issue Date	DESCRIPTION
2-F-H-007-98 June 26 (continued)	<p>In addition, this emergency order opens the Tutka Bay Special Harvest Area to the harvest and sale of salmon seven days per week by authorized agents of CIAA, effective at 6:00 a.m. Monday, June 29, 1998, until further notice. Revenue obtained from the sale of these fish will be used for recovery of operational costs associated with the Tutka Lagoon Hatchery salmon enhancement programs in Lower Cook Inlet.</p> <p>The commercial purse seine fishery in the Tutka Bay Subdistrict is currently restricted to those waters seaward of a line extending from the "rock quarry" on the north side of Tutka Bay at approximately 59° 30' 14" N. latitude, 151° 28' 14" W. longitude, to the Tutka Bay Lodge on the south side of the bay at approximately 59° 28' 31" N. latitude, 151° 28' 55" W. longitude, on a five days per week basis (see LCI E.O. # 2-F-H-006-98). Waters of Tutka Bay between the HEA powerlines and the above described line remain closed to all seine fishing.</p>
2-F-H-008-98 June 30	<p>Closes McNeil River Subdistrict of the Kamishak Bay District to commercial salmon fishing with purse seines, effective at 6:00 a.m. Thursday, July 2, 1998, until further notice.</p>
2-F-H-009-98 July 2	<p>Extends fishing time for commercial set gillnets in Halibut Cove Subdistrict of the Southern District to five days per week, from 6:00 a.m. Monday until 6:00 a.m. Saturday, effective at 6:00 a.m. Monday, July 6, 1998, until further notice.</p>
2-F-H-010-98 July 9	<p>Closes waters of the China Poot and Hazel Lakes Special Harvest Areas (see LCI E.O. #2-F-H-006-98) in the Southern District to salmon hatchery cost recovery harvest by Cook Inlet Aquaculture Association effective at 12:00 noon Thursday, July 9, 1998. In addition, this emergency order opens waters of China Poot Subdistrict, including both the China Poot and Hazel Lake Sections, to commercial salmon seining west (or offshore) of the regulatory markers located near the HEA power lines in China Poot Bay on a seven-day-per-week basis, effective at 6:00 a.m. Friday, July 10, until further notice. Waters of China Poot Bay east (or inshore) of these markers will open to commercial seining five days per week, from Monday 6:00 a.m. until Saturday 6:00 a.m., also effective at 6:00 a.m. Friday, July 10, until further notice. The regulatory markers designating the Dungeness crab sanctuary in the north arm of China Poot Bay are still in effect for these openings. At China Poot Creek, the regulatory markers near the creek mouth will be in effect during the Monday through Saturday opening. At Neptune Bay, no markers will be in effect and fishing is allowed up to the Wosnesenski River mouth.</p>

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Table 8. (page 4 of 5)

Number/ Issue Date	DESCRIPTION
2-F-H-011-98 July 17	<p>Closes the Tutka Bay Special Harvest Area (see LCI E.O. # 2-F-H-007-98), except for waters of Tutka Lagoon, to the harvest of salmon by authorized agents of Cook Inlet Aquaculture Association (CIAA), effective at 6:00 a.m. Sunday, July 19, 1998, until further notice. Concurrently, waters of Tutka Bay Subdistrict, excluding Tutka Lagoon, will open to commercial salmon seining seven days per week until further notice. Waters of Tutka Lagoon will remain open to hatchery fishing and closed to commercial seining.</p>
2-F-H-012-98 July 23	<p>Closes the Kirschner and Bruin Lakes Special Harvest Areas (SHA's; see LCI Emergency Order #2-F-H-006-98) to the harvest of salmon by authorized agents of Cook Inlet Aquaculture Association (CIAA) effective at 6:00 a.m., Friday, July 24, 1998, until further notice. In addition, this emergency order opens waters of the Kirschner Lake Section (statistical reporting area 249-75) of Bruin Bay Subdistrict to commercial salmon seining seven days per week, effective at 6:00 a.m. Friday, July 24, 1998, until further notice. Concurrently, waters of the Bruin Lake SHA will open to commercial salmon seining on the same weekly schedule as is currently in place for the Bruin Bay Section (statistical reporting area 249-70) of Bruin Bay Subdistrict, which is two 48-hour periods per week, from Monday 6:00 a.m. until Wednesday 6:00 a.m. and from Thursday 6:00 a.m. until Saturday 6:00 a.m., until further notice.</p> <p>This emergency order also closes waters of Port Graham Subdistrict, including the English Bay Section, to commercial salmon set gillnetting effective at 6:00 a.m. Saturday, July 25, 1998, until further notice</p>
2-F-H-013-98 July 23	<p>Opens waters of Tutka Lagoon to commercial salmon seining for six hours, from 12:00 noon Friday, July 24, 1998, until 6:00 p.m. Friday, July 24, 1998.</p>
2-F-H-014-98 July 27	<p>Opens waters of Port Dick Subdistrict in the Outer District, except those of the Port Dick North Section, to commercial salmon seining for two 48-hour periods per week, from Monday 6:00 a.m. until Wednesday 6:00 a.m. and from Thursday 6:00 a.m. until Saturday 6:00 a.m., effective at 12:00 noon Tuesday, July 28, 1998, until further notice. Waters open to fishing include statistical reporting areas 232-06, -07, and -08. Waters of the North Section (232-09) of Port Dick Subdistrict remain closed to fishing.</p> <p>In addition, this emergency order opens waters of Port Chatham Subdistrict in the Outer District to commercial salmon seining on the same schedule of two 48-hour periods per week, also effective at 12:00 noon Tuesday, July 28, 1998, until further notice.</p>

-continued-

Table 8. (page 5 of 5)

Number/ Issue Date	DESCRIPTION
2-F-H-015-98 July 31	<p>Opens those waters of Nuka Island Subdistrict in the Outer District south of the latitude of the southern entrance to Westdahl Cove at approximately 59° 19' 00" N. latitude and east of the longitude of the entrance to Tonsina Bay at approximately 150° 52' 52" W. longitude to commercial salmon seining on two 48-hour weekly fishing periods, from Monday 6:00 a.m. until Wednesday 6:00 a.m. and from Thursday 6:00 a.m. until Saturday 6:00 a.m., effective at 6:00 a.m. Monday, August 3, 1998, until further notice. The regulatory markers near the mouth of South Nuka Island Creek WILL BE in effect for this opening.</p>
2-F-H-016-98 August 4	<p>Opens waters of Rocky Bay Subdistrict in the Outer District to commercial salmon seining five days per week, from Monday 6:00 a.m. until Saturday 6:00 a.m., effective at 6:00 a.m. Wednesday, August 5, 1998, until further notice. This emergency order also opens all waters of Port Dick Subdistrict, including the North Section, to commercial salmon seining on the same schedule of five days per week, also effective at 6:00 a.m. Wednesday, August 5, 1998, until further notice.</p> <p>In addition, this emergency order extends commercial seine fishing time in waters of Nuka Island Subdistrict in the Outer District south of the latitude of the southern entrance to Westdahl Cove at approximately 59° 19' 00" N. latitude and east of the longitude of the entrance to Tonsina Bay at approximately 150° 52' 52" W. longitude on the same schedule of five days per week, effective at 6:00 a.m. Wednesday, August 5, 1998, until further notice. Additionally, the regulatory markers near the mouth of South Nuka Island Creek WILL NOT BE in effect for this opening.</p>
2-F-H-017-98 August 6	<p>Opens waters of Tutka Lagoon in Tutka Bay Subdistrict of the Southern District to commercial salmon seining seven days per week, effective at 6:00 a.m. Friday, August 7, 1998, until further notice. Waters of Tutka Bay Subidistrict outside of Tutka Lagoon were previously opened on a continuous basis beginning July 19 (see LCI Emergency Order #2-F-H-011-98).</p>
2-F-H-018-98 August 11	<p>Opens the Port Graham Special Harvest Area (see LCI Emergency Order #2-F-H-007-98) to the harvest of salmon seven days per week by authorized agents of Port Graham Hatchery Corporation (PGHC), effective at 8:00 a.m. Tuesday, August 11, 1998, until further notice. Pink salmon harvested during this opening will be utilized for hatchery brood stock.</p>
2-F-H-019-98 August 25	<p>Closes the Southern District (Kachemak Bay) personal use set gillnet fishery for coho salmon, effective at 6:00 a.m. Saturday, August 29, 1998, for the remainder of the season.</p>

Table 9. Total return of adult pink salmon to the Tutka Bay Hatchery in the Southern District of Lower Cook Inlet, 1998.

<u>COMMERCIAL HARVEST</u>	
Tutka Bay/Lagoon:	
Purse Seine	492,504
Set Gillnet	12,255 ^a
Hatchery Cost Recovery	<u>792,542</u>
TUTKA COMMERCIAL HARVEST	1,297,301
<u>SPORT HARVEST</u>	
TOTAL SPORT HARVEST (Tutka Bay and Lagoon)	2,000^b
<u>ESCAPEMENT</u>	
Tutka Creek and Channel	17,473
Tutka Hatchery Brood Stock	<u>153,580</u>
TOTAL ESCAPEMENT	171,053
TOTAL RETURN	1,470,354

^a Based primarily on run timing, all of the set gillnet pink salmon catch in the Tutka Bay Subdistrict was apportioned to the Tutka Hatchery return.

^b Figure represents average estimated sport catch of pinks in Tutka Bay from 1990 – 1997.

Table 10. Commercial purse seine catch of sac roe herring in short tons and average roe recovery in percent, by statistical area and date, Kamishak Bay District, Lower Cook Inlet, 1998.

Date	Statistical Area	Nearest Location	No. of Permits	No. of Landings	Short Tons	Roe %
4/21	249-75	Contact Point	12	13	160	8.35
4/22	249-40	Douglas Reef	^a	^a	1	10.00
	249-75	Contact Point	11	13	136	8.48
5/14	249-90	Dry Bay/Oil Bay	1 ^b	1 ^b	10 ^b	10.20 ^b
5/19	249-90	Dry Bay/Oil Bay	1 ^b	1 ^b	23 ^b	^c
KAMISHAK BAY DISTRICT TOTALS			20	29	331	8.48

^a To comply with AS 16.05.815 CONFIDENTIAL NATURE OF CERTAIN REPORTS AND RECORDS, effort data has been masked where fewer than four vessels fished in a given area.

^b Figures from 5/14 and 5/19 are for the landings from ADF&G's post-season sampling and test fishing program.

^c Sold as bait.

Table 11. Total biomass estimates and commercial catch of Pacific herring (*Clupea pallasii*) in short tons by age class, Kamishak Bay District, Lower Cook Inlet, 1998, and 1999 forecast^a.

Age	1998 Est. Spawning Biomass	Percent by Weight	1998 Commercial Harvest	Percent by Weight	1998 Total Biomass	Percent by Weight	1999 Forecast Biomass	Percent by Weight
1								
2								
3	270.2	3.64	9.0	2.71	279.16	3.60	643.9	6.78
4	975.4	13.14	40.6	12.26	1015.94	13.10	524.2	5.52
5	2,595.1	34.96	134.3	40.60	2729.39	35.20	1,700.0	17.90
6	1,489.8	20.07	60.6	18.32	1550.40	20.00	3,574.7	37.64
7	440.2	5.93	17.4	5.26	457.58	5.90	1,225.1	12.90
8	649.5	8.75	17.5	5.29	667.01	8.60	336.2	3.54
9	515.9	6.95	11.0	3.32	526.88	6.80	340.9	3.59
10	406.0	5.47	36.0	10.87	442.00	5.70	229.8	2.42
11	27.5	0.37	3.4	1.03	30.87	0.40	820.5	8.64
12	30.4	0.41	0.8	0.24	31.23	0.40	82.6	0.87
13+	23.0	0.31	0.3	0.09	23.3	0.30	19.0	0.20
TOTALS	7,423.0	100.00	330.8	99.99	7,753.8	100.00	9,497.0	100.00

^a Absence of reliable aerial survey data in 1998 dictated use of the ASA model's "hindcast" estimate to derive the 1998 spawning biomass (see text). Additionally, because of the ASA Model's inability to produce a point estimate with certainty due to recent years' limited aerial survey data, the spawning, total run, and forecast biomass estimates presented here represent the midpoint of possible biomass estimates.

Table 12. Proposed regulatory changes for the Lower Cook Inlet commercial, subsistence, and personal use salmon and herring fisheries, and resultant actions taken, at the Alaska Board of Fisheries meeting held in Homer, November, 1998^a.

PROPOSAL NUMBER	PROPOSED BY	DESCRIPTION	BOARD ACTION	BOARD VOTE
35	Seldovia Advisory Committee/ Jere Murray	5 AAC 01.566. Allow additional area open to fishing in the Seldovia area subsistence salmon set gillnet fishery.	Opposed (see text)	0 - 7
36	Fred Elvsaas/ Sedovia Village Tribe	5 AAC 01.560. Allow additional area open to fishing in the Seldovia area subsistence salmon set gillnet fishery.	No Action (see text)	
37	Jere Murray	5 AAC 01.570. Require a permit holder for the Seldovia area subsistence salmon fishery to be present at the net site when deploying the gear, removing the gear, or removing fish from the gear.	Adopted	6 - 1
39	ADF&G	5 AAC 77.549. Reduce the season length of the Southern District (Kachemak Bay) fall coho salmon personal use set gillnet fishery by 18 days (amended by BOF to reduce the fishery's GHF to 1-2000 cohos but leave season length status quo).	Adopted	7 - 0
43	South Peninsula Sportman Association	5 AAC 21.310. Delay the opening of the commercial set gillnet fishery in Halibut Cove Subdistrict from the present starting date of the first Monday in June to June 10.	Opposed	0 - 6 - 1
44	Karl Pulliam	5 AAC 21.331. Restrict the maximum mesh size in the commercial set gillnet fishery in Halibut Cove and Seldovia Bay Subdistricts to 5¼" for the entire season (amended by BOF to restrict maximum size to 6" for entire Southern District).	Adopted	7 - 0
45	Wesley Humbyrd	5 AAC 21.330. Allow drift gillnetting in the commercial salmon fishery of the Eastern District.	Opposed	0 - 7
46	Alaska Sportfishing Association	5 AAC 21.376. Prohibit the stocking of Spring Creek with juvenile sockeye salmon and prohibit commercial fishing within waters of Resurrection Bay.	Withdrawn by proposer	

- continued -

Table 12. (continued)

PROPOSAL NUMBER	PROPOSED BY	DESCRIPTION	BOARD ACTION	BOARD VOTE
47	William Jones	5 AAC 77.531. Allow dip nets as legal gear in the personal use herring fishery of Cook Inlet.	Adopted	7 - 0
48	Alaska Herring Seiners Association	5 AAC 27.450. Establish a standard method of measure for catch weight and roe percentage for Cook Inlet sac roe herring fisheries.	Adopted	7 - 0

^a Proposed regulatory changes adopted by the Alaska Board of Fisheries become effective in April, 1999, upon approval of language by the Alaska Dept. of Law and subsequent signing by the Lt. Governor.

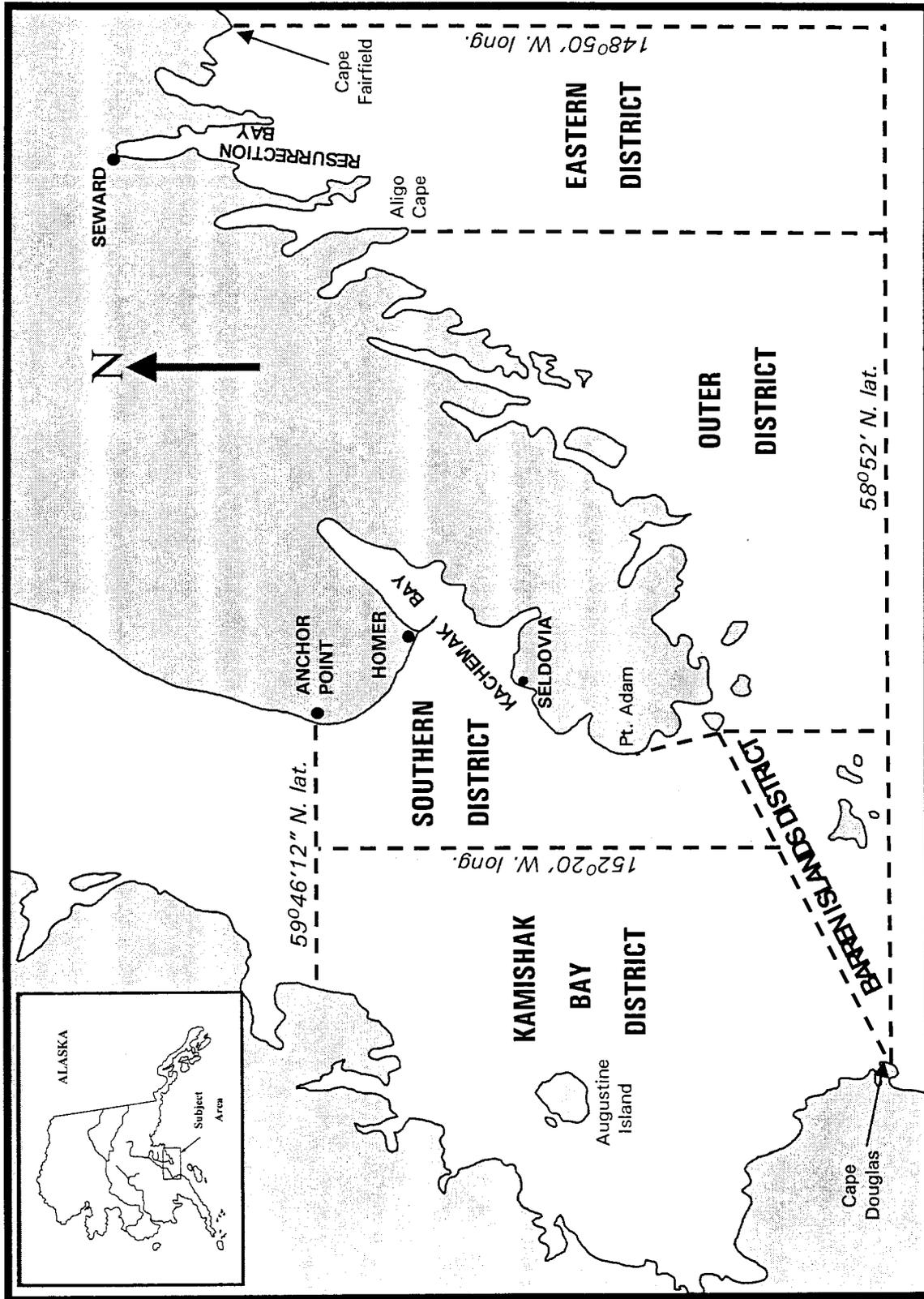


Figure 1. Lower Cook Inlet salmon and herring management area (not to scale).

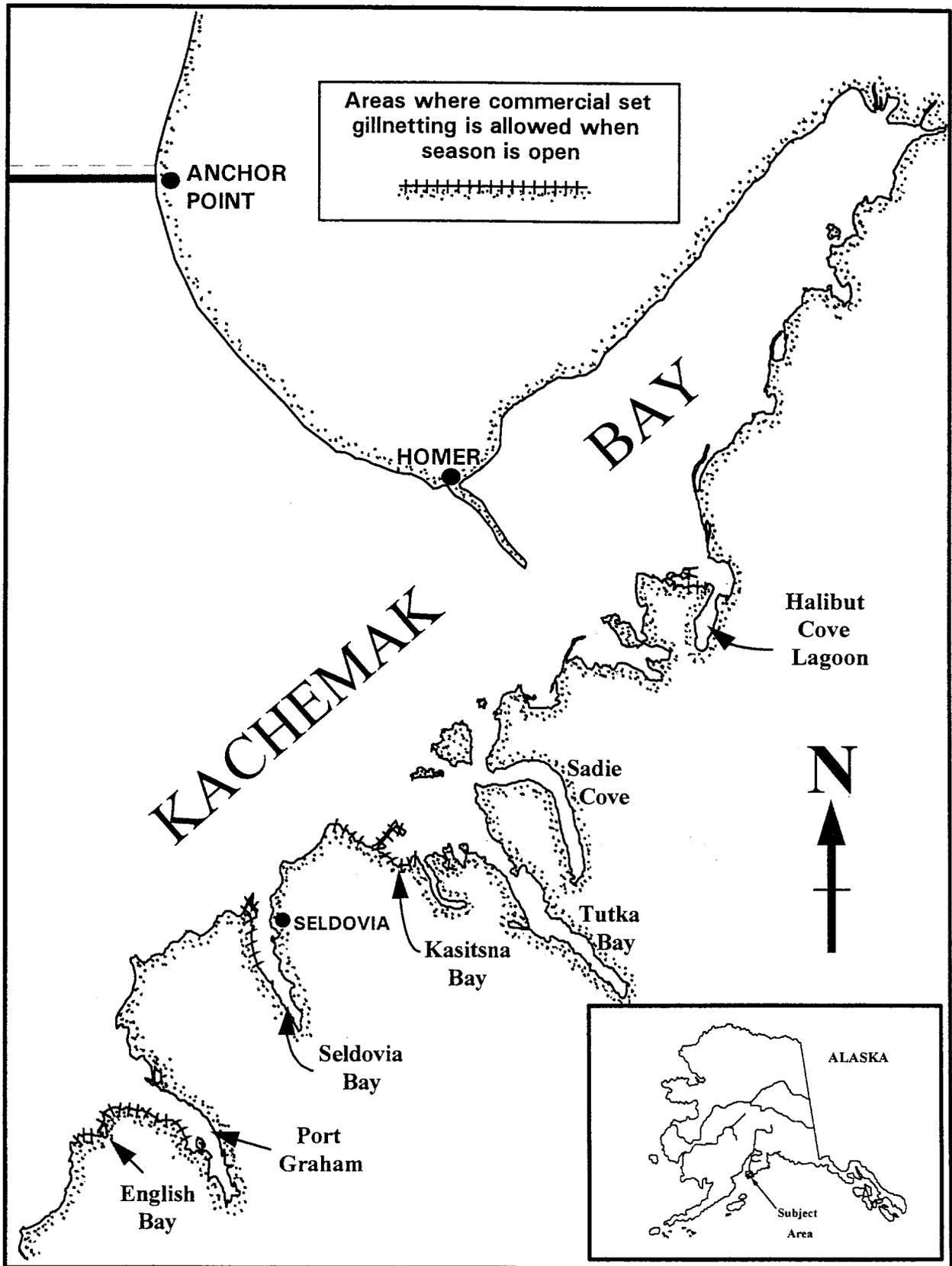


Figure 2. Commercial set gillnet locations in the Southern District of Lower Cook Inlet.

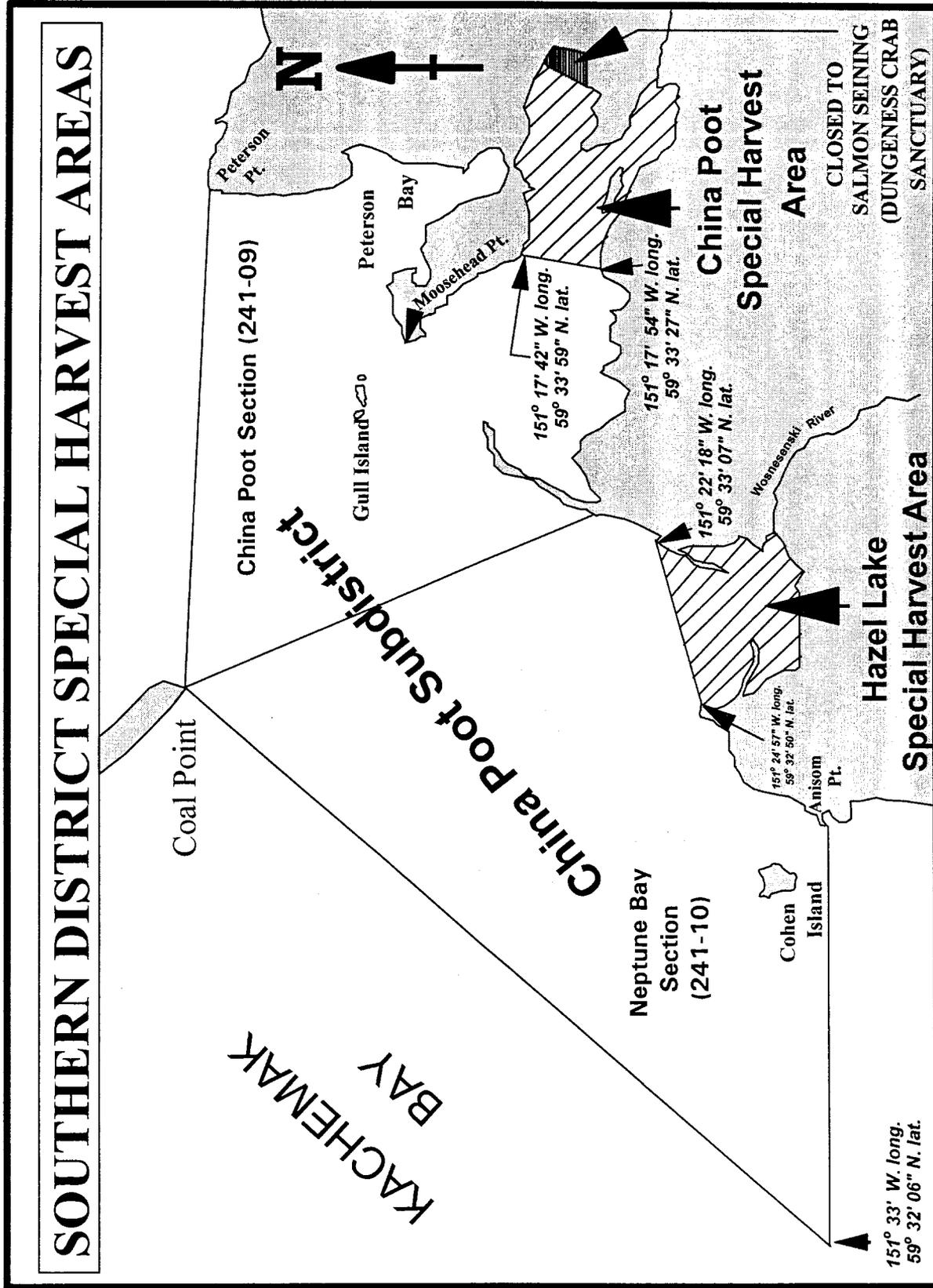


Figure 3. China Poot and Hazel Lake Special Harvest Areas for salmon hatchery cost recovery in the Southern District of Lower Cook Inlet.

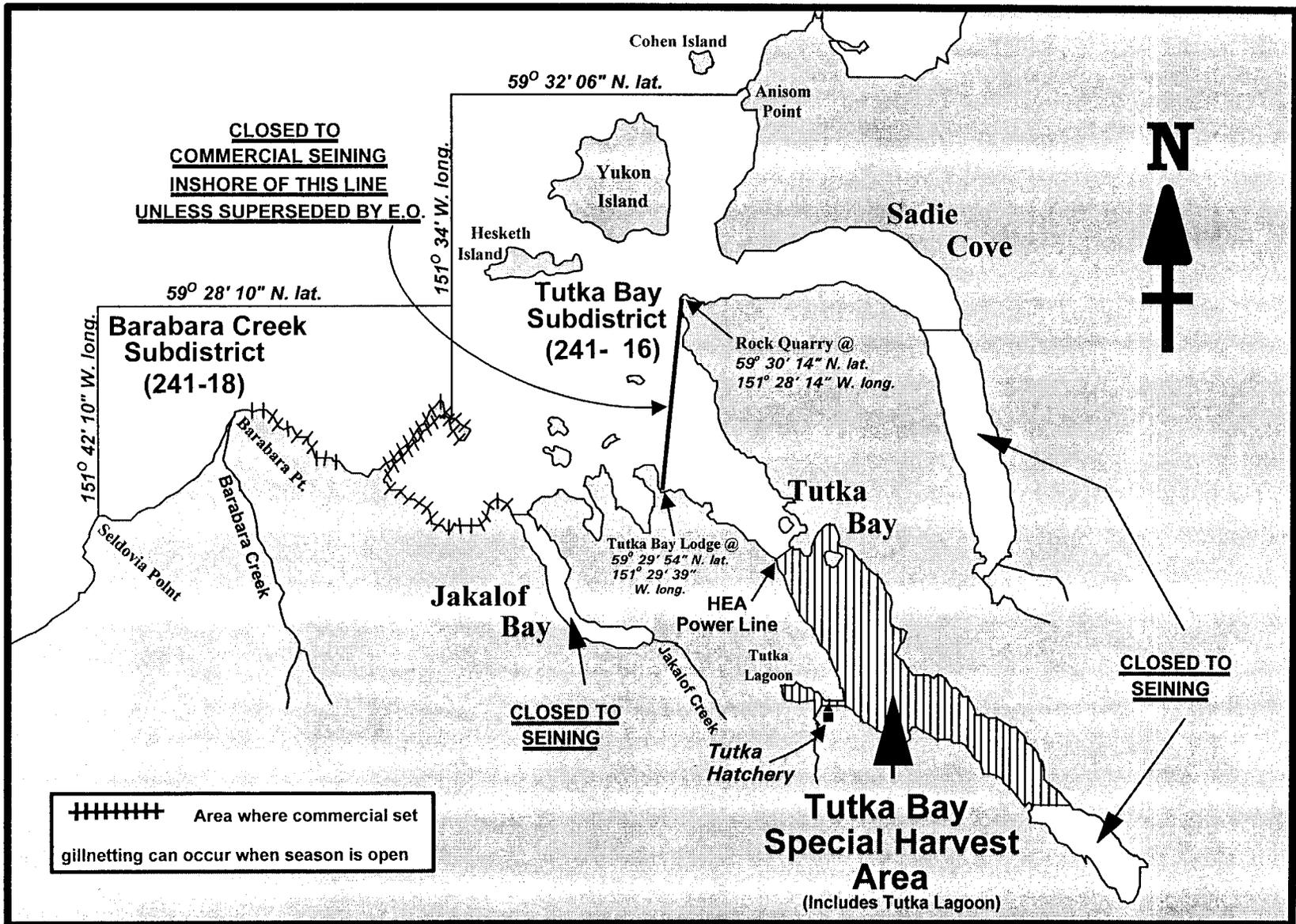


Figure 4. Tutka Special Harvest Area for salmon hatchery cost recovery in the Southern District of Lower Cook Inlet.

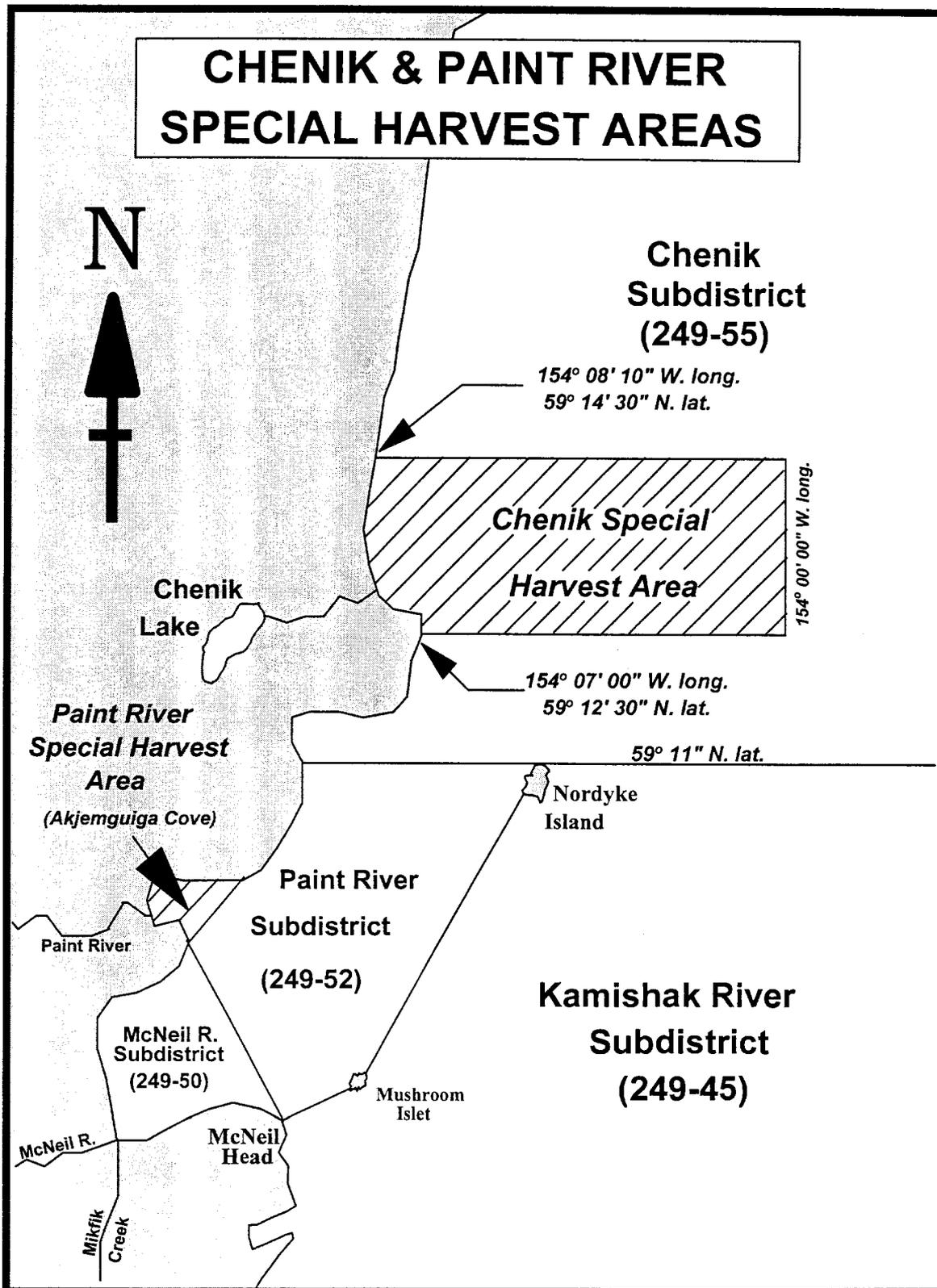


Figure 5. Chenik and Paint River Special Harvest Areas for salmon hatchery cost recovery in the Kamishak Bay District of Lower Cook Inlet.

KIRSCHNER & BRUIN LAKES SPECIAL HARVEST AREAS



Note: Regulations prohibit salmon net fishing in federal waters beyond territorial seas (3 nautical miles).

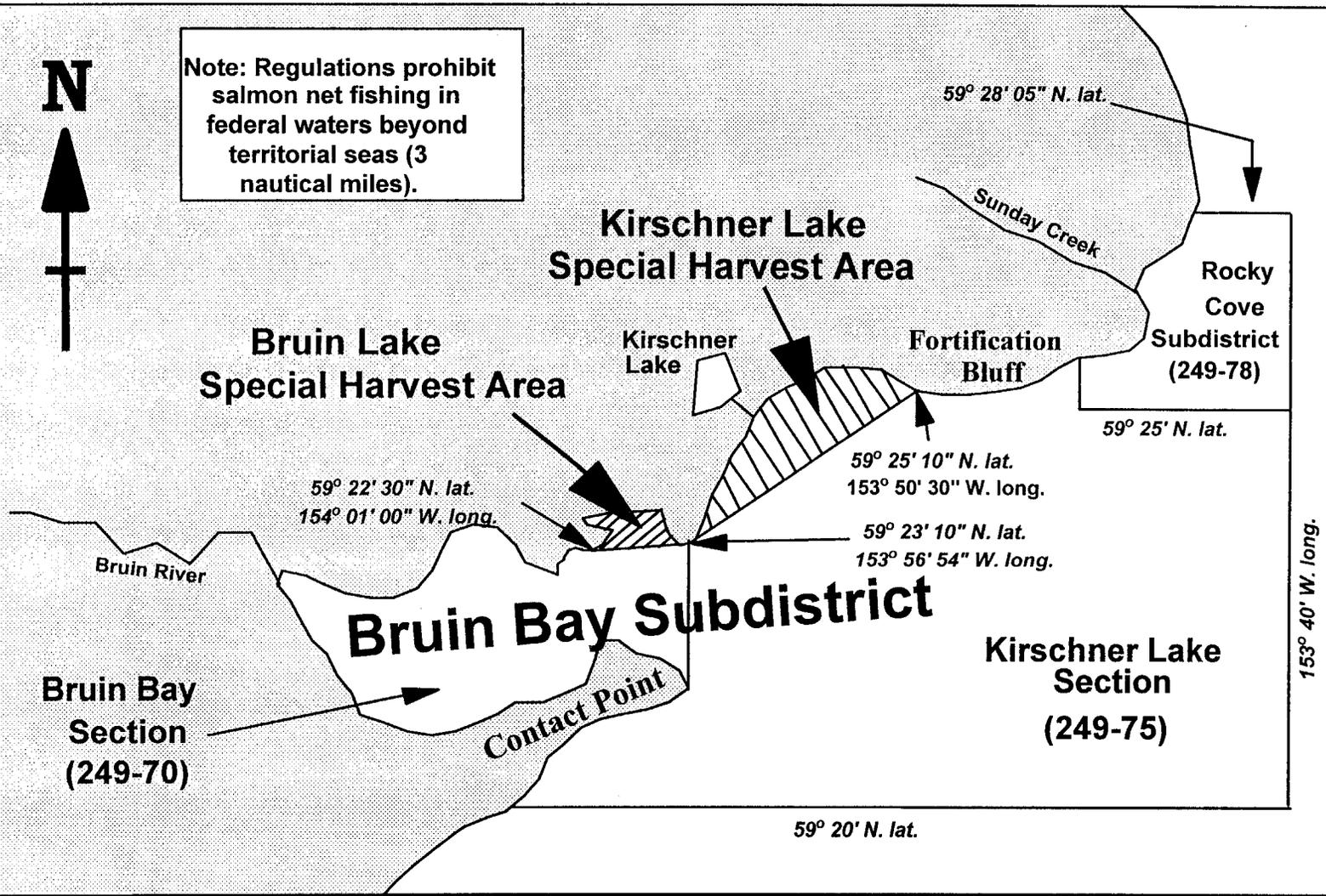


Figure 6. Kirschner and Bruin Lakes Special Harvest Areas for salmon hatchery cost recovery in the Kamishak Bay District of Lower Cook Inlet.

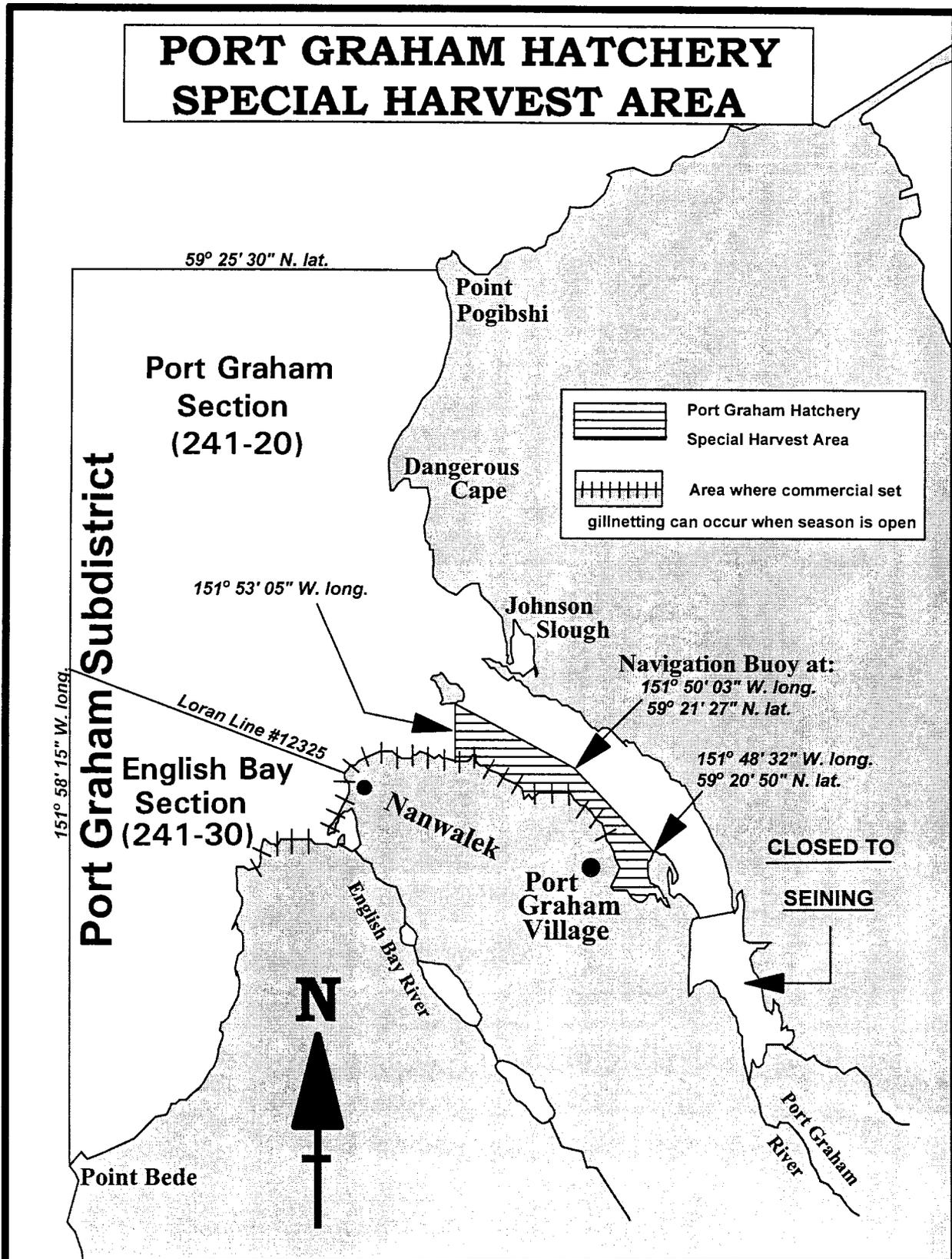


Figure 7. Port Graham Special Harvest Area for salmon hatchery cost recovery in the Southern District of Lower Cook Inlet.

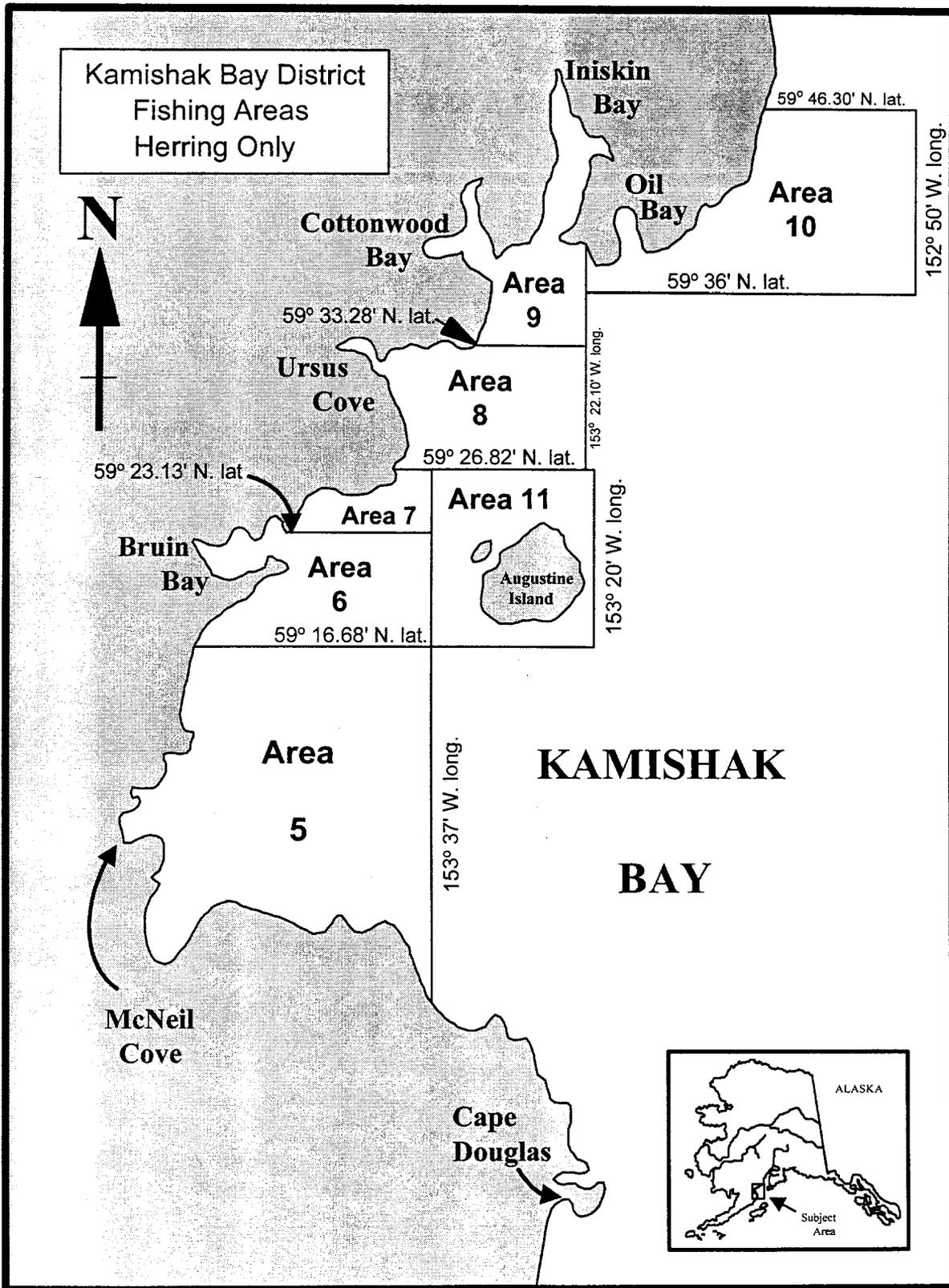


Figure 8. Commercial herring fishing areas in the Kamishak Bay District of Lower Cook Inlet.

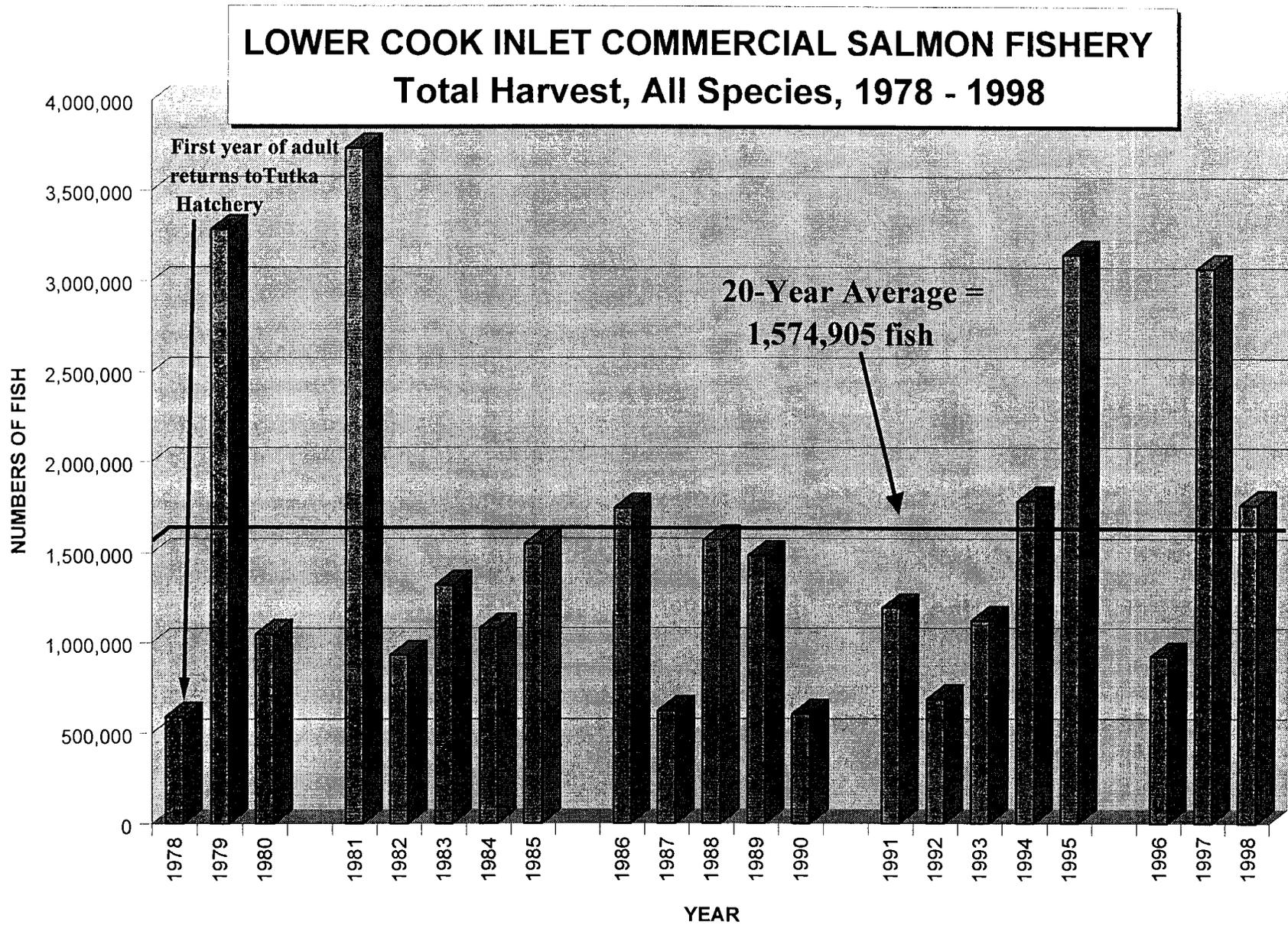


Figure 9. Total commercial salmon catch, Lower Cook Inlet, 1978 - 1998.

**LOWER COOK INLET COMMERCIAL SALMON FISHERY
1978 - 1998 Sockeye Harvest**

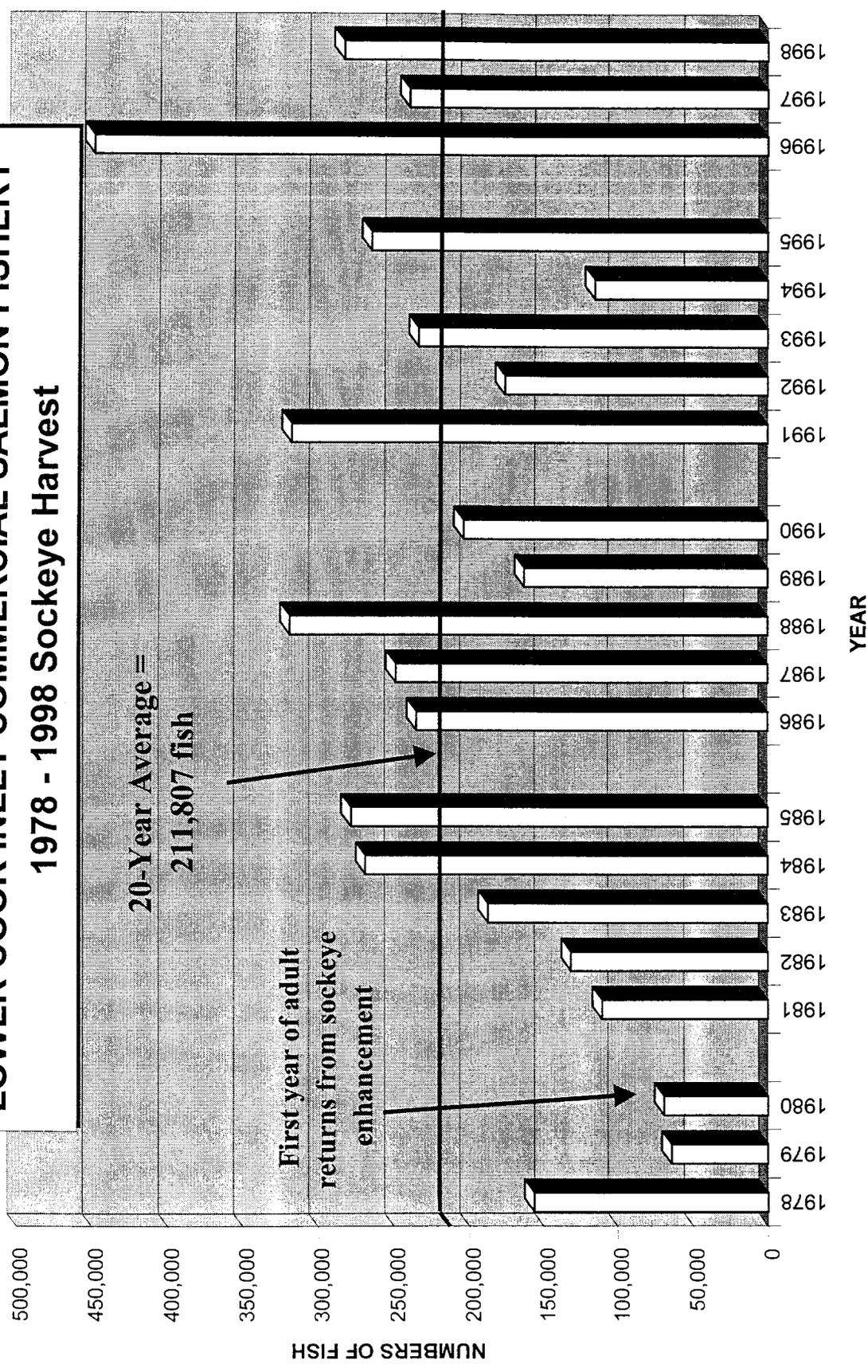


Figure 10. Commercial sockeye salmon catch, Lower Cook Inlet, 1978 - 1998.

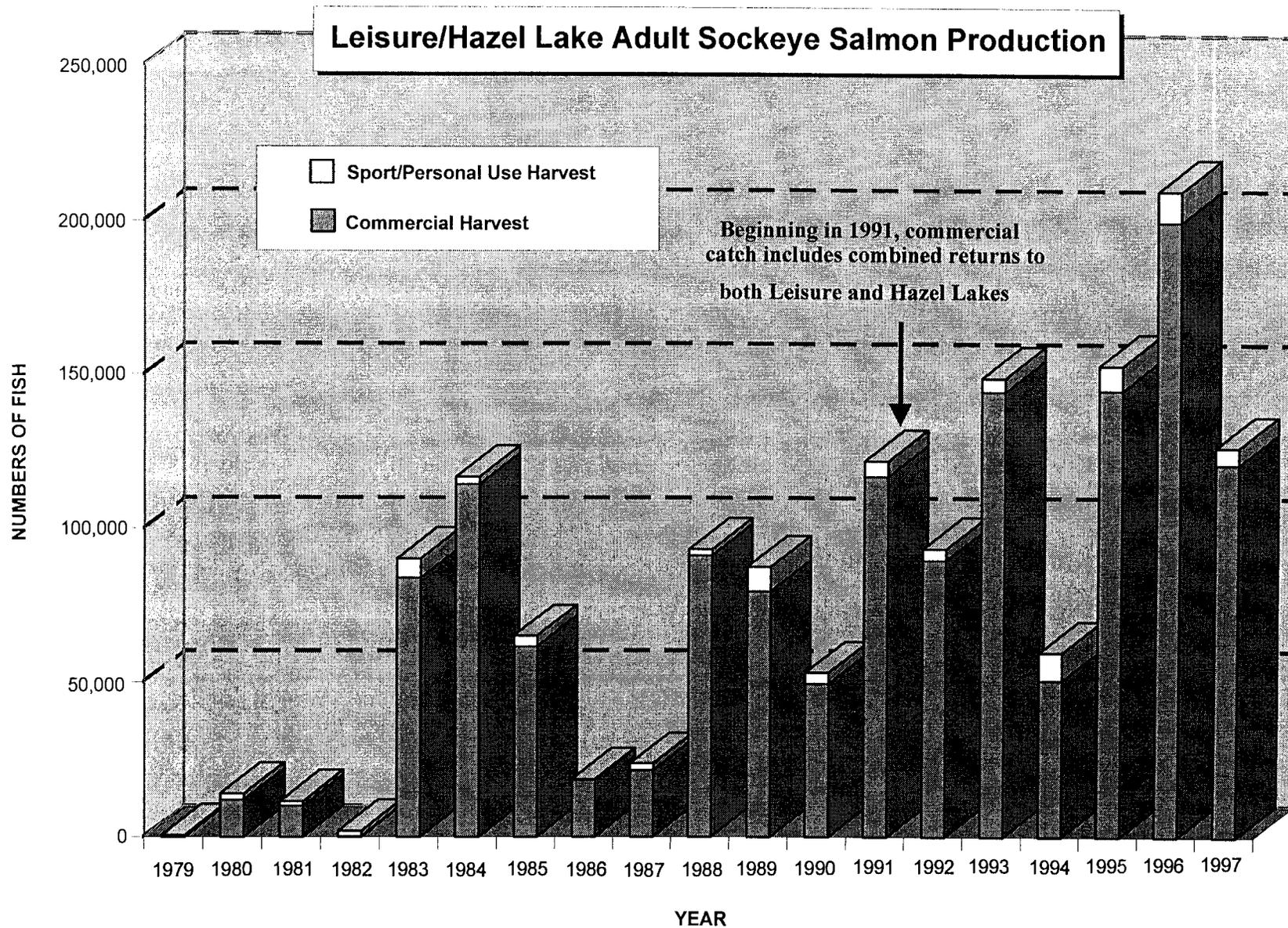


Figure 11. Sockeye salmon returns to Leisure and Hazel Lakes in the Southern District of Lower Cook Inlet, 1980 - 1997.

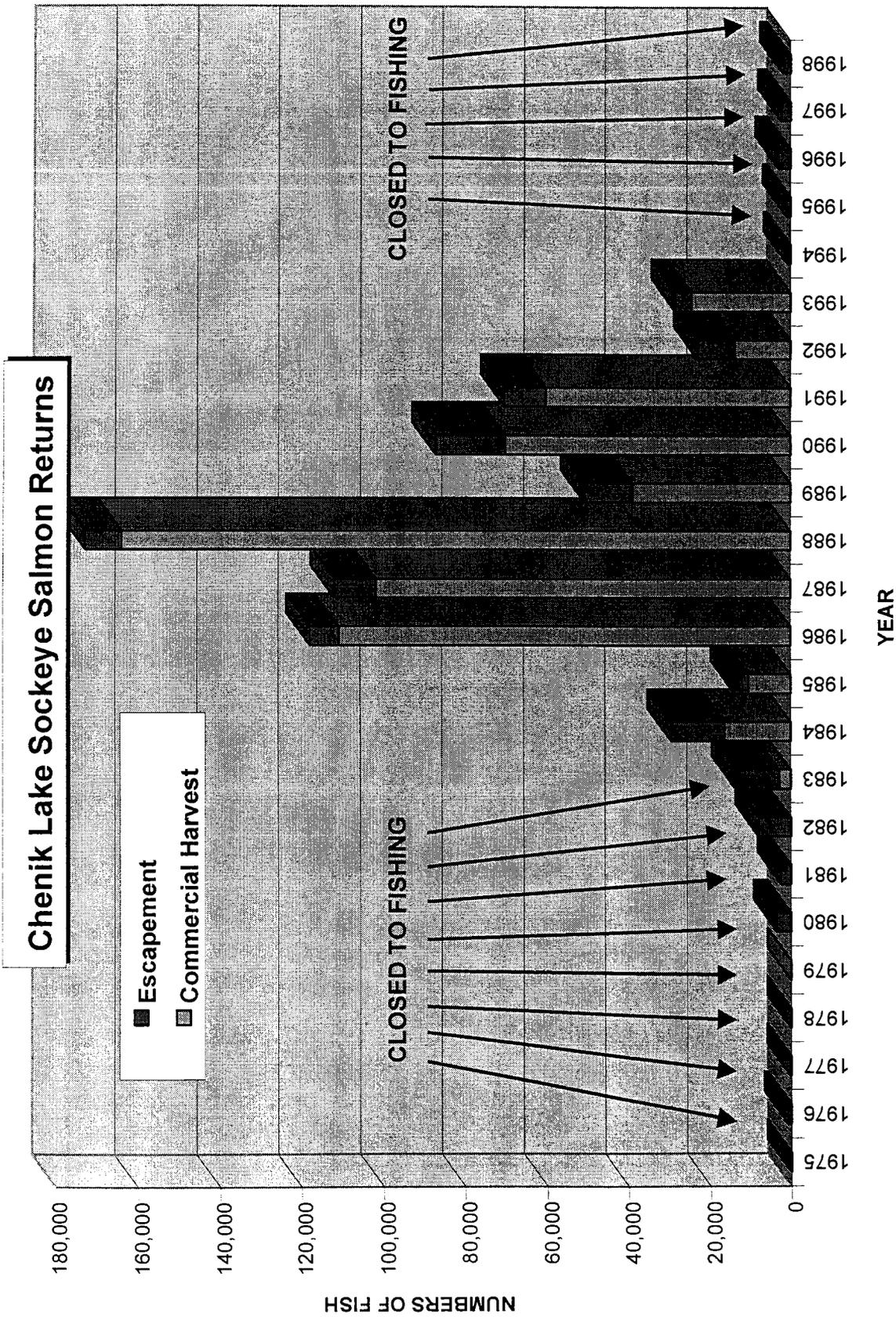


Figure 12. Sockeye salmon returns to Chenik Lake in the Kamishak Bay District of Lower Cook Inlet, 1975 - 1998.

**LOWER COOK INLET COMMERCIAL SALMON FISHERY
1978 - 1998 Pink Harvest**

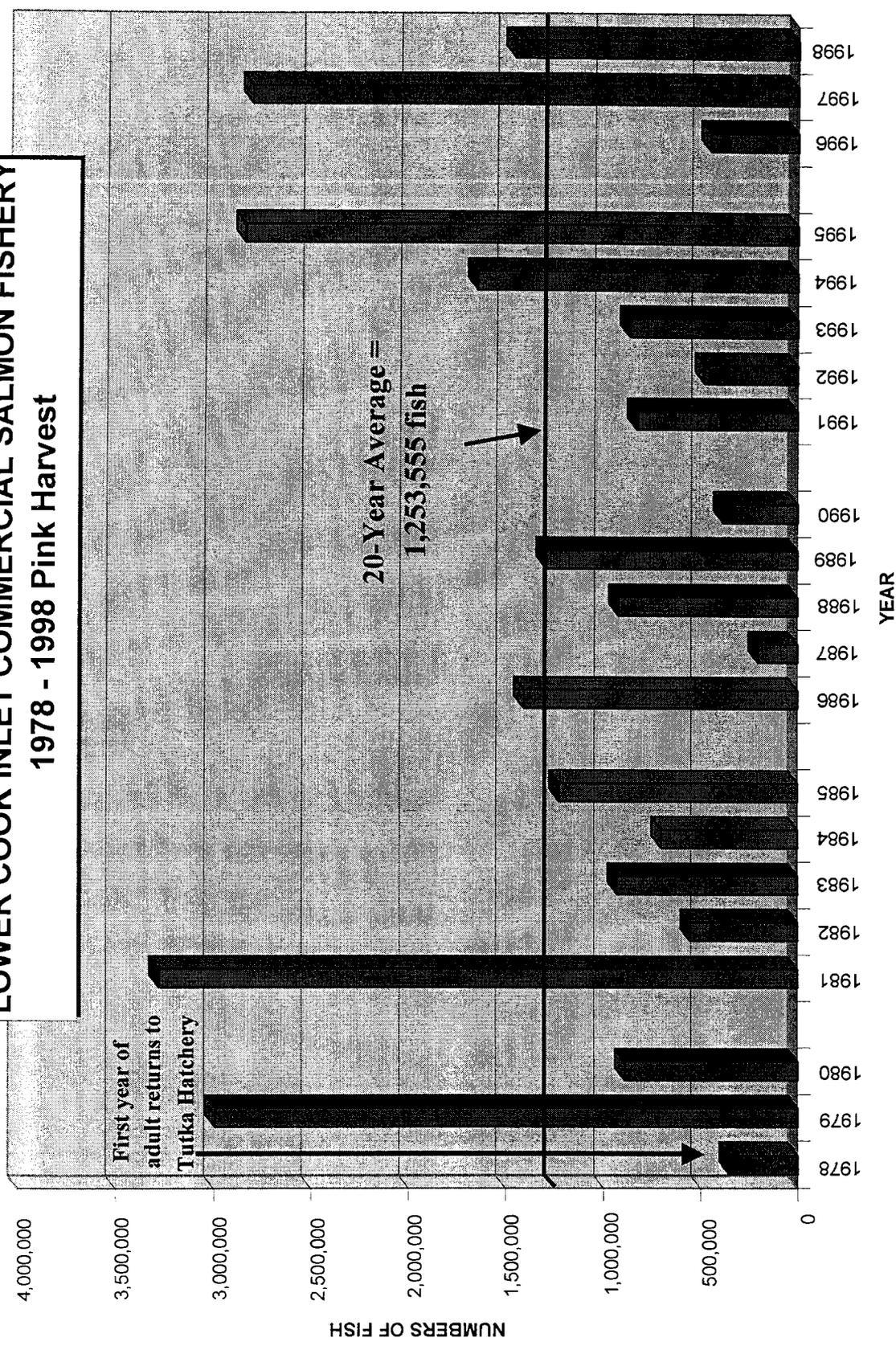


Figure 13. Commercial pink salmon catch, Lower Cook Inlet, 1978 - 1998.

**LOWER COOK INLET COMMERCIAL SALMON FISHERY
1978 - 1998 Chum Harvest**

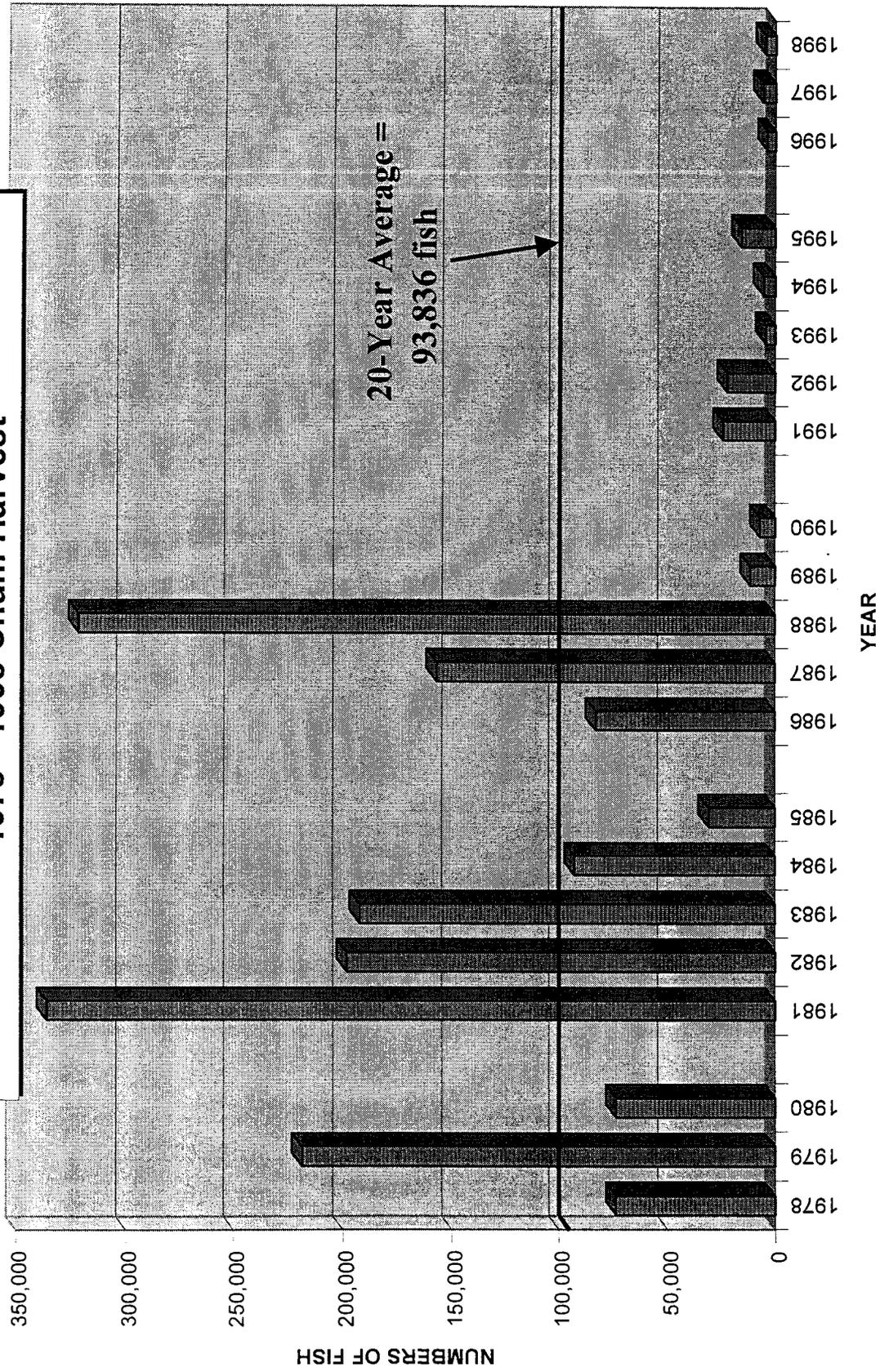


Figure 14. Commercial chum salmon catch, Lower Cook Inlet, 1978 - 1998.

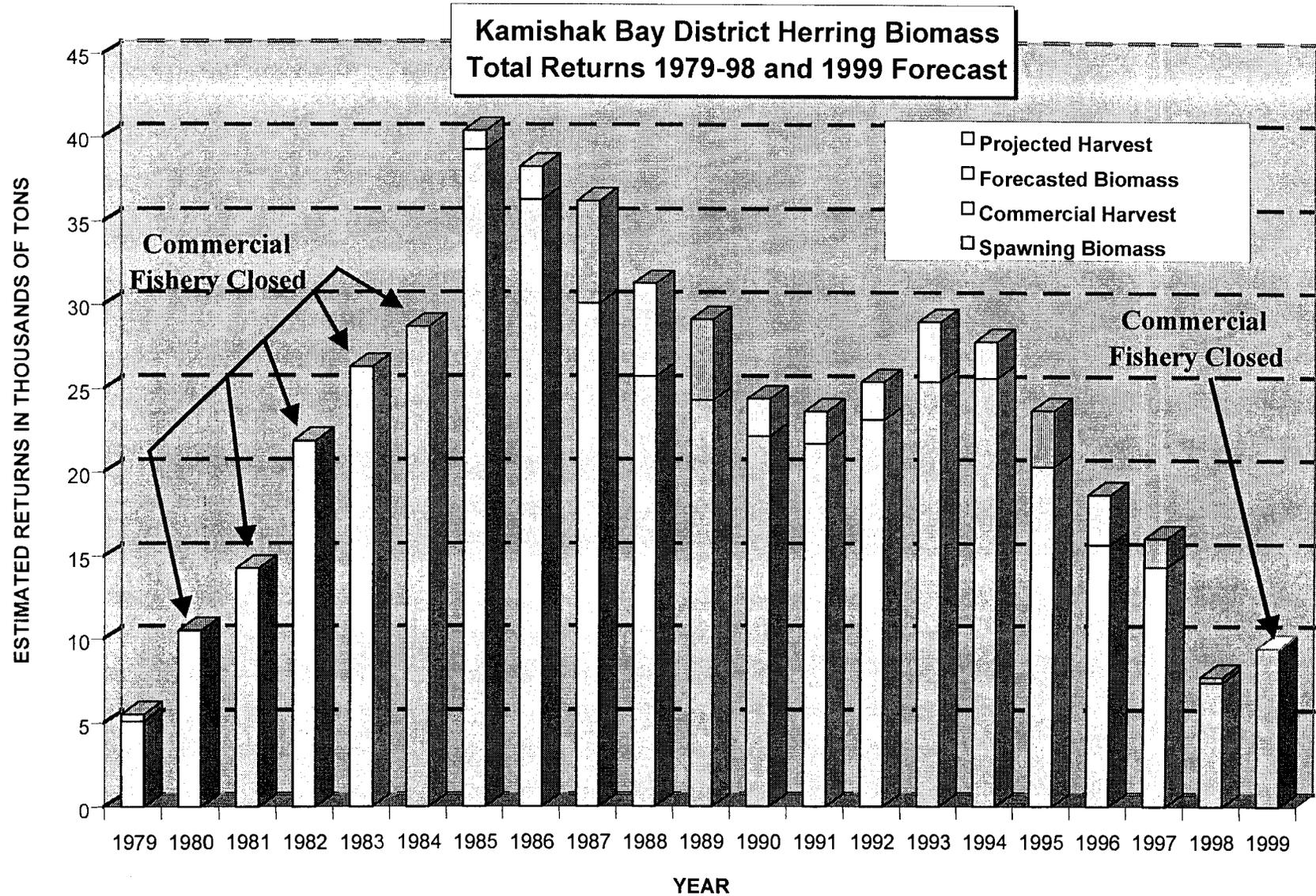


Figure 15. Biomass estimates and commercial harvests of Pacific herring in the sac roe seine fishery, Kamishak Bay, District, Lower Cook Inlet, 1979 - 1998, and 1999 projection.

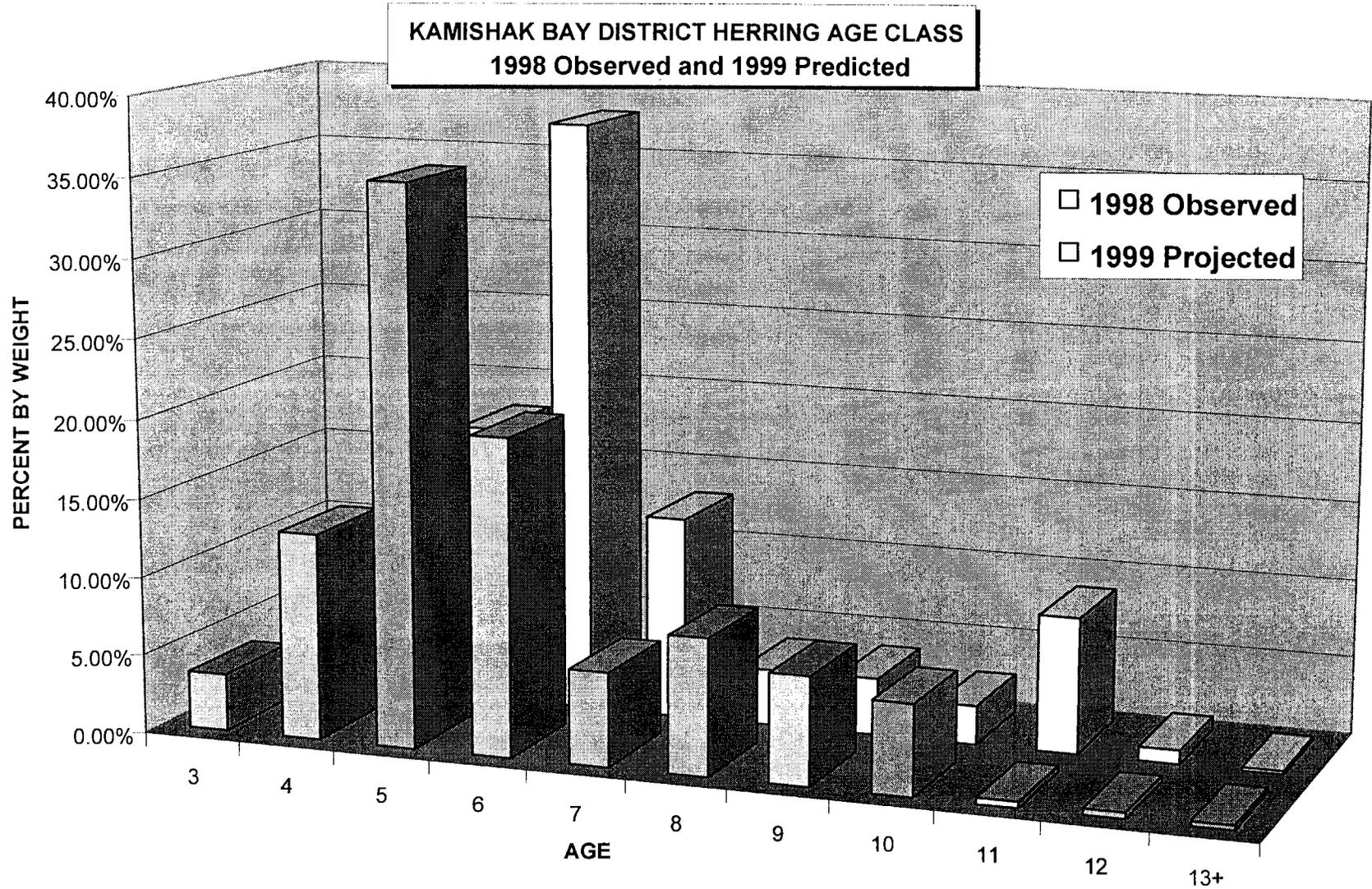


Figure 16. Herring age composition from samples collected in Kamishak Bay District, Lower Cook Inlet, 1998, and 1999 forecast.

Appendix Table 1. Salmon fishing permits issued and fished, by gear type, Lower Cook Inlet, 1978 - 1998^a.

Year	Seines			Actively fished	Set Net Permits fished
	Permanent Permits	Interim Permits	Total Issued		
1978	74	9	83	72	39
1979	75	9	84	75	38
1980	75	9	84	83	40
1981	75	10	85	85	40
1982	77	7	84	69	39
1983	78	5	83	83	24
1984	78	3	81	54	35
1985	80	1	81	51	34
1986	79	0	79	62	34
1987	79	0	79	66	29
1988	79	0	79	71	27
1989	83	0	83	64	23
1990	82	1	83	71	20
1991	82	1	83	68	20
1992	82	1	83	63	21
1993	82	1	83	51	17
1994	82	1	83	32	16
1995	83	1	84	49	23
1996	84	1	85	34	24
1997	84	1	85	23	25
1998	84	1	85	41	24
1978-97 Avg.	79	4	83	64	28
1988-97 Avg.	82	1	83	57	22

^a Data source: Commercial Fisheries Entry Commission and ADF&G fish ticket database.

Appendix Table 2. Exvessel value of the commercial salmon harvest in thousands of dollars by species, Lower Cook Inlet, 1978 - 1998^a.

Year	Chinook	Sockeye	Coho	Pink	Chum	Total
1978	62	1,516	52	370	341	2,341
1979	36	621	68	4,495	1,097	6,317
1980	12	336	64	1,196	298	1,906
1981	18	740	69	5,334	1,346	7,507
1982	28	827	367	406	820	2,448
1983	20	704	57	696	513	1,990
1984	23	1,393	120	635	242	2,413
1985	47	1,637	86	974	78	2,822
1986	21	1,414	132	1,245	201	3,013
1987	27	1,951	118	295	598	2,989
1988	32	3,812	127	2,237	2,548	8,756
1989	33	1,213	59	1,660	39	3,004
1990	29	1,287	28	306	31	1,681
1991 ^b	19	1,115	36	275	48	1,493
1992 ^b	30	1,152	19	212	53	1,466
1993 ^b	27	802	41	287	7	1,164
1994 ^b	18	496	93	745	9	1,361
1995 ^b	48	1,381	62	1,245	24	2,760
1996 ^b	26	2,113	42	100	5	2,286
1997 ^b	23	1,066	36	1,286	10	2,421
1998 ^b	20	1,224	37	712	9	2,002
1978-97 Avg.	29	1,279	84	1,200	415	3,007
1998 % of Total	1.00%	61.14%	1.85%	35.56%	0.45%	100.00%

^a Values obtained by using the formula: (average price per lb.) x (average weight per fish) x (catch) = Exvessel value; average prices are determined only from fish ticket information and may not reflect retroactive or postseason adjustments.

^b Includes hatchery cost recovery.

Appendix Table 3. Average salmon price in dollars per pound by species, Lower Cook Inlet, 1978 - 1998^a.

Year	Chinook	Sockeye	Coho	Pink	Chum
1978	1.09	1.31	0.97	0.30	0.54
1979	1.54	1.53	0.89	0.43	0.60
1980	1.30	0.88	0.85	0.42	0.52
1981	1.35	1.10	0.75	0.44	0.49
1982	1.29	1.05	0.87	0.23	0.46
1983	1.00	0.75	0.70	0.25	0.29
1984	1.29	1.05	0.77	0.26	0.28
1985	1.60	1.25	0.85	0.22	0.31
1986	1.25	1.40	0.85	0.26	0.30
1987	1.25	1.60	1.00	0.42	0.46
1988	1.25	2.50	1.80	0.80	0.84
1989	1.25	1.60	0.70	0.40	0.40
1990	1.35	1.55	0.60	0.30	0.50
1991	1.12	0.83	0.29	0.13	0.27
1992	1.29	1.47	0.43	0.14	0.27
1993	1.02	0.80	0.51	0.12	0.28
1994	0.95	1.06	0.62	0.15	0.25
1995	1.17	1.11	0.47	0.15	0.24
1996	1.33	0.91	0.40	0.08	0.18
1997	1.29	0.93 ^b	0.50 ^b	0.15	0.23
1998	1.45	0.96 ^b	0.36 ^b	0.16	0.27
20-Year Avg.	1.25	1.23	0.74	0.28	0.39
1978-87 Avg.	1.30	1.19	0.85	0.32	0.43
1988-97 Avg.	1.20	1.27	0.63	0.24	0.35

^a Average prices are determined only from fish ticket information and may not reflect retroactive or postseason adjustments.

^b Average price for sockeyes and cohos includes only those fish actually sold and does not include hatchery cost recovery fish that were donated or discarded.

Appendix Table 4. Salmon average weight in pounds per fish by species in the commercial fishery, Lower Cook Inlet, 1978 - 1998^a.

Year	Chinook	Sockeye	Coho	Pink	Chum
1978	32.3	7.4	8.2	3.5	8.6
1979	18.9	6.3	6.2	3.5	8.2
1980	21.7	5.5	5.2	3.2	7.8
1981	12.5	6.1	8.5	3.7	8.1
1982	20.6	6.0	9.0	3.2	9.0
1983	22.8	5.0	7.2	3.0	9.2
1984	28.8	4.7	8.8	3.5	8.9
1985	28.0	4.7	9.8	3.5	8.2
1986	20.6	4.3	8.6	3.4	8.1
1987	18.1	4.9	8.2	3.5	8.3
1988	15.3	4.8	8.9	3.0	9.4
1989	14.1	4.6	7.0	3.1	8.6
1990	13.8	4.1	7.1	2.8	8.9
1991	12.3	4.2	6.6	2.6	7.5
1992	12.3	4.4	7.7	3.2	8.8
1993	12.0	4.4	6.0	2.7	6.2
1994	15.0	4.1	10.2	3.0	6.4
1995	17.8	4.7	7.4	2.9	6.4
1996	16.9	5.2	7.6	2.9	8.0
1997	13.9	4.9	7.8	3.1	7.6
1998	13.1	4.6	8.5	3.1	7.4
20-Year Avg.	18.4	5.0	7.8	3.2	8.1
1978-87 Avg.	22.4	5.5	8.0	3.4	8.4
1988-97 Avg.	14.3	4.5	7.7	2.9	7.8

^a Values obtained from ADF&G fish ticket database.

Appendix Table 5. Commercial salmon catch in numbers of fish by species, Lower Cook Inlet, 1978 - 1998^a.

Year	Chinook	Sockeye	Coho	Pink	Chum	Total
1978	1,747	156,404	6,529	352,561	73,518	590,759
1979	1,238	64,417	12,393	2,990,929	218,490	3,287,467
1980	424	69,442	14,505	889,703	73,492	1,047,566
1981	1,086	110,255	10,776	3,279,183	336,093	3,737,393
1982	1,066	131,320	46,892	551,589	198,185	929,052
1983	873	187,645	11,219	927,607	192,319	1,319,663
1984	714	268,950	16,797	700,622	92,540	1,079,623
1985	1,043	278,694	10,327	1,229,708	30,640	1,550,412
1986	796	234,861	18,852	1,408,293	82,688	1,745,490
1987	1,179	248,848	14,354	201,429	157,018	622,828
1988	1,694	319,008	7,946	921,296	321,911	1,571,855
1989	1,893	163,271	12,089	1,296,926	11,305	1,485,484
1990	1,560	203,895	9,297	383,670	6,951	605,373
1991	1,419	317,947	19,047	828,709	24,232	1,191,354
1992	1,891	176,644	5,902	479,768	22,203	686,408
1993	2,168	233,834	13,477	866,774	4,367	1,120,620
1994	1,231	115,418	14,673	1,647,929	5,469	1,784,720
1995	2,303	265,423	17,709	2,848,464	15,636	3,149,535
1996	1,181	449,685	13,572	451,506	3,764	919,708
1997	1,262	240,184	11,004	2,814,431	5,908	3,072,789
1998	1,071	284,029	16,653	1,457,819	4,647	1,764,219
20-Year Avg.	1,338	211,807	14,368	1,253,555	93,836	1,574,905
1978-87 Avg.	1,017	175,084	16,264	1,253,162	145,498	1,591,025
1988-97 Avg.	1,660	248,531	12,472	1,253,947	42,175	1,558,785
1998 % of Total	0.06%	16.10%	0.94%	82.63%	0.26%	100.00%

^a Data source: ADF&G fish ticket database.

Appendix Table 6. Commercial salmon catch in numbers of fish by species in the Southern District, Lower Cook Inlet, 1978 - 1998^a.

Year	Chinook	Sockeye	Coho	Pink	Chum	Total
1978	1,511	141,088	4,318	251,761	5,525	404,203
1979	1,199	37,342	10,846	986,909	8,221	1,044,517
1980	414	42,929	11,568	478,019	4,605	537,535
1981	1,024	77,880	7,976	1,453,982	20,920	1,561,782
1982	926	43,433	7,165	296,556	18,466	366,546
1983	858	133,671	3,433	690,254	14,281	842,497
1984	661	160,654	3,193	336,595	8,065	509,168
1985	1,007	84,149	4,258	518,889	5,513	613,816
1986	776	36,838	3,095	542,521	5,560	588,790
1987	1,158	89,662	2,163	90,522	5,030	188,535
1988	1,655	105,302	2,987	852,382	7,742	970,068
1989	1,889	98,052	6,667	987,488	3,141	1,097,237
1990	1,546	82,412	1,552	178,087	2,433	266,030
1991	1,399	170,224	9,415	253,962	1,962	436,962
1992	1,852	106,793	1,277	417,021	1,885	528,828
1993	2,162	159,747	4,431	692,794	2,788	861,922
1994	1,230	64,531	1,373	1,589,709	2,631	1,659,474
1995	2,289	164,798	5,161	2,475,312	4,530	2,652,090
1996	1,180	358,163	9,543	444,236	3,511	816,633
1997	1,262	188,413	5,597	2,685,764	4,260	2,885,296
1998	1,070	196,262	2,243	1,315,042	3,956	1,518,534
20-Year Avg.	1,300	117,304	5,301	811,138	6,553	941,596
1978-87 Avg.	953	84,765	5,802	564,601	9,619	665,739
1988-97 Avg.	1,646	149,844	4,800	1,057,676	3,488	1,217,454
1998 % of Total	0.07%	12.92%	0.15%	86.60%	0.26%	100.00%

^a Data source: ADF&G fish ticket database.

Appendix Table 7. Commercial set gillnet catch of salmon in numbers of fish by species in the Southern District, Lower Cook Inlet, 1978 - 1998^a.

Year	Chinook	Sockeye	Coho	Pink	Chum	Total
1978	1,052	86,934	3,053	11,556	4,117	106,712
1979	483	34,367	7,595	69,368	5,266	117,079
1980	225	29,922	8,038	26,613	2,576	67,374
1981	222	53,665	6,735	68,794	8,524	137,940
1982	894	42,389	5,557	15,838	7,113	71,791
1983	822	41,707	1,799	20,533	4,377	69,238
1984	639	40,987	2,862	17,836	5,008	67,332
1985	958	23,188	3,908	22,898	4,221	55,173
1986	745	21,807	2,827	14,244	2,426	42,049
1987	653	28,209	2,025	9,224	2,419	42,530
1988	1,145	14,758	2,819	29,268	4,423	52,413
1989	1,281	13,970	4,792	16,210	1,877	38,130
1990	1,361	15,863	1,046	12,646	1,938	32,854
1991	842	20,525	5,011	3,954	1,577	31,909
1992	1,288	17,002	848	15,958	1,687	36,783
1993	1,089	14,791	3,088	12,008	2,591	33,567
1994	1,103	14,004	1,073	23,621	2,419	42,220
1995	2,078	19,406	3,564	41,654	3,958	70,660
1996	1,054	69,338	5,779	14,813	2,792	93,776
1997	1,136	59,412	4,475	64,162	4,166	133,351
1998	952	26,131	1,057	24,403	3,754	56,297
20-Year Avg.	954	33,112	3,845	25,560	3,674	67,144
1978-87 Avg.	669	40,318	4,440	27,690	4,605	77,722
1988-97 Avg.	1,238	25,907	3,250	23,429	2,743	56,566
1998 % of Total	1.69%	46.42%	1.88%	43.35%	6.67%	100.00%

^a Data source: ADF&G fish ticket database.

Appendix Table 8. Commercial salmon catch in numbers of fish by species in the Outer District, Lower Cook Inlet, 1978 - 1998^a.

Year	Chinook	Sockeye	Coho	Pink	Chum	Total
1978	236	10,695	45	70,080	19,224	100,280
1979	30	25,297	135	1,945,536	180,558	2,151,556
1980	10	22,514	16	154,041	32,246	208,827
1981	61	18,133	485	1,714,115	238,393	1,971,187
1982	129	66,781	92	67,523	63,075	197,600
1983	14	16,835	54	199,794	27,203	243,900
1984	3	29,276	41	89,085	3,204	121,609
1985	19	91,957	3,210	618,222	11,844	725,252
1986	6	48,472	5,052	401,755	11,701	466,986
1987	14	31,845	2,481	23,890	28,663	86,893
1988	5	9,501	2	6,094	71,202	86,804
1989	1	10,286	72	52,677	43	63,079
1990	2	17,404	74	191,320	614	209,414
1991	2	6,408	12	359,664	14,337	380,423
1992	0	572	1	146	181	900
1993	2	4,613	119	159,159	970	164,863
1994	0	5,930	993	13,200	32	20,155
1995	12	17,642	1,272	192,098	474	211,498
1996	0	14,999	96	7,199	3	22,297
1997	0	6,255	63	128,373	1,575	136,266
1998	0	15,991	45	102,172	611	118,819
20-Year Avg.	27	22,771	716	319,699	35,277	378,489
1978-87 Avg.	52	36,181	1,161	528,404	61,611	627,409
1988-97 Avg.	2	9,361	270	110,993	8,943	129,570
1998 % of Total	0.00%	13.46%	0.04%	85.99%	0.51%	100.00%

^a Data source: ADF&G fish ticket database.

Appendix Table 9. Commercial salmon catch in numbers of fish by species in the Eastern District, Lower Cook Inlet, 1978 - 1998^a.

Year	Chinook	Sockeye	Coho	Pink	Chum	Total
1978	0	2	582	29,738	100	30,422
1979	0	0	296	0	0	296
1980	0	122	426	155,779	720	157,047
1981	0	9,270	470	44,989	3,279	58,008
1982	0	3,092	950	143,639	7,698	155,379
1983	0	25,932	594	36,154	7,934	70,614
1984	47	54,420	536	136,797	10,535	202,335
1985	11	24,338	835	92,403	5,144	122,731
1986	0	3,055	770	40,243	3,757	47,825
1987	0	3,687	1,631	14,333	14,913	34,564
1988	1	20,253	486	1,740	24,668	47,148
1989	0	8,538	5,346	92	312	14,288
1990	0	7,682	7,645	11,815	307	27,449
1991	1	4,703	7,283	167,250	80	179,317
1992	0	432	3,136	60,007	86	63,661
1993	0	1,824	8,924	10,616	9	21,373
1994	1	9,661	10,410	44,987	2,792	67,851
1995	0	46,556	5,192	12,000	330	64,078
1996	0	44,919	3,932	36	223	49,110
1997	0	33,783	5,344	1	66	39,194
1998	1	44,274	14,365	38,829	51	97,520
20-Year Avg.	3	15,113	3,239	50,131	4,148	72,634
1978-87 Avg.	6	12,392	709	69,408	5,408	87,922
1988-97 Avg.	0	17,835	5,770	30,854	2,887	57,347
1998 % of Total	0.00%	45.40%	14.73%	39.82%	0.05%	100.00%

^a Data source: ADF&G fish ticket database.

Appendix Table 10. Commercial salmon catch in numbers of fish by species in the Kamishak Bay District, Lower Cook Inlet, 1978 - 1998^a.

Year	Chinook	Sockeye	Coho	Pink	Chum	Total
1978	0	4,619	1,584	982	48,669	55,854
1979	9	1,778	1,116	58,484	29,711	91,098
1980	0	3,877	2,495	101,864	35,921	144,157
1981	1	4,972	1,845	66,097	73,501	146,416
1982	11	18,014	38,685	43,871	108,946	209,527
1983	1	11,207	7,138	1,405	142,901	162,652
1984	3	24,600	13,027	138,145	70,736	246,511
1985	6	78,250	2,024	194	8,139	88,613
1986	14	146,496	9,935	423,774	61,670	641,889
1987	7	123,654	8,079	72,684	108,412	312,836
1988	33	183,952	4,471	61,080	218,299	467,835
1989	3	46,395	4	256,669	7,809	310,880
1990	12	96,397	26	2,448	3,597	102,480
1991	17	136,612	2,337	47,833	7,853	194,652
1992	39	68,847	1,488	2,594	20,051	93,019
1993	4	67,650	3	4,205	600	72,462
1994	0	35,296	1,897	33	14	37,240
1995	2	36,427	6,084	169,054	10,302	221,869
1996	1	31,604	1	35	27	31,668
1997	0	11,733	0	293	7	12,033
1998	0	27,502	0	1,776	29	29,307
20-Year Avg.	8	56,619	5,112	72,587	47,858	182,185
1978-87 Avg.	5	41,747	8,593	90,750	68,861	209,955
1988-97 Avg.	11	71,491	1,631	54,425	26,856	154,414
1998 % of Total	0.00%	93.84%	0.00%	6.06%	0.10%	100.00%

^a Data source: ADF&G fish ticket database.

Appendix Table 11. Total commercial salmon catch in numbers of fish by district, Lower Cook Inlet, 1978 - 1998^a.

Year	Southern	Outer	Kamishak	Eastern	Total
1978	404,203	100,280	55,854	30,422	590,759
1979	1,044,517	2,151,556	91,098	296	3,287,467
1980	537,535	208,827	144,157	157,047	1,047,566
1981	1,561,782	1,971,187	146,416	58,008	3,737,393
1982	366,546	197,600	209,527	155,379	929,052
1983	842,497	243,900	162,652	70,614	1,319,663
1984	509,168	121,609	246,511	202,335	1,079,623
1985	613,816	725,252	88,613	122,731	1,550,412
1986	588,790	466,986	641,889	47,825	1,745,490
1987	188,535	86,893	312,836	34,564	622,828
1988	970,068	86,804	467,835	47,148	1,571,855
1989	1,097,237	63,079	310,880	14,288	1,485,484
1990	266,030	209,414	102,480	27,449	605,373
1991	436,962	380,423	194,652	179,317	1,191,354
1992	528,828	900	93,019	63,661	686,408
1993	861,922	164,863	72,462	21,373	1,120,620
1994	1,659,474	20,155	37,240	67,851	1,784,720
1995	2,652,090	211,498	221,869	64,078	3,149,535
1996	816,633	22,297	31,668	49,110	919,708
1997	2,885,296	136,266	12,033	39,194	3,072,789
1998	1,518,573	118,819	29,307	97,520	1,764,219
20-Year Avg.	941,596	378,489	182,185	72,634	1,574,905
1978-87 Avg.	665,739	627,409	209,955	87,922	1,591,025
1988-97 Avg.	1,217,454	129,570	154,414	57,347	1,558,785
1998 % of Total	86.08%	6.73%	1.66%	5.53%	100.00%

^a Data source: ADF&G fish ticket database.

Appendix Table 12. Commercial chinook salmon catch in numbers of fish by district, Lower Cook Inlet, 1978 - 1998^a.

Year	Southern	Outer	Kamishak	Eastern	Total
1978	1,511	236	0	0	1,747
1979	1,199	30	9	0	1,238
1980	414	10	0	0	424
1981	1,024	61	1	0	1,086
1982	926	129	11	0	1,066
1983	858	14	1	0	873
1984	661	3	3	47	714
1985	1,007	19	6	11	1,043
1986	776	6	14	0	796
1987	1,158	14	7	0	1,179
1988	1,655	5	33	1	1,694
1989	1,889	1	3	0	1,893
1990	1,546	2	12	0	1,560
1991	1,399	2	17	1	1,419
1992	1,852	0	39	0	1,891
1993	2,162	2	4	0	2,168
1994	1,230	0	0	1	1,231
1995	2,289	12	2	0	2,303
1996	1,180	0	1	0	1,181
1997	1,262	0	0	0	1,262
1998	1,070	0	0	1	1,071
20-Year Avg.	1,300	27	8	3	1,338
1978-87 Avg.	953	52	5	6	1,017
1988-97 Avg.	1,646	2	11	0	1,660
1998 % of Total	99.91%	0.00%	0.00%	0.09%	100.00%

^a Data source: ADF&G fish ticket database.

Appendix Table 13. Commercial sockeye salmon catch in numbers of fish by district, Lower Cook Inlet, 1978 - 1998^a.

Year	Southern	Outer	Kamishak	Eastern	Total
1978	141,088	10,695	4,619	2	156,404
1979	37,342	25,297	1,778	0	64,417
1980	42,929	22,514	3,877	122	69,442
1981	77,880	18,133	4,972	9,270	110,255
1982	43,433	66,781	18,014	3,092	131,320
1983	133,671	16,835	11,207	25,932	187,645
1984	160,654	29,276	24,600	54,420	268,950
1985	84,149	91,957	78,250	24,338	278,694
1986	36,838	48,472	146,496	3,055	234,861
1987	89,662	31,845	123,654	3,687	248,848
1988	105,302	9,501	183,952	20,253	319,008
1989	98,052	10,286	46,395	8,538	163,271
1990	82,412	17,404	96,397	7,682	203,895
1991	170,224	6,408	136,612	4,703	317,947
1992	106,793	572	68,847	432	176,644
1993	159,747	4,613	67,650	1,824	233,834
1994	64,531	5,930	35,296	9,661	115,418
1995	164,798	17,642	36,427	46,556	265,423
1996	358,163	14,999	31,604	44,919	449,685
1997	188,413	6,255	11,733	33,783	240,184
1998	196,262	15,991	27,502	44,274	284,029
20-Year Avg.	117,304	22,771	56,619	15,113	211,807
1978-87 Avg.	84,765	36,181	41,747	12,392	175,084
1988-97 Avg.	149,844	9,361	71,491	17,835	248,531
1998 % of Total	69.10%	5.63%	9.68%	15.59%	100.00%

^a Data source: ADF&G fish ticket database.

Appendix Table 14. Commercial sockeye salmon catch in thousands of fish by subdistrict, Lower Cook Inlet, 1959 – 1998^a.

Location	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
Resurrection Bay	0	0.1	0	0	0	0	0	0	0	74.5	99.4	1.8	2.2
Aialik Bay	1.3	0.2	4.3	2.6	0.5	0	0	0	0	0	0	3.1	0
Nuka Bay	8.3	6.7	8.2	5.1	0.5	0	2.0	0	2.2	1.5	0	1.0	1.6
Port Dick	0	0	0	0	0	0	0	0	0	0	0	0	0
Halibut Cove & Lagoon	1.3	1.4	0.8	2.0	1.1	0.7	1.4	1.5	1.9	2.7	1.7	1.3	1.3
Tutka/Barabara	1.1	1.7	3.0	5.2	2.9	9.0	5.2	6.0	11.8	6.3	5.6	6.0	10.0
Seldovia Bay	0.4	1.2	1.2	1.7	1.2	2.1	0.9	1.0	2.2	1.9	1.1	1.2	1.5
Port Graham Bay	6.6	7.8	5.2	6.8	7.8	5.5	3.5	2.7	10.4	7.7	4.3	3.7	5.6
Kamishak/Douglas	0	0	0	0	0	0	0	0	0	0	0	0	0
McNeil (Mikfik)	0	0.7	0	0	0	1.9	0.2	0	0	0	8.9	2.8	0
Paint River	0	0	0	0	0	0	0	0	0	0	0	0	0
Chenik Lake	0	0	0	0	0	0	0	0	0.2	0	1.9	0	0
Bruin (Kirschner)	0	0	0	0	0	0	0	0	0	0	0	0	0
Miscellaneous	2.6	4.9	0.1	1.9	1.1	1.5	0.8	4.1	0.3	0.6	0.1	0	0
Totals	21.6	24.7	22.8	25.3	15.1	20.7	14.0	15.3	29.0	95.2	122.8	20.9	22.2

Location	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Resurrection Bay	0.1	0	0	0	0	0	0	0	0	0.6	0	0	3.4
Aialik Bay	0.3	3.1	0.2	0.6	0	5.8	0	0	0.1	8.7	3.0	25.9	50.8
Nuka Bay	26.1	1.1	0.1	0	18.9	31.1	10.6	24.4	21.5	17.2	66.3	16.8	29.2
Port Dick	0	0	0	0	0	0	0	0	0	0	0	0	0
Halibut Cove & Lagoon	3.7	2.1	3.0	3.4	5.1	3.6	12.9	5.3	11.5	11.2	1.2	77.7	116.6
Tutka/Barabara	14.8	8.1	10.8	12.6	14.2	21.3	92.1	15.6	13.2	41.0	15.8	35.9	26.7
Seldovia Bay	2.3	2.2	2.3	2.1	2.1	3.0	5.6	2.6	1.6	5.3	5.0	6.7	4.9
Port Graham Bay	10.5	11.7	10.9	9.2	13.6	16.6	30.5	12.9	16.5	20.3	21.5	13.4	12.5
Kamishak/Douglas	0	0	0	0	0.2	5.3	4.6	0.5	0	4.9	0	2.8	0
McNeil (Mikfik)	0	0	0	0	3.8	2.1	0	1.2	3.9	0	17.8	5.8	10.7
Paint River	0	0	0	0	0	0	0	0	0	0	0	0	0
Chenik Lake	0	0	0	0	0	0	0	0	0	0	0.3	2.7	13.9
Bruin (Kirschner)	0	0	0	0	0	0	0	0	0	0	0	0	0
Miscellaneous	0.1	0.8	0.1	0.2	0.3	2.8	0.1	1.9	1.1	1.1	0.4	0	0.3
Totals	57.9	29.1	27.4	28.1	58.2	101.6	156.4	64.4	69.4	110.3	131.3	187.6	269.0

Location	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Resurrection Bay	0.3	0	0.2	0	0	0	0	0	1.7	9.0	44.6	43.9	31.7
Aialik Bay	24.1	3.0	3.5	20.2	8.5	7.7	4.7	0.4	0.2	0.6	2.0	1.0	2.1
Nuka Bay	91.8	48.4	31.8	9.5	10.3	5.7	1.8	0	3.5	5.9	17.6	15.0	6.2
Port Dick	0	0	0	0	0	11.7	4.6	0.6	1.0	0	0	0	0
Halibut Cove & Lagoon	63.2	15.2	69.1	24.9	46.6	20.3	36.0	14.7	19.0	12.2	9.0	75.3	12.3
China Poot ^b				63.6	35.8	49.9	116.7	76.0	127.6	38.7	133.4	225.2	116.1
Tutka/Barabara	14.9	16.3	14.7	12.9	13.4	7.9	13.4	12.9	8.4	11.0	15.4	27.8	14.4
Seldovia Bay	2.6	3.2	3.5	2.5	1.8	4.3	4.0	3.3	4.4	2.7	4.2	11.9	12.5
Port Graham Bay	3.5	2.0	2.4	1.4	0	0	0	0	0	0	2.6	17.9	33.1
Kamishak/Douglas	0.7	7.6	2.3	5	0	0.1	7.0	9.9	1.3	3.4	2.7	0	2.6
McNeil (Mikfik)	67.0	27.5	21.4	14.6	7.0	9.1	12.9	4.0	0.9	0	0.1	0	0.2
Paint River	0	0	0	0	0	0	0.4	0	0	0	0	0	0
Chenik Lake	10.6	111.3	98.5	164.2	38.9	70.3	60.4	14.4	24.6	0	0	0	0
Bruin/Kirschner	0	0	0	0	0.2	14.5	55.9	40.5	39.7	31.9	33.6	31.6	9.0
Miscellaneous	0	0.4	1.6	0.2	0.8	2.4	0.1	0	1.5	0	0.2	0	0
Totals	278.7	234.9	248.8	319.0	163.3	203.9	317.9	176.6	233.8	115.4	265.4	449.7	240.2

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Appendix Table 14. (page 2 of 2)

Location	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Resurrection Bay	35.0												
Aialik Bay	8.6												
Nuka Bay	16.0												
Port Dick	0												
Halibut Cove & Lagoon	62.3												
China Poot ^b	100.2												
Tutka/Barabara	9.8												
Seldovia Bay	6.0												
Port Graham Bay	17.9												
Kamishak/Douglas	0												
McNeil (Mikfik)	0												
Paint River	0												
Chenik Lake	0												
Bruin/Kirschner	27.5												
Miscellaneous	0.7												
Totals	284.0												

^a Data source: ADF&G fish ticket database.

^b China Poot Subdistrict, which includes China Poot, Peterson, and Neptune Bays, was part of Halibut Cove Subdistrict prior to 1988.

Appendix Table 15. Harvest of sockeye salmon returning to China Poot Bay in the Southern District of Lower Cook Inlet, by user group, 1979 - 1998^a.

Return Year	Sport Harvest	Personal Use Harvest	Commercial Harvest	Non-harvested fish	Total Return
1979	650	0	^b	0	650
1980	1,000	1,000	12,000	0	14,000
1981	1,500	0	10,000	0	11,500
1982	450	1,320	200	1,430	3,400
1983	480	5,910	84,020	10	90,420
1984	500	2,000	114,360	500	117,360
1985	500	3,000	61,500	920	65,920
1986	100	150	18,350	200	18,800
1987	200	2,000	21,500	0	23,700
1988	500	1,500	91,469	470	93,939
1989	1,000	7,000	79,714	0	87,714
1990	500	3,000	49,587	0	53,087
1991	1,000	4,000	117,000 ^c	0	122,000
1992	300	3,500	89,791 ^c	0	93,591
1993	400	4,000	144,677 ^c	0	149,077
1994	500	8,500	50,527 ^c	0	59,527
1995	1,000	7,000	145,392 ^c	450	153,842
1996	1,000	9,000	200,000 ^c	441	210,441
1997	640 ^d	4,950 ^d	120,900 ^c	1,130	127,620
1998	668 ^d	5,494 ^d	164,000 ^c	380	170,542
1979-97 Average	684	5,245	78,372	249	83,091

^a Through 1990, "Commercial Harvest" and "Total Return" includes returns only to Leisure Lake in China Poot Bay; after 1990, these figures include combined returns to both Leisure Lake in China Poot Bay and Hazel Lake in Neptune Bay.

^b No data.

^c Portions of the commercial sockeye harvest in China Poot, Halibut Cove, and Tutka Bay Subdistricts were attributed to the Leisure and/or Hazel Lake returns.

^d The final "Sport Harvest" and "Personal Use Harvest" estimates for 1997 and 1998 were not available at the time of publishing, therefore figures here represent the recent 10-year averages.

Appendix Table 16. Commercial catch and escapement of sockeye salmon at Chenik Lake in the Kamishak Bay District of Lower Cook Inlet, 1975 - 1998.

Return Year	Commercial Harvest	Escapement ^a	Total Return
1975	b	100	100
1976	b	900	900
1977	b	200	200
1978	b	100	100
1979	b	c	b
1980	b	3,500	3,500
1981	b	2,500	2,500
1982	b	8,000	8,000
1983	2,800	11,000	13,800
1984	16,500	13,000	29,500
1985	10,500	3,500	14,000
1986	111,000	7,000	118,000
1987	102,000	10,000	112,000
1988	164,200	9,000	173,200
1989	38,905	12,000	50,905
1990	70,347	17,000	87,347
1991	60,397	10,189	70,586
1992	13,793	9,269	23,062
1993	24,567	4,000	28,567
1994	0 ^d	808	808
1995	0 ^d	1,086	1,086
1996	0 ^d	2,990	2,990
1997	0 ^d	2,338	2,338
1998	0 ^d	1,880	1,880
Average Since 1985	45,824	6,860	52,684

^a Estimated from aerial surveys from 1975-1990 and 1998, weir counts from 1991-1997.

^b Closed to fishing.

^c No data.

^d Due to low returns, the Chenik Subdistrict was closed to fishing for the entire season.

Appendix Table 17. Commercial coho salmon catch in numbers of fish by district, Lower Cook Inlet, 1978 - 1998^a.

Year	Southern	Outer	Kamishak	Eastern	Total
1978	4,318	45	1,584	582	6,529
1979	10,846	135	1,116	296	12,393
1980	11,568	16	2,495	426	14,505
1981	7,976	485	1,845	470	10,776
1982	7,165	92	38,685	950	46,892
1983	3,433	54	7,138	594	11,219
1984	3,193	41	13,027	536	16,797
1985	4,258	3,210	2,024	835	10,327
1986	3,095	5,052	9,935	770	18,852
1987	2,163	2,481	8,079	1,631	14,354
1988	2,987	2	4,471	486	7,946
1989	6,667	72	4	5,346	12,089
1990	1,552	74	26	7,645	9,297
1991	9,415	12	2,337	7,283	19,047
1992	1,277	1	1,488	3,136	5,902
1993	4,431	119	3	8,924	13,477
1994	1,373	993	1,897	10,410	14,673
1995	5,161	1,272	6,084	5,192	17,709
1996	9,543	96	1	3,932	13,572
1997	5,597	63	0	5,344	11,004
1998	2,243	45	0	14,365	16,653
20-Year Avg.	5,301	716	5,112	3,239	14,368
1978-87 Avg.	5,802	1,161	8,593	709	16,264
1988-97 Avg.	4,800	270	1,631	5,770	12,472
1998 % of Total	13.47%	0.27%	0.00%	86.26%	100.00%

^a Data source: ADF&G fish ticket database.

Appendix Table 18. Commercial pink salmon catch in numbers of fish by district, Lower Cook Inlet, 1978 - 1998^a.

Year	Southern	Outer	Kamishak	Eastern	Total
1978	251,761	70,080	982	29,738	352,561
1979	986,909	1,945,536	58,484	0	2,990,929
1980	478,019	154,041	101,864	155,779	889,703
1981	1,453,982	1,714,115	66,097	44,989	3,279,183
1982	296,556	67,523	43,871	143,639	551,589
1983	690,254	199,794	1,405	36,154	927,607
1984	336,595	89,085	138,145	136,797	700,622
1985	518,889	618,222	194	92,403	1,229,708
1986	542,521	401,755	423,774	40,243	1,408,293
1987	90,522	23,890	72,684	14,333	201,429
1988	852,382	6,094	61,080	1,740	921,296
1989	987,488	52,677	256,669	92	1,296,926
1990	178,087	191,320	2,448	11,815	383,670
1991	253,962	359,664	47,833	167,250	828,709
1992	417,021	146	2,594	60,007	479,768
1993	692,794	159,159	4,205	10,616	866,774
1994	1,589,709	13,200	33	44,987	1,647,929
1995	2,475,312	192,098	169,054	12,000	2,848,464
1996	444,236	7,199	36	35	451,506
1997	2,685,764	128,373	293	1	2,814,431
1998	1,315,042	102,172	1,776	38,829	1,457,819
20-Year Avg.	811,138	319,699	72,587	50,131	1,253,555
1978-87 Avg.	564,601	528,404	90,750	69,408	1,253,162
1988-97 Avg.	1,057,676	110,993	54,425	30,854	1,253,947
1998 % of Total	90.21%	7.01%	0.12%	2.66%	100.00%

^a Data source: ADF&G fish ticket database.

Appendix Table 19. Commercial pink salmon catch in thousands of fish by subdistrict during odd-numbered years, Lower Cook Inlet, 1959 – 1997^a.

Location	1959	1961	1963	1965	1967	1969	1971	1973	1975	1977
Humpy Creek	13.2	34.5	20.6	6.7	6.9	0.6	0	37.3	242.1	26.4
Halibut Cove and Lagoon		33.4	36.9	7.1	33.4	0	11.4	7.2	97.2	16.3
Tutka/Barabara	14.4	106.8	37.7	44.6	31.6	32.9	3.9	20.0	89.2	21.9
Seldovia Bay	4.9	15.1	1.6	19.2	11.7	28.8	27.4	19.4	429.6	47.6
Port Graham Bay	5.3	1.0	2.7	12.4	5.1	2.0	1.0	13.9	18.3	44.8
Dogfish Bay	1.6	0	0	0.1	2.3	0	10.4	0.3	0	5.0
Port Chatham	1.2	0	0.8	0	0	0	26.3	20.6	16.0	1.4
Windy Bay	3.1	2.2	0	5.4	0	0	57.3	68.5	18.1	173.2
Rocky Bay	2.3	0	1.4	0.1	0	0	0.1	0.2	0	11.6
Port Dick Bay	28.2	92.9	19.0	15.3	259.9	51.5	94.6	96.6	90.3	881.7
Nuka Bay	33.3	2.0	0.3	0	0.1	0	119.7	8.1	35.4	56.3
Resurrection Bay	8.4	0	0	0	1.2	0	0	0	0	0
Bruin Bay	0	0	12.3	0.9	2.1	0	11.7	0	0	6.2
Rocky/Ursus Coves	3.7	2.7	44.2	0	13.0	52.8	16.4	7.9	0	0
Iniskin/Cottonwood Bays	1.5	3.3	21.8	0	0.1	26.0	0	4.7	0	0.1
Miscellaneous	3.6	9.5	4.3	3.8	8.1	7.8	12.7	2.7	27.1	1.4
Total	124.7	303.4	203.6	115.6	375.5	202.4	392.9	307.4	1,063.3	1,293.9

Location	1979	1981	1983	1985	1987	1989	1991	1993	1995	1997
Humpy Creek	277.0	239.9	8.1	5.6	0	91.4	0	0.2	13.7	0
Halibut Cove and Lagoon	27.1	11.1	18.8	5.9	30.5	254.4	91.1	100.2	1.9	2.6
China Poot ^b						8.5	135.7	50.6	12.9	14.5
Tutka/Barabara	416.8	1,026.6	616.0	491.2	56.5	632.1	117.6	539.4	2,428.5	2,511.2
Seldovia Bay	140.8	126.4	43.3	3.8	1.2	1.1	0.3	2.4	8.2	12.3
Port Graham Bay	124.7	45.9	4.1	12.5	2.3	0	0	0	10.2	145.1
Dogfish Bay	7.4	22.9	0.2	0	0	0	0	0	0	0
Port Chatham	174.4	55.8	3.3	7.0	0	9.7	7.5	14.7	17.6	0
Windy Bay	552.7	2.9	0	4.8	0	0	49.1	43.4	111.2	93.2
Rocky Bay	122.2	16.5	1.3	0	0	0	0	0	27.5	0
Port Dick Bay	964.8	1,140.9	140.0	455.6	3.0	0	289.7	26.6	0	0.6
Nuka Bay	121.7	395.1	55.0	150.8	20.9	43.0	10.6	13.8	21.4	33.3
Resurrection Bay	0	32.6	27.1	74.6	11.8	0	0	0.7	0	0
Bruin Bay	40.3	51.9	0.3	0	1.2	202.8	45.1	0.1	104.8	0.3
Rocky/Ursus Coves	14.4	14.1	0	0	69.4	53.8	0	0	58.0	0
Iniskin/Cottonwood Bays	0.2	0	0.3	0	0.2	0	0	0	0	0
Miscellaneous	6.4	16.6	9.8	17.9	4.4	0.1	82.0	74.7	32.6	1.3
Total	2,990.9	3,199.2	927.6	1,229.7	201.4	1,296.9	828.7	866.8	2,848.5	2,814.4

^a Data source: ADF&G fish ticket database.

^b China Poot Subdistrict, including Neptune Bay, was part of Halibut Cove Subdistrict prior to 1988.

Appendix Table 20. Commercial pink salmon catch in thousands of fish by subdistrict during even-numbered years, Lower Cook Inlet, 1960 - 1998^{a,b}.

Location	1960	1962	1964	1966	1968	1970	1972	1974	1976	1978
Humpy Creek	51.0	73.9	53.5	24.6	2.6	85.2	1.7	33.3	3.3	16.3
Halibut Cove and Lagoon	20.7	35.5	28.9	16.0	41.3	28.9	0.4	2.2	69.8	27.8
Tutka/Barabara	87.6	279.5	100.9	53.5	26.9	43.9	5.2	5.5	18.0	167.9
Seldovia Bay	42.6	142.8	37.4	44.1	23.6	19.0	0.2	3.5	3.0	35.8
Port Graham Bay	7.1	18.1	38.4	5.1	23.0	19.6	1.1	4.5	3.9	4.0
Dogfish Bay	1.8	1.4	0.1	7.1	0	9.8	0.3	0	0	0.3
Port Chatham	15.7	102.2	67.1	6.7	10.0	1.9	0	0	0	0
Windy Bay	29.2	85.5	68.6	20.1	3.4	0.8	0	0	0	0
Rocky Bay	17.0	225.9	53.2	0	10.8	36.8	0	0	0	0
Port Dick Bay	257.4	1,118.3	526.3	296.8	55.0	336.5	0	0.6	0	63.6
Nuka Bay	26.6	129.8	23.8	0	90.2	48.4	0.3	0.7	0.1	6.3
Resurrection Bay	5.8	0.1	0.3	0	37.4	40.2	18.2	0	35.4	29.7
Bruin Bay	2.6	0	0	0	126.2	10.2	0	0	0	0
Rocky/Ursus Coves	6.6	3.2	13.5	2.9	18.0	7.5	0	0	0	0.1
Iniskin/Cottonwood Bays	2.1	3.2	4.3	0	9.9	3.5	0	0	0.1	0.1
Miscellaneous	37.8	28.9	39.1	102.3	107.1	14.0	1.3	0.3	2.8	0.7
Total	611.6	2,248.3	1,055.4	579.2	585.4	716.2	28.7	50.6	136.4	352.6

Location	1980	1982	1984	1986	1988	1990	1992	1994	1996	1998
Humpy Creek	48.6	4.9	53.5	116.7	0	0	0	0	0	0
Halibut Cove and Lagoon	4.7	1.0	10.9	14.0	106.8	91.0	58.4	105.6	2.3	2.4
China Poot ^c					5.4	46.1	35.7	24.2	8.2	3.3
Tutka/Barabara	312.5	184.9	262.0	400.2	723.9	37.4	320.9	1,454.5	428.2	1,300.6
Seldovia Bay	81.7	70.3	2.2	2.8	5.5	3.6	1.9	5.4	4.1	7.4
Port Graham Bay	30.5	35.4	8.0	8.8	10.7	0	0	0	1.5	1.4
Dogfish Bay	4.7	1.7	0.1	0	0	0	0	0	0	0
Port Chatham	1.8	12.6	0	0	0	22.1	0	0	0	9.4
Windy Bay	0	0	0	0	0	0	0	0	0	0
Rocky Bay	1.4	0	0	0	0	0	0	0	0	35.0
Port Dick Bay	133.3	44.0	84.6	304.0	5.9	169.1	0.1	1.6	0	2.4
Nuka Bay	12.8	8.7	4.4	97.8	0.2	0.2	0	11.6	7.2	41.1
Resurrection Bay	155.8	137.4	122.3	36.5	0.5	0	0	T	T	0
Bruin Bay	100.6	13.3	125.2	349.7	5.0	0.4	1.9	T	T	1.8
Rocky/Ursus Coves	0	20.2	8.5	71.1	49.9	0	0.3	0	0	0
Iniskin/Cottonwood Bays	0.1	0.4	0.4	0.2	1.3	0	T	0	0	0
Miscellaneous	0.2	16.8	18.5	6.5	6.2	60.6	60.6	45.0	0	53.0
Total	889.7	551.6	700.6	1,408.3	921.3	383.7	479.8	1,647.9	451.5	1,457.8

^a Data source: ADF&G fish ticket database.

^b "T" denotes trace, less than 50 fish harvested.

^c China Poot Subdistrict, including Neptune Bay, was part of Halibut Cove Subdistrict prior to 1988.

Appendix Table 21. Commercial chum salmon catch in numbers of fish by district, Lower Cook Inlet, 1978 - 1998^a.

Year	Southern	Outer	Kamishak	Eastern	Total
1978	5,525	19,224	48,669	100	73,518
1979	8,221	180,558	29,711	0	218,490
1980	4,605	32,246	35,921	720	73,492
1981	20,920	238,393	73,501	3,279	336,093
1982	18,466	63,075	108,946	7,698	198,185
1983	14,281	27,203	142,901	7,934	192,319
1984	8,065	3,204	70,736	10,535	92,540
1985	5,513	11,844	8,139	5,144	30,640
1986	5,560	11,701	61,670	3,757	82,688
1987	5,030	28,663	108,412	14,913	157,018
1988	7,742	71,202	218,299	24,668	321,911
1989	3,141	43	7,809	312	11,305
1990	2,433	614	3,597	307	6,951
1991	1,962	14,337	7,853	80	24,232
1992	1,885	181	20,051	86	22,203
1993	2,788	970	600	9	4,367
1994	2,631	32	14	2,792	5,469
1995	4,530	474	10,302	330	15,636
1996	3,511	3	27	223	3,764
1997	4,260	1,575	7	66	5,908
1998	3,956	611	29	51	4,647
20-Year Avg.	6,553	35,277	47,858	4,148	93,836
1978-87 Avg.	9,619	61,611	68,861	5,408	145,498
1988-97 Avg.	3,488	8,943	26,856	2,887	42,175
1998 % of Total	85.13%	13.15%	0.62%	1.10%	100.00%

^a Data source: ADF&G fish ticket database.

Appendix Table 22. Commercial chum salmon catch in thousands of fish by subdistrict, Lower Cook Inlet, 1959 - 1998^{a,b}.

Location	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
Tutka Bay	0.1	2.4	1.8	2.9	2.4	5.6	1.1	3.9	4.0	1.3	0.7	1.6	0.5
Port Graham	2.3	1.8	0.5	4.0	3.8	2.1	0.9	5.3	3.0	2.3	1.3	4.8	2.0
Dogfish Bay	4.9	0.4	0.1	0	0.2	0	0	7.0	15.3	0.1	0	50.9	114.5
Port Chatham	1.0	2.5	0	2.8	4.3	5.2	0	17.8	0	1.0	0	0.1	2.4
Rocky/Windy Bays	14.9	6.4	2.2	8.5	0.3	33.8	8.1	1.7	0	0.5	0	39.4	1.4
Port Dick	42.4	51.0	36.8	112.0	110.8	227.4	14.2	60.9	36.0	10.9	5.4	41.2	0.7
Nuka Bay	1.7	8.4	1.7	0.5	1.5	0	0	0	1.5	6.9	0	5.9	0.1
Resurrection Bay	0.1	0.5	0	0	0	0	0	0	0.1	0.7	0	0.6	0.4
Douglas River	0.2	0	0	0	0	0	0	0	0	0	0	0	0
Kamishak River	0	0	0	0	0	0	0	0	0	3.7	0.4	0	0
McNeil River	0	0.4	0	0	0	2.7	0.90	0	0.4	8.3	4.4	1.9	0
Bruin Bay	0	0.3	0.5	0	0.1	0	0.4	0	1.0	7.5	0	12.8	1.6
Ursus/Rocky Coves	8.5	8.6	1.8	1.1	2.8	1.2	0	4.0	2.9	1.0	3.6	8.9	10.3
Cottonwood/Iniskin	12.1	33.4	10.2	41.7	10.9	10.9	0	0	19.0	25.5	44.4	71.9	14.5
Miscellaneous	22.6	0	0	5.8	1.4	1.4	2.5	28.5	2.2	5.4	1.0	2.4	0.2
Totals	110.8	116.1	55.6	179.3	138.5	323.3	28.1	129.1	85.4	75.1	61.2	242.4	148.6

Location	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Tutka Bay	1.3	0.8	1.4	2.0	0.9	0.8	2.6	2.7	1.8	7.9	8.3	9.9	3.4
Port Graham	3.2	2.6	1.0	2.2	0.5	5.0	2.4	4.3	2.5	11.2	7.4	1.7	3.6
Dogfish Bay	41.1	0.4	0	0	0	9.4	0	8.5	2.1	71.8	15.6	2.8	1.1
Port Chatham	0	0.4	0	0.6	0	0.1	0	1.7	1.3	59.6	16.2	2.1	0
Rocky/Windy Bays	0	0.9	0	0.3	0	17.7	0	76.7	2.1	7.4	0	3.2	0
Port Dick	0	33.4	8.1	6.8	0	25.6	10.3	79.0	19.0	85.8	30.3	18.0	1.9
Nuka Bay	2.3	40.8	3.9	3.6	0.4	17.4	0.4	14.7	7.8	3.8	0.9	0.8	0.2
Resurrection Bay	0.7	0	0	0	0	0	0.1	0	0.7	2.4	7.7	6.9	3.0
Douglas River	0	0	0	0.1	7.1	4.0	2.9	0.7	10.1	46.7	37.1	27.2	9.2
Kamishak River	2.4	0	1.8	0	10.5	0	23.9	17.8	2.8	8.6	9.2	23.9	16.2
McNeil River	2.3	0	2.0	0	16.9	38.5	4.9	6.5	6.3	11.6	32.6	67.9	12.0
Bruin Bay	1.8	0	0.7	0	0	0	0	4.0	11.0	1.7	1.3	2.6	5.9
Ursus/Rocky Coves	0.2	5.7	0	2.0	2.8	7.8	1.9	0.5	0.3	1.5	13.5	0	3.7
Cottonwood/Iniskin	19.7	29.9	0	2.8	11.5	15.3	14.9	0.2	5.4	3.5	21.6	21.4	23.0
Miscellaneous	0.5	0.6	0.3	1.2	0.2	4.2	9.2	1.2	0.4	2.6	3.5	3.9	9.3
Totals	75.5	115.5	19.2	21.6	50.8	145.8	73.5	218.5	73.5	336.1	198.0	192.3	92.5

Location	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Tutka Bay	3.2	3.9	3.9	4.7	2.5	1.5	0.8	0.6	0.9	0.8	1.6	1.0	1.1
Port Graham	1.3	0.8	0.4	1.2	0	0	0	0	0	0	0.7	0.7	2.0
Dogfish Bay	0	0	0	0	0	0	0	0	0	0	0	0	0
Port Chatham	1.3	0	0	0	0	0.1	0.1	0	0.1	0	T	0	0
Rocky/Windy Bays	0	0	0	0	0	0	0.5	0	0.1	0	0.4	0	1.6
Port Dick	9.6	10.4	27.1	64.4	0	0.5	13.7	0.2	0.7	T	0	0	0
Nuka Bay	0.8	1.3	1.6	6.8	0	T	T	0	T	T	0.1	T	T
Resurrection Bay	3.0	3.5	13.9	23.9	0	0	0	0	0	2.5	0.3	0.2	0
Douglas River	8.0	11.6	23.7	24.8	0	0.1	3.0	12.5	T	T	0.7	0	0
Kamishak River	0.1	0.1	24.6	26.7	0	T	0.7	1.5	0	0	0.1	0	0
McNeil River	0	13.7	32.9	104.0	0.1	0.1	0.1	2.0	0.4	0	0	0	T
Bruin Bay	0	5.4	0.1	2.8	4.4	0.1	2.6	0.8	T	0	4.9	T	T
Ursus/Rocky Coves	0	22.1	17.2	20.7	3.4	0	0	2.7	0	0	2.2	0	0
Cottonwood/Iniskin	0	8.8	9.7	39.2	0	0	1.0	0.2	0	0	2.3	0	0
Miscellaneous	3.3	1.1	1.9	2.7	0.9	4.7	1.7	1.6	2.1	2.1	2.3	1.9	1.2
Totals	30.6	82.7	157.0	321.9	11.3	7.0	24.2	22.2	4.4	5.5	15.6	3.8	5.9

- continued -

Appendix Table 22. (continued)

Location	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Tutka Bay	0.9												
Port Graham	0.8												
Dogfish Bay	0												
Port Chatham	0.1												
Rocky/Windy Bays	0.3												
Port Dick	0.1												
Nuka Bay	T												
Resurrection Bay	0												
Douglas River	0												
Kamishak River	0												
McNeil River	0												
Bruin Bay	T												
Ursus/Rocky Coves	0												
Cottonwood/Iniskin	0												
Miscellaneous	2.3												
Totals	4.6												

^a Data source: ADF&G fish ticket database.

^a "T" denotes trace, less than 50 fish harvested.

Appendix Table 23. Estimated sockeye salmon escapements in thousands of fish for the major spawning systems of Lower Cook Inlet, 1978 - 1998^a.

Year	English Bay	Delight Lake	Desire Lake	Bear Lake ^{b,c}	Aialik Lake	Mikfik Lake	Chenik Lake	Amakd. Creek	Kamish. Rivers	Douglas River	Total
1978	13.5	8.0	10.0	0.0	3.0	12.0	0.1	2.6	^d	^d	49.2
1979	4.4	8.0	12.0	0.0	5.0	6.0	0.0	1.0		^d	36.4
1980	12.0	10.0	17.0	1.5	6.6	6.5	3.5	2.6	^d	0.4	60.1
1981	10.5	7.3	12.0	0.7	1.8	5.3	2.5	1.9	^d	0.2	42.2
1982	20.0	25.0	18.0	0.5	22.4	35.0	8.0	3.2	1.0	4.2	137.3
1983	12.0	7.0	12.0	0.7	20.0	7.0	11.0	1.2	0.4	0.5	71.8
1984	11.1	10.5	15.0	0.5	22.0	6.0	13.0	1.4	0.1	0.0	79.6
1985	5.0	26.0	18.0	1.1	8.0	20.0	3.5	0.9	0.8	0.0	83.3
1986	2.8	13.0	10.0	0.8	7.6	7.8	7.0	1.9	5.0	0.2	56.1
1987	7.0	10.5	13.4	0.3	9.2	9.0	10.0	1.1	^d	0.1	60.6
1988	2.5	1.2	9.0	0.1	13.0	10.1	9.0	0.4	0.5	0.0	45.8
1989	4.5	7.7	9.0	0.1	6.5	11.5	12.0 ^c	1.2	0.5	0.6	53.6
1990	3.3	5.2	9.5	0.1	5.7	8.8	17.0	1.8	0.2	0.6	52.2
1991	7.0	4.1	8.2	0.7	3.7	9.7	10.2 ^c	1.9	0.7	^d	46.2
1992	6.4	5.9	11.9	1.9	2.5	7.8	9.3 ^c	1.9	4.9	0.2	52.7
1993	8.9	5.6	11.0	5.0	3.0	6.4	4.0 ^c	2.0	4.1	^d	50.0
1994	13.8 ^c	5.6	10.5	8.6	7.3	9.5	0.8 ^c	0.8	^d	^d	56.9
1995	22.5 ^c	15.8	15.8	8.3	2.6	10.1	1.1 ^c	2.4	^d	^d	78.6
1996	12.4 ^c	7.7	9.4	8.0	3.5	10.5	3.0 ^c	2.9	1.8	0.6	55.8
1997	15.4 ^c	27.8 ^c	14.7 ^c	7.9	11.4	8.5	2.3 ^c	1.5	^d	^d	89.5
1998	15.4 ^c	9.2 ^c	7.9	6.5	4.9	12.6	1.9	4.1	^d	^d	61.2
20-Year Average	9.8	10.6	12.3	2.3	8.2	10.2	6.4	1.7	1.7	0.6	63.8
1978-87 Average	9.8	12.5	13.7	0.6	10.6	11.5	5.9	1.8	1.5	0.7	68.5
1988-97 Average	9.7	8.7	10.9	4.1	5.9	8.9	6.9	1.7	1.8	0.4	58.9
Esc. Goal	10-20	10	10	1	2.5-5	5-7	10	1	^d	^e	49.5-64

^a Unless otherwise noted, estimated escapements are either peak aerial survey counts or adjusted aerial survey counts based on survey conditions and time of surveys.

^b Limited by Bear Lake Management Plan since 1971.

^c Weir counts.

^d No formal escapement goal established.

Appendix Table 24. Estimated pink salmon escapements in thousands of fish for the major spawning systems of Lower Cook Inlet, 1960 - 1998^a.

Location	Y E A R										
	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
Humpy Creek	10.0	22.6	56.0	34.7	18.5	28.0	30.0	25.0	24.7	5.4	55.2
China Poot Creek	9.0	2.0	26.0	--	--	--	--	2.5	6.0	0.2	1.5
Tutka Lagoon Creek	15.0	15.0	30.0	10.0	20.0	20.0	12.0	7.0	7.9	6.5	6.5
Barabara Creek	2.0	0.1	1.5	0.1	--	--	5.0	--	2.0	0.9	0.4
Seldovia River	25.0	25.0	50.0	13.0	60.0	30.0	86.0	55.0	53.2	60.0	23.0
Port Graham River	15.0	5.0	50.0	2.0	16.0	1.5	24.0	2.0	24.4	4.0	16.6
Dogfish Lagoon	2.0		3.0	--	--	--	--	--	--	--	--
Port Chatham Creeks	4.0	7.0	7.0	--	--	--	10.0	--	--	--	3.0
Windy Right Creek	8.0	10.0	12.5	4.9	6.2	2.0	7.0	6.0	2.8	3.2	2.1
Windy Left Creek	8.0	5.0	12.5	4.5	7.7	10.0	7.0	6.0	6.9	23.0	13.0
Rocky River	130.0	2.0	200.0	12.0	80.0	0.3	44.0	1.0	43.1	1.0	32.0
Port Dick Creek	35.0	14.0	40.0	16.0	31.5	50.0	35.0	20.0	29.0	12.0	34.5
Island Creek	23.2	2.0	15.0	3.6	30.0	0.5	7.0	0.5	4.3	0.1	5.5
South Nuka Island Creek	20.0	2.0	22.0	0.1	10.0	--	10.0	--	10.0	3.0	11.0
Desire Lake Creek	--	--	18.0	--	1.3	--	--	--	--	--	--
James Lagoon	--	--	--	--	--	--	--	--	--	--	--
Aialik Lagoon	--	--	25.0	0.3	--	--	2.0	--	--	--	--
Bear Creek	1.4	--	3.1	--	6.4	--	--	--	3.1	--	--
Salmon Creek	--	--	--	--	--	--	--	--	--	--	--
Thumb Cove	--	--	--	--	--	--	--	--	--	--	--
Humpy Cove	--	--	--	--	--	--	--	--	--	--	--
Tonsina Creek	--	--	--	--	--	--	--	--	2.9	0.1	--
Big Kamishak River	--	--	100.0	75.0	75.0	--	13.0	--	--	--	--
Little Kamishak River	--	--	100.0	24.0	--	--	28.0	3.5	--	0.5	2.0
Amakdedori Creek	60.0	--	80.0	--	10.0	--	8.0	--	--	1.0	13.0
Bruin Bay River	18.0	--	300.0	25.0	--	--	20.0	0.5	--	5.0	40.0
Sunday Creek	1.5	--	5.0	2.0	--	--	20.0	--	--	1.0	2.0
Brown's Peak Creek	--	--	25.0	10.0	20.0	10.0	11.0	--	--	2.0	--
Totals	387.1	111.7	1,181.6	237.2	392.6	152.3	379.0	129.0	220.3	128.9	261.3

-continued-

Appendix Table 24. (page 2 of 4)

Location	Y E A R										
	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
Humpy Creek	45.0	13.8	36.9	17.4	64.0	27.2	86.0	46.1	200.0	64.4	115.0
China Poot Creek	2.1	1.0	6.0	5.2	21.6	2.0	3.9	11.2	20.6	12.3	5.0
Tutka Lagoon Creek	16.7	1.5	6.5	2.6	17.6	11.5	14.0	15.0	10.6	17.3	21.1
Barabara Creek	4.0	0.6	—	0.2	22.7	0.2	5.7	1.4	10.0	5.8	16.8
Seldovia River	31.1	5.8	14.5	13.7	36.2	25.6	35.7	24.6	43.7	65.5	62.7
Port Graham River	13.2	2.4	7.0	2.8	27.3	6.5	20.6	6.7	32.7	40.2	18.4
Dogfish Lagoon	0.3	—	1.0	—	2.3	—	8.1	0.6	7.3	0.3	2.6
Port Chatham Creeks	15.5	1.0	5.0	0.2	7.7	—	14.2	0.3	20.8	7.7	11.2
Windy Right Creek	13.0	0.1	4.6	0.1	18.7	0.2	11.1	0.3	10.4	3.3	4.7
Windy Left Creek	35.4	0.4	12.9	0.1	9.7	0.2	47.3	1.1	74.8	10.9	31.3
Rocky River	1.6	8.2	2.0	1.5	4.4	2.7	36.7	8.2	85.0	6.4	25.0
Port Dick Creek	97.8	10.0	26.4	1.5	62.8	12.7	109.3	44.9	116.0	56.1	106.0
Island Creek	0.1	1.7	0.5	0.5	0.1	—	0.6	0.4	0.6	2.2	25.0
South Nuka Island Creek	14.0	0.3	16.0	—	28.0	—	12.0	—	15.0	0.3	16.0
Desire Lake Creek	30.0	0.3	3.0	—	0.4	0.6	0.8	1.0	3.0	16.0	5.0
James Lagoon	—	—	—	—	—	—	—	—	—	4.6	14.0
Aialik Lagoon	—	—	—	0.1	—	0.4	—	—	—	—	—
Bear Creek	—	0.5	—	4.9	—	10.0	—	7.8	—	13.3	0.4
Salmon Creek	—	—	—	—	—	16.9	—	11.0	—	15.5	0.1
Thumb Cove	—	—	—	1.1	—	2.0	—	2.0	—	1.2	1.0
Humpy Cove	—	—	—	0.6	—	1.4	—	0.9	—	5.7	0.4
Tonsina Creek	—	—	—	1.4	—	5.7	—	1.5	—	0.7	0.2
Big Kamishak River	—	—	15.0	1.0	—	8.0	—	12.0	10.0	2.0	—
Little Kamishak River	—	—	13.0	—	—	6.0	—	0.4	3.5	0.6	—
Amakdedori Creek	—	0.2	3.0	1.0	5.0	—	—	0.9	6.0	3.8	1.5
Bruin Bay River	22.0	2.5	2.0	0.6	20.0	13.5	60.0	33.0	200.0	400.0	95.0
Sunday Creek	43.0	2.0	5.0	0.1	20.0	0.3	9.0	0.2	12.0	5.2	14.2
Brown's Peak Creak	8.0	1.2	3.2	0.1	10.0	1.2	13.0	0.9	15.0	2.3	17.7
Totals	392.8	53.5	183.5	56.7	378.5	154.8	488.0	232.4	897.0	763.6	610.3

-continued-

Appendix Table 24. (page 3 of 4)

Location	Y E A R										
	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Humpy Creek	31.9	104.0	84.2	117.0	49.7	26.6	21.4	93.0	27.0	17.4	14.9
China Poot Creek	3.1	14.1	8.4	1.9	11.5	3.1	3.9	8.5	4.2	2.6	4.1
Tutka Lagoon Creek	18.5	12.9	10.5	14.0	13.4	4.8	11.2	11.9	38.5	16.8	26.7
Barabara Creek	2.1	14.8	1.0	1.6	1.8	0.3	0.7	4.5	3.9	10.9	2.2
Seldovia River	38.4	27.9	14.2	22.8	28.2	7.6	16.9	26.2	27.8	30.0	14.7
Port Graham River	28.9	4.6	10.9	26.3	17.5	3.8	7.9	19.1	20.1	29.0	5.4
Dogfish Lagoon	2.6	1.0	0.6	0.2	0.4	1.2	0.3	0.2	7.1	9.3	^c
Port Chatham Creeks	2.0	3.5	7.8	8.9	11.5	10.2	21.0	31.7	27.8	23.8	4.3
Windy Right Creek	4.7	4.3	3.4	5.4	2.5	2.0	1.3	6.6	7.1	20.7	3.9
Windy Left Creek	4.4	11.9	2.5	8.9	2.2	5.6	3.4	25.2	7.5	34.5	8.2
Rocky River	6.6	16.6	9.0	12.1	12.0	4.5	5.4	10.3	18.0	26.1	25.4
Port Dick Creek	19.9	64.1	44.6	65.3	41.6	4.5	12.0	55.4	41.7	54.2	6.9
Island Creek	15.0	15.3	35.0	27.9	16.6	0.1	7.2	6.7	25.0	24.4	12.5
South Nuka Island Creek	0.4	22.2	0.6	3.6	7.0	2.8	1.2	7.3	13.3	16.4	6.1
Desire Lake Creek	12.0	8.5	23.0	62.5	32.0	11.0	2.5	47.0	1.0	1.3	0.4
James Lagoon	6.0	5.1	4.0	9.0	6.6	1.1	1.7	4.9	3.8	4.4	0.4
Aialik Lagoon	5.0	3.0	4.0	9.4	6.0	1.5	0.7	0.8	—	—	^c
Bear Creek	7.9	0.8	7.7	4.1	14.0	3.5	0.2	1.7	4.4	15.4 ^b	2.3
Salmon Creek	21.0	0.5	10.2	2.1	8.3	1.7	0.1	1.6	—	^b	5.3
Thumb Cove	7.9	4.9	4.2	14.5	4.0	2.7	0.3	4.2	—	3.4	0.4
Humpy Cove	4.0	2.0	2.5	5.0	0.9	0.3	0.4	1.0	3.8	—	^c
Tonsina Creek	7.5	5.4	6.0	48.2	11.2	3.4	0.1	0.5	1.2	0.3	^c
Big Kamishak River	5.0	—	—	—	5.0	—	1.0	—	—	—	^c
Little Kamishak River	2.2	—	0.1	1.6	2.0	—	0.5	—	—	0.9	^c
Amakdedori Creek	6.3	0.2	—	1.0	6.0	0.4	1.0	2.0	0.1	0.7	3.2
Bruin Bay River	75.0	4.0	110.0	3.5	1,200.0	24.0	29.0	350.0	19.0	74.9	3.2
Sunday Creek	12.0	4.7	12.0	11.4	109.0	29.7	18.0	103.0	2.8	20.9	2.9
Brown's Peak Creak	3.5	1.7	6.8	7.0	28.0	40.2	17.0	120.0	1.0	16.7	5.0
Totals	353.8	358.0	423.2	495.2	1,648.9	196.6	186.3	943.3	306.1	455.0	158.4

-continued-

Appendix Table 24. (page 4 of 4)

Location	Y E A R								1960-97	Escapement
	1993	1994	1995	1996	1997	1998	1999	2000	Average	Goal
Humpy Creek	36.0	14.1	89.3	9.0	78.3	17.5			47.6	25-50
China Poot Creek	1.6	5.7	2.0	2.8	2.8	5.7			6.5	5
Tutka Lagoon Creek	27.4	14.5	15.9	3.5	45.0	17.5			14.2	6-10
Barabara Creek	11.9	4.5	10.8	2.4	12.5	2.8			4.6	18-24
Seldovia River	43.4	24.4	48.5	17.8	39.1	31.5			33.2	25-35
Port Graham River	12.8	7.6	10.0	7.0	12.5	12.6			14.8	20-40
Dogfish Lagoon	0.3	1.3	13.3	2.3	20.0	6.7			2.8	-
Port Chatham Creeks	22.2	3.3	14.0	8.6	42.7	22.2			10.5	10-15
Windy Right Creek	13.6	2.2	11.4	9.9	13.9	19.5			6.2	10
Windy Left Creek	25.9	3.0	31.6	2.5	64.6	12.9			13.6	30-50
Rocky River	70.0	17.1	56.3	80.1	48.1	165.0			29.6	50
Port Dick Creek	37.0	18.1	6.6	23.2	36.9	59.1			39.3	20-100
Island Creek	12.1	28.3	10.6	40.1	71.1	83.6			11.1	12-18
South Nuka Island Creek	34.3	1.4	6.2	6.8	9.3	14.0			10.0	10
Desire Lake Creek	19.3	—	—	—	6.2	6.2			12.5	10-20
James Lagoon	3.3	0.8	0.6	—	—	—			4.4	5-10
Aialik Lagoon	—	—	1.1	—	—	0.4			4.2	5
Bear Creek	6.6 ^b	34.8 ^b	38.6 ^b	8.0 ^b	6.3 ^b	13.2 ^b			8.0	5
Salmon Creek	^b	^b	^b	^b	^b				7.3	10
Thumb Cove	5.5	10.8	9.3	9.5	4.7	21.0			4.7	4
Humpy Cove	0.9	2.2	1.8	3.4	2.2	1.2			2.1	2
Tonsina Creek	3.2	7.0	0.5	0.4	0.4	2.3			5.1	5
Big Kamishak River	—	—	—	16.7	—	2.0			24.2	20
Little Kamishak River	—	—	—	—	—	—			11.1	20
Amakdedori Creek	1.7	0.7	4.5	—	1.7	—			8.2	5
Bruin Bay River	86.4	5.9	307.3	27.5	162.7	134.9			108.4	25-50
Sunday Creek	57.8	3.1	95.9	2.8	52.5	24.0			19.6	10
Brown's Peak Creak	41.6	1.3	96.7	2.4	42.3	7.9			16.9	10
Totals	574.8	212.1	882.8	286.7	775.8	683.7			412.8	377-593

^a Escapement estimates are derived from periodic ground surveys with stream life factors applied, or from periodic aerial surveys. Aerial survey estimates after 1990 incorporate stream life factors; prior to 1990, aerial estimates are peak aerial survey counts adjusted for survey conditions and time of surveys.

^b Escapement figure for Bear Creek represents the combined escapement for Bear and Salmon Creeks.

^c Insufficient data for escapement estimates.

Appendix Table 25. Estimated chum salmon escapements in thousands of fish for the major spawning systems of Lower Cook Inlet, 1978 - 1998^a.

Year	Port Graham	Dogfish Lagoon	Rocky River	Pt. Dick Head	Island Creek	Big Kamishak	Little Kamishak	McNeil River	Bruin Bay	Ursus Cove	Cotton-wood	Iniskin Bay	Total
1978	4.8	9.3	6.3	8.9	16.9	23.0	30.0	45.0	4.0	9.7	12.5	11.4	181.8
1979	2.2	8.2	35.0	4.0	16.8	15.0	15.0	8.0	15.0	5.0	2.5	4.0	130.7
1980	1.1	4.0	23.0	4.2	10.9	10.0	13.0	8.0	15.0	8.0	4.2	9.3	110.7
1981	4.8	11.5	12.5	4.1	17.5	11.0	6.0	30.0	10.0	10.0	9.0	9.0	135.4
1982	2.5	8.5	2.8	1.7	8.7	25.0	18.0	25.0	10.0	9.0	7.0	12.8	131.0
1983	1.9	5.3	4.0	4.5	36.2	25.0	25.0	48.0	5.5	7.7	8.3	12.0	183.4
1984	2.1	8.6	3.5	2.7	25.6	19.0	12.0	21.0	8.0	7.0	6.5	9.8	125.8
1985	0.5	4.9	2.5	1.0	9.1	6.0	4.5	9.5	2.0	3.0	3.0	5.0	51.0
1986	0.6	2.5	2.0	1.7	8.6	24.0	17.0	22.0	2.0	11.0	11.0	5.9	108.3
1987	1.5	2.0	0.2	6.1	13.2	12.0	18.0	26.0	10.0	9.9	17.0	9.1	125.0
1988	3.0	8.6	0.3	9.0	7.8	15.0	13.0	49.0	7.0	9.4	16.0	9.5	147.6
1989	1.3	1.8	1.2	3.3	4.8	30.0	12.0	34.0	8.0	6.3	8.0	5.9	116.6
1990	2.6	1.0	0.8	1.1	2.3	2.5	7.9	8.0	4.0	3.8	4.3	8.4	46.7
1991	1.1	3.1		7.4	17.3	8.7	8.4	10.0	6.0	1.3	7.7	8.3	79.3
1992	1.4	0.8	1.7	5.4	6.7	4.5	7.1	19.2	8.5	1.7	6.1	3.4	66.5
1993	2.5	5.4	0.1	2.5	3.6	9.1	6.3	17.4	6.0	7.7	12.0	8.0	78.8
1994	5.2	11.3	1.9	3.5	8.8	—	9.0	15.0	6.1	6.2	10.2	18.9	96.1
1995	3.8	4.2	5.1	3.3	7.7	^b	^b	14.4	6.6	11.1	12.0	22.7	90.9
1996	3.7	6.7	2.0	2.3	6.9	11.1	4.4	16.1	14.9	7.6	16.1	7.8	99.6
1997	4.1	12.7	1.1	1.9	5.2	—	—	27.5	8.8	6.2	5.6	15.4	88.5
1998	5.1	9.8	0.7	1.8	3.4	7.1	9.7	23.5	9.4	4.6	2.3	18.6	96.0
20-Year Avg.	2.5	6.0	5.6	3.9	11.7	14.8	12.6	22.7	7.9	7.1	9.0	9.8	113.5
1978-87 Avg.	2.2	6.5	9.2	3.9	16.4	17.0	15.9	24.3	8.2	8.0	8.1	8.8	128.3
1988-97 Avg.	2.9	5.6	1.6	4.0	7.1	11.6	8.5	21.1	7.6	6.1	9.8	10.8	96.6
Esc. goal	4-8	5-10	20	4	10-15	20	20	20-40	5-10	5-10	10	10	133-177

^a Escapement estimates are derived from periodic ground surveys with stream life factors applied, or from periodic aerial surveys. Aerial survey estimates after 1990 incorporate stream life factors; prior to 1990, aerial estimates are peak aerial survey counts adjusted for survey conditions and time of surveys.

^b Insufficient data to generate escapement estimates.

Appendix Table 26. Personal use/subsistence set gillnet salmon catch in numbers of fish by species and effort, Southern District, Lower Cook Inlet, 1969 - 1998^a.

Year	Permits Issued	Permits Returned		Permits		Total			Catch			Total
		Number	%	Did Fish	Not Fished	Chinook	Sockeye	Coho	Pink	Chum	Other	
1969	47	44	93.6	35	9	0	9	752	38	0	17	816
1970	78	73	93.6	55	18	0	12	1,179	143	13	39	1,386
1971	112	95	84.8	53	42	2	16	1,549	44	7	20	1,638
1972	135	105	77.8	64	41	1	11	975	48	69	19	1,123
1973	143	128	89.5	82	46	0	18	1,304	84	40	9	1,455
1974	148	118	79.7	52	66	0	16	376	43	77	27	539
1975	292	276	94.5	221	55	4	47	1,960	632	61	95	2,799
1976	242	221	91.3	138	83	16	46	1,962	1,513	56	75	3,668
1977	197	179	90.9	137	42	12	46	2,216	639	119	84	3,116
1978	311	264	84.9	151	113	4	35	2,482	595	34	89	3,239
1979	437	401	91.8	238	163	6	37	2,118	2,251	41	130	4,583
1980	533	494	92.7	299	195	43	32	3,491	1,021	25	153 ^b	4,765
1981	384	374	97.4	274	100	25	64	4,314	732	89	100	5,324
1982	395	378	95.7	307	71	39	46	7,303	955	123	8	8,474
1983	360	328	91.1	210	118	4	21	2,525	330	40	2	2,922
1984	390	346	88.7	219	127	4	25	3,666	821	87	25	4,628
1985	316	302	95.6	205	97	5	43	3,372	166	35	3	3,624
1986	338	310	91.7	247	63	7	68	3,831	3,132	56	0	7,094
1987	361	338	93.6	249	89	5	50	3,977	279	61	0	4,372
1988	438	404	92.2	287	117	14	60	4,877	1,422	75	0	6,448
1989	466	452	97.0	332	120	41	156	7,215	882	53	49	8,396
1990	578	543	93.9	420	123	12	200	8,323	1,846	69	0	10,450
1991	472	459	97.2	295	164	8	47	4,931	366	23	0	5,375
1992	365	350	95.9	239	111	5	63	2,277	643	21	0	3,009
1993	326	317	97.2	215	102	6	44	1,992	463	18	0	2,523
1994	286	284	99.3	224	60	66	80	4,097	1,178	18	0	5,439
1995	235	232	98.7	178	54	118	108	2,916	343	7	0	3,492
1996	299	293	98.0	213	80	302	102	3,347	1,022	24	0	4,797
1997	276	264	95.7	185	79	383	191	1,814	252	12	0	2,652
1998	227	214	94.3	142	72	135	20	1,461	167	5	0	1,788
69-97												
Avg.	310	289	93.5	201	88	39	59	3,157	753	48	29	4,084

^a Figures after 1991 include information from both returned permits and inseason oral reports.

^b Steelhead trout (*Onchorhynchus mykiss*).

Appendix Table 27. Summary of personal use/subsistence salmon gillnet fishermen in the Southern District of Lower Cook Inlet (excluding the Port Graham/Nanwalek subsistence fishery and the Seldovia subsistence fishery) by area of residence, 1978 - 1998.

Year	Homer/ Fritz Cr.		Anchorage Area ^a		Halibut Cove		Anchor Pt./ Ninilchik		Seldovia		Pt. Graham/ Nanwalek		Kenai/ Soldotna		Other		Total Permits Issued
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
1978	214	68.8	40	12.9	5	1.6	30	9.6	12	3.9	3	1.0	4	1.3	3	1.0	311
1979	276	62.7	67	15.2	2	0.5	61	13.9	3	0.7	0	0.0	11	2.5	20	4.5	440
1980	310	57.9	81	15.1	0	0.0	80	15.0	7	1.3	0	0.0	42	7.9	13	2.4	535
1981	274	71.4	43	11.2	8	2.1	37	9.6	3	0.8	1	0.3	14	3.6	4	1.0	384
1982	295	74.7	19	4.8	9	2.3	44	11.1	0	0.0	0	0.0	7	1.8	21	5.3	395
1983	267	77.8	24	7.0	3	0.9	33	9.6	8	2.3	0	0.0	0	0.0	8	2.3	343
1984	266	72.1	20	5.4	6	1.6	62	16.8	5	1.4	1	0.3	5	1.4	4	1.1	369
1985	251	79.4	15	4.7	6	1.9	33	10.4	6	1.9	0	0.0	2	0.6	3	0.9	316
1986	280	82.8	18	5.3	4	1.2	29	8.6	1	0.3	0	0.0	1	0.3	5	1.5	338
1987	284	78.7	25	6.9	3	0.8	37	10.2	7	1.9	0	0.0	2	0.6	3	0.8	361
1988	338	77.2	36	8.2	5	1.1	43	9.8	6	1.4	0	0.0	10	2.3	0	0.0	438
1989	348	74.7	36	7.7	5	1.1	51	10.9	8	1.7	0	0.0	6	1.3	12	2.6	466
1990	441	76.3	36	6.2	5	0.9	65	11.2	12	2.1	0	0.0	6	1.0	13	2.2	578
1991	384	81.4	27	5.7	8	1.7	41	8.7	6	1.3	0	0.0	4	0.8	2	0.4	472
1992	302	82.7	21	5.8	5	1.4	32	8.8	3	0.8	0	0.0	1	0.3	1	0.3	365
1993	242	74.2	25	7.7	5	1.5	44	13.5	3	0.9	0	0.0	5	1.5	2	0.6	326
1994	235	82.2	20	7.0	4	1.4	21	7.3	1	0.3	0	0.0	1	0.3	4	1.4	286
1995	191	81.3	15	6.4	7	3.0	20	8.5	1	0.4	0	0.0	0	0.0	1	0.4	235
1996	241	80.6	16	5.4	7	2.3	26	8.7	3	1.0	1	0.3	2	0.7	3	1.0	299
1997	232	84.1	13	4.7	3	1.1	20	7.2	4	1.4	0	0.0	1	0.4	3	1.1	276
1998	175	77.1	18	7.9	2	0.9	24	10.6	5	2.2	0	0.0	2	0.9	1	0.4	227
20-Year Avg.	284	75.3	30	7.9	5	1.3	40	10.7	5	1.3	0	0.1	6	1.6	6	1.7	377
1978-87 Avg.	272	71.7	35	9.3	5	1.2	45	11.8	5	1.4	1	0.1	9	2.3	8	2.2	379
1988-97 Avg.	295	79.0	25	6.5	5	1.4	36	9.7	5	1.3	0	0.0	4	1.0	4	1.1	374

^a After 1989, "Anchorage Area" includes Mat-Su Valley, Eagle River, Chugiak, and or Fort Richardson.

Appendix Table 28. Subsistence salmon catch in numbers of fish by species for the village of Port Graham, Lower Cook Inlet, 1981 - 1998^a.

Year	SALMON HARVEST					Total	Households Reporting ^b
	Chinook	Sockeye	Coho	Pink	Chum		
1981 ^c	116	1,694	625	298	150	2,883	47
1982 ^b	98	798	508	851	193	2,448	38
1983 ^d	57	1,066	440	169	65	1,797	31
1984 ^c	21	2,095	166	215	6	2,503	34
1985 ^c	156	469	190	42	22	879	^e
1986 ^b	118	279	179	234	13	823	36
1987 ^f	21	186	574	264	69	1,114	31
1988 ^g	90	380	447	577	88	1,582	31
1989	48	94	555	524	46	1,267	32
1990	180	472	811	1,107	68	2,638	31
1991	178	61	355	1,454	173	2,221	32
1992 ^b	127	100	449	707	167	1,550	^e
1993 ^b	248	153	396	978	130	1,905	27
1994 ^b	267	246	872	858	452	2,695	43
1995 ^b	441	398	345	679	364	2,227	49 ^h
1996 ^b	251	669	373	267	227	1,787	45
1997 ^e							
1998 ^c							
81-96 Avg	151	573	455	577	140	1,895	36

^a Data source: ADF&G, Subsistence Division, data files.

^b Prior to 1995, figures represent only the single highest monthly total of households that *actually fished* over the course of the season; beginning in 1995, figures represent the total number of different households reporting over the course of the entire season, even if they did not fish.

^c Data include both subsistence set gillnet and rod/reel/handline harvest.

^d Data include only subsistence set gillnet harvest.

^e No data available.

^f 46% set gillnet harvest, 54% rod/reel harvest.

^g 51% set gillnet harvest, 49% rod/reel harvest.

^h Salmon totals and households include 3 reports from non-residents of Port Graham village.

Appendix Table 29. Subsistence salmon catch in numbers of fish by species for the village of Nanwalek (formerly English Bay), Lower Cook Inlet, 1981 - 1998^a.

Year	SALMON HARVEST					Total	Households Reporting ^b
	Chinook	Sockeye	Coho	Pink	Chum		
1981 ^c	24	1,075	314	621	19	2,053	29
1982 ^b	13	1,584	1,305	1,850	36	4,788	31
1983 ^d	0	1,784	367	363	10	2,524	28
1984 ^c	18	1,225	385	404	0	2,032	26
1985 ^c	5	696	530	313	2	1,546	^e
1986 ^b	4	378	296	825	2	1,505	21
1987 ^f	2	626	322	476	45	1,471	21
1988 ^g	8	609	385	1,185	35	2,222	26
1989	0	60	651	868	0	1,579	29
1990	46	636	616	1,968	49	3,315	30
1991	4	574	1,508	3,087	46	5,219	35
1992 ^b	72	430	570	519	59	1,650	^e
1993 ^b	24	1,018	570	1,703	115	3,430	21
1994 ^b	29	642	512	1,127	49	2,359	25
1995 ^b	77	1,126	150	431	0	1,784	29
1996 ^b	55	1,054	560	437	25	2,131	25
1997 ^e							
1998 ^e							
81-96 Avg	24	845	565	1,011	31	2,476	27

^a Data source: ADF&G, Subsistence Division, data files.

^b Prior to 1995, figures represent only the single highest monthly total of households that *actually fished* over the course of the season; beginning in 1995, figures represent the total number of different households reporting over the course of the entire season, even if they did not fish.

^c Data include both subsistence set gillnet and rod/reel harvest.

^d Data include only subsistence set gillnet harvest.

^e No data available.

^f 63% set gillnet harvest, 37% rod/reel harvest.

^g 37% set gillnet harvest, 63% rod/reel harvest.

Appendix Table 30. Subsistence set gillnet catches of salmon by species and permit/effort information for the Seldovia area, Lower Cook Inlet, 1996 – 1998.

YEAR	NUMBER OF PERMITS				NUMBER OF SALMON HARVESTED					
	Issued	Returned	Fished	Not Fished	Chinook	Sockeye	Coho	Pink	Chum	Total
Early Season: April - May										
1996	41	41	13	28	51	7	0	0	0	58
1997	19	16	12	4	44	19	0	0	0	63
1998	20	19	10	9	132	61	0	8	0	201
Avg.	27	25	12	14	76	29	0	3	0	107
Late Season: August										
1996	4	3	1	2	0	1	0	0	0	1
1997	1	1	0	1	0	0	0	0	0	0
1998	3	2	1	1	0	0	0	0	0	0
Avg.	3	2	1	1	0	0	0	0	0	0

Appendix Table 31. ADF&G, CIAA, and/or CRRC salmon stocking projects and releases of salmon fry, fingerling, and smolt, in millions of fish, Lower Cook Inlet, 1984 - 1998.

JUVENILE SOCKEYE SALMON														
YEAR	Leisure Lake	Hazel Lake	Chenik Lake	Paint Upper	River Lower	Lakes Elusivak	Kirschner Lake	Bruin Lake	Ursus Lake	Port Dick Lake	English Bay Lakes	Bear Lake	Grouse Lake	TOTAL SOCKEYE
1984	2.110													2.100
1985	2.018													2.018
1986	2.350		0.839	0.500	0.320									4.009
1987	2.022		1.000				0.867			0.705				4.594
1988	2.100	0.783	2.600	1.100	0.552	0.521	0.521			0.222				8.399
1989	2.000	1.000	3.500	1.000	0.500	0.500	0.250			0.430		2.200		11.380
1990	1.750	1.250	3.250	1.000	0.500	0.500	0.250	0.500			0.350	2.400		11.750
1991	2.000	1.300	2.200	0.500	0.250		0.250	0.250			0.241	1.619		8.610
1992	2.000	1.000	2.750	0.500	0.250		0.250	0.250	0.250		0.290	2.370		9.910
1993	2.000	1.000	1.400	0.500	0.250		0.250	0.250	0.250		0.581	1.813		8.294
1994	0	0	0	0	0		0.300	0	0		0.800	0.170		1.270
1995	1.632	1.061	1.129	0.337	0.251		0.251	0.251	0.252		0	0.360		5.524
1996	1.490	1.030	0.951	0.500	0		0.250	0.250	0.250		0.155	0.864	0.217	5.957
1997	2.000	1.000	0				0.250				0.199	0.788	2.425	6.662
1998	1.870	1.220					0.234				0	0.265	2.021	5.843
AVG.	1.823	0.968	1.635	0.540	0.261	0.507	0.327	0.250	0.200	0.452	0.291	1.272	0.818	6.360

- continued -

Appendix Table 31. (page 2 of 2)

YEAR	JUVENILE PINK SALMON				JUVENILE CHINOOK SALMON					JUVENILE COHO SALMON			
	Tutka Bay Hatchery	Halibut Cove Lagoon	Homer Spit	TOTAL PINKS	Seldovia Bay	Halibut Cove Lagoon	Homer Early	Spit Late	TOTAL CHINOOK	Caribou Lake	Seldovia Lake	Homer Spit	TOTAL COHO
1984	19.560			19.560				0.080					
1985	23.500			23.500			0.098	0.152	0.250	0.139	0.083		0.222
1986	23.100	2.000		25.100			0.101	0.104	0.205	0.138	0.072		0.210
1987	20.500	3.000	0.295	23.795	0.084	0.094	0.104		0.282	0.150	0.045		0.195
1988	12.000	3.000	0.300	15.300	0.084	0.094	0.104		0.282	0.150	0.045	0.060	0.255
1989	30.100	6.000	0.332	36.432	0.108	0.115	0.104		0.327	0.182	0.080	0.143	0.405
1990	23.600	6.000	0.303	29.903	0.099	0.112	0.212		0.423	0.180	0.050	0.123	0.353
1991	23.600	6.000	0.303	29.903	0.091	0.092	0.191		0.374	0.180	0.050	0.100	0.330
1992	23.600	6.000	0.300	29.900	0.113	0.117	0.226	0.126	0.582	0.150		0.100	0.250
1993	43.000	6.000		49.000	0.107	0.100	0.212	0.100	0.519	0.150		0.116	0.266
1994	61.000			61.000	0.106	0.107	0.192	0.157	0.562	0.064		0.156	0.220
1995	63.000			63.000	0.113	0.036	0.228	0.124	0.501			0.110	0.110
1996	105.000			105.000	0.109	0.103	0.101	0.121	0.434			0.150	0.150
1997	89.000			89.000	0.092	0.078	0.216	0.105	0.491			0.120	0.120
1998	90.000			90.000	0.079	0.073	0.137	0.120	0.409			0.148	0.148
AVG.	43.371	4.750	0.306	48.426	0.099	0.094	0.158	0.122	0.472	0.148	0.061	0.121	0.330

Appendix Table 32. Catch of Pacific herring in short tons and effort in number of permits by district in the commercial sac roe seine fishery, Lower Cook Inlet, 1978 - 1998^a.

Year	<u>Southern</u>		<u>Kamishak</u>		<u>Eastern</u>		<u>Outer</u>		<u>Total</u>	
	Tons	Permits	Tons	Permits	Tons	Permits	Tons	Permits	Tons	Permits
1978	17	7	402	44	---	---	---	---	419	44
1979	13	3	415	35	---	---	---	---	428	36
1980	---	---	---	---	---	---	---	---	---	---
1981	---	---	---	---	---	---	---	---	---	---
1982	---	---	---	---	---	---	---	---	---	---
1983	---	---	---	---	---	---	---	---	---	---
1984	---	---	---	---	---	---	---	---	---	---
1985	---	---	1,132	23	204	7	12	2	1,348	29
1986	---	---	1,959	54	167	4	28	3	2,154	57
1987	---	---	6,132	63	584	4	202	9	6,918	69
1988	---	---	5,548	75	0	0	0	0	5,548	75
1989	170	6	4,801	75	0	0	0	0	4,971	75
1990	---	---	2,264	75	---	---	---	---	2,264	75
1991	---	---	1,992	58	0	0	0	0	1,992	58
1992	---	---	2,282	56	0	0	0	0	2,282	56
1993	---	---	3,570	60	---	---	---	---	3,570	60
1994	---	---	2,167	61	---	---	---	---	2,167	61
1995	---	---	3,378	60	---	---	---	---	3,378	60
1996	---	---	2,984	62	---	---	---	---	2,984	62
1997	---	---	1,746	45	---	---	---	---	1,746	45
1998	---	---	331	20	---	---	---	---	331	20
20-Year										
Average	67	5	2,718	56	136	2	35	2	2,811	57
1978-87										
Average	15	5	2,008	44	---	---	---	---	2,253	47
1988-97										
Average	170	6	3,073	63	0		0		3,090	63

^a Data source: ADF&G fish ticket database.

Appendix Table 33. Preseason estimates of biomass and projected commercial sac roe seine harvests, and actual harvests, for Pacific herring (*Clupea pallasii*) in short tons, average roe recovery, numbers of permits making landings, and exvessel value in millions of dollars, Kamishak Bay District, Lower Cook Inlet, 1978 - 1998.

Year	PRESEASON		Actual Commercial Harvest (st) ^a	Average Roe %	No. of Permits w/Landings	Exvessel Value ^b (\$\$ millions)
	Forecasted Biomass (st)	Projected Harvest (st) ^a				
1978	c	d	402	---	44	e
1979	c	d	415	---	36	e
1980	c	---	CLOSED	---	---	---
1981	c	---	CLOSED	---	---	---
1982	c	---	CLOSED	---	---	---
1983	c	---	CLOSED	---	---	---
1984	c	---	CLOSED	---	---	---
1985	c	d	1,132	11.3	23	1.00
1986	c	d	1,959	10.4	54	2.20
1987	c	3,833	6,132	11.3	63	8.40
1988	c	5,190	5,548	11.1	74	9.30
1989	37,785	5,000	4,801	9.5	74	3.50 ^f
1990	28,658	2,292	2,264	10.8	75	1.80
1991	17,256	1,554	1,992	11.3	58	1.30
1992	16,431	1,479	2,282	9.7	56	1.40
1993	28,805	2,592	3,570	10.2	60	2.20
1994	25,300	3,421	2,167	10.6	61	1.50
1995	21,998	2,970	3,378	9.8	60	4.00
1996	20,925	2,250	2,984	10.1	62	6.00 ^f
1997	25,300	3,420	1,746	9.3	45	0.40
1998	19,800	1,780	331	8.5	20	0.07
<hr/>						
1978-97						
Average	24,645	3,058	2,788	10.5	57	3.6

- ^a Kamishak Bay allocation only, does not include Shelikof Strait food/bait allocation.
- ^b Exvessel values exclude any postseason retroactive adjustments (except where noted).
- ^c Prior to 1989, preseason forecasts of biomass were not generated.
- ^d Prior to 1987, preseason harvest projections were not generated.
- ^e Data not available.
- ^f Includes retroactive adjustment.

Appendix Table 34. Summary of herring sac roe seine fishery openings and commercial harvests in the Kamishak Bay District of Lower Cook Inlet, 1969 - 1998.

Year	Dates of Openings	Total Hrs. Open	Harvest (short tons)	Catch Rate (short tons/hour open)	Number of Permits w/Landings
1969-73	No closed periods				
1974	1/1 - 5/20		2,114		26
1975	1/1 - 6/6	(Closed Iniskin Bay 5/17)	4,119		40
1976	1/1 - 5/21	(Closed Iniskin Bay 5/17; reopened Kamishak 6/2)	4,824		66
1977	1/1 - 5/31	(Closed Kamishak Dist. 5/12; reopened 5/14 - 5/17; reopened 5/29 - 5/31)	2,908		57
1978 ^a	4/16 - 5/31	96	402	4.2	44
1979	5/12 - 5/15	72	415	5.8	36
1980 through 1984	CLOSED	0	0		
1985	4/20 - 6/15	1,350 (56.2 days)	1,132	0.8	23
1986	4/20 - 6/13	1,303 (54.3 days)	1,959	1.5	54
1987	4/21 - 4/23	65	6,132	94.3	63
1988	4/22 - 4/29	42	5,548	132.1	74
1989	4/17 - 4/30	24.5	4,801	196.0	74
1990	4/22 - 4/23	8	2,264	283.0	75
1991	4/26	1	1,922	1,922.0	58
1992	4/24	0.5	2,282	4,564.0	56
1993	4/21	0.75	3,570	4,760.0	60
1994	4/25	0.5	778	1,556.0	35
	4/29	1.0	1,338	1,338.0	53
1995	4/27	0.5	1,685	3,370.0	45
	4/28	1.0	1,693	1,693.0	44
1996	4/24	0.5	2,984	5,968.0	62
1997	4/25 ^b	0.5	0	0	0
	4/29	1.5	1,580	1,053.3	42
	4/30	8.0	61	7.6	^c
	5/1	12.0	51	4.3	4
	5/22 ^d	^d	54	^d	-
1998	4/21	0.5	160	320.0	12
	4/22	2.0	136	68.0	11
	5/14 ^d	^d	10	^d	-
	5/19 ^d	^d	23	^d	-

^a Management by emergency order began.

^b Despite the open fishing period, the entire fleet collectively agreed not to fish due to ongoing price negotiations with processors.

^c To comply with AS 16.05.815 CONFIDENTIAL NATURE OF CERTAIN REPORTS AND RECORDS, effort data has been masked where fewer than four vessels fished in a given area.

^d ADF&G test fishing harvest.

Appendix Table 35. Estimates of Pacific herring (*Clupea pallasii*) total biomass in short tons using two different methods, actual commercial sac roe seine harvest in short tons, and percent exploitation, Kamishak Bay District, Lower Cook Inlet, 1978 - 1998.

Year	Aerial Survey Total Biomass Estimate (st) ^a	ASA Model Total Biomass Estimate (st) ^{b,c}	Actual Commercial Harvest (st)	Estimated Exploitation Rate (%) ^b
1978	1,202	1,651	402	24.3
1979	3,315	4,691	415	8.8
1980	^d	10,194	CLOSED	---
1981	5,130	14,366	CLOSED	---
1982	4,835	22,817	CLOSED	---
1983	4,750	27,113	CLOSED	---
1984	6,500	28,702	CLOSED	---
1985	13,320	31,436	1,132	3.6
1986	26,001	30,168	1,959	6.5
1987	35,332	28,521	6,132	21.5
1988	29,548	23,410	5,548	23.7
1989	35,701	20,723	4,801	23.2
1990	19,664	17,174	2,264	13.2
1991	18,163 ^e	16,503	1,992	12.1
1992	24,077	16,393	2,282	13.9
1993	32,439	17,384	3,570	20.5
1994	25,344 ^e	16,187	2,167	13.4
1995	25,115	13,864	3,378	24.4
1996	21,121	10,256	2,984	29.1
1997	-----	7,734	1,746	22.6
1998	-----	7,753	331	4.3
1978-97 Average	18,219	17,964	2,718	15.6

^a Diverse methods have been used to generate historical aerial survey biomass estimates; after 1989, see LCI herring forecast report or statewide herring forecast document to determine specific method for individual year.

^b Figures are based on the best available data at the time of publishing and are subject to change; therefore all figures herein supercede those previously reported.

^c ASA model integrates heterogeneous data sources and simultaneously minimizes differences between observed and expected return data to forecast the following year's biomass as well as hindcast previous years' biomass.

^d No data available.

^e Due to poor aerial survey conditions, biomass was calculated from the preseason estimate of abundance, adjusted to match observed age composition samples in the commercial catch.

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