

INFORMATIONAL LEAFLET NO. 209

PRELIMINARY FORECASTS AND PROJECTIONS FOR 1983

ALASKAN SALMON FISHERIES

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February 1983

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ABSTRACT

More than 109 million salmon were harvested by commercial fishermen in Alaska in 1982, down slightly from the 1981 commercial catch of 113.3 million fish. The 1982 harvest was the sixth largest in history.

In 1983, commercial harvests of salmon in Alaska are expected to total about 95 million fish, down noticeably from catches since 1980, which were all close to 110 million fish. The projected decline is due almost entirely to anticipated weaker returns of pink salmon to Southeastern Alaska. There is considerable uncertainty associated with the 1983 projection, but the actual harvest is not expected to be below 70 million fish or above 135 million. Based on projection experience since 1970, only 1 of 4 realized harvests would fall outside this range.

INTRODUCTION

This report reviews Alaska's 1982 commercial salmon season and presents preliminary salmon return forecasts and harvest projections for 1983 commercial salmon fisheries. The report is released in December, before final catch figures are available, to provide preliminary information to the Board of Fisheries, the fishing industry, and the public well before the season begins.

Projections of statewide commercial salmon harvests have been published yearly by the Alaska Department of Fish and Game since 1969 (ADF&G; 1969-1982). Table 1 summarizes the accuracy of these projections. On the average, the projections have been too low by 4 million fish, or 7% of the average harvest of 63 million fish. Without regard to sign, the mean error is 15 million fish, 24% of the average harvest. Projection errors stem primarily from inadequate knowledge of salmon escapements, numbers of juveniles produced, and early marine survival.

From 1974 through 1981, the Department's salmon harvest projections were consistently below realized harvests. Alaska's salmon runs were steadily recovering from the effects of severe winters in the early 1970's during this period. Mild winters and generally warmer sea water temperatures are thought to be the major factor behind the higher juvenile salmon survival which has resulted in recent phenomenally high commercial harvests. These very favorable environmental conditions have worked in tandem with the painstaking fisheries management which insured well-distributed salmon escapements in the early 1970s when salmon returns were weak throughout the state. Pink salmon runs in almost all areas of the state have now rebounded to robust levels. State and private non-profit hatcheries contributed several million salmon to the 109-million-fish 1982 harvest, and these supplemental production sources are becoming increasingly significant.

Table 1. Projected and realized Alaska commercial salmon harvests with absolute and relative errors, 1970-1982.

Year	Millions of fish			(4) Relative error (% of actual harvest): (3)/(2) X 100%
	(1) Projected harvest	(2) Actual harvest	(3) Error: (1) - (2)	
1970	91.5	68.5	23.0	34%
1971	41.5	47.5	-6.0	-13%
1972	46.7	32.0	14.7	46%
1973	30.0	22.3	7.7	35%
1974	15.6	21.9	-6.3	-29%
1975	19.9	26.2	-6.3	-24%
1976	37.1	44.4	-7.3	-16%
1977	34.7	50.8	-16.1	-32%
1978	62.9	82.3	-19.4	-24%
1979	72.0	88.8	-16.8	-19%
1980	102.6	110.0	-7.4	-7%
1981	74.5	113.3	-38.8	-34%
1982	<u>135.0</u>	<u>109.1</u> ¹	<u>25.9</u>	24%
TOTAL	764.0	817.1	-53.1 (195.7) ²	
1970-1982 average	58.8	62.9	-4.1 (15.1) ²	-7% (24%) ²

¹ Preliminary data. Compiled 22 November 1982.

² Values in parentheses are the sum or average of errors without regard to sign.

Glossary

- Salmon return or run: The total number of mature salmon returning in a given year from ocean rearing areas to coastal waters.
- Escapement, spawning population or brood stock: That portion of a salmon run which is not harvested and survives to reach the spawning grounds.
- Forecast: Forecast harvests and returns are estimated using information such as parent-year escapements, subsequent fry abundance, spring sea water temperatures, and escapement requirements.
- Harvest projections: Harvest projections are averages of recent harvests. They may be modified subjectively when qualitative escapement or other relevant information is available. Only harvests are projected, and harvest projections are given only for salmon runs which have no forecast.

Alaska Pacific Salmon Species

<u>Common Name</u>	<u>Scientific Name</u>
chinook, king	<i>Oncorhynchus tshawytscha</i>
sockeye, red	<i>Oncorhynchus nerka</i>
coho, silver	<i>Oncorhynchus kisutch</i>
pink, humpy, humpback	<i>Oncorhynchus gorbuscha</i>
chum, dog	<i>Oncorhynchus keta</i>

Brood years of salmon returning to spawn in 1983, by species and age¹

Species	Age of Returning Salmon in Years				
	2	3	4	5	6
Pink	1981				
Chum		1980	1979		
Coho		1980	1979		
Sockeye			1979	1978	1977
Chinook			1979	1978	1977

¹ The brood years listed for each species generally comprise more than 90% of the run.

The boundaries of and major fishing areas within the Southeastern, Central, and Western statistical regions are shown in Figure 1. These regions and areas are the ones used in the Department's statistical leaflet series and in prior statistical reports.

Acknowledgments

Information on which this report is based was contributed by Division of Commercial Fisheries biologists located in field offices throughout the state. Area biologists, not individually identified, supplied reviews of the 1982 fishing season. Individual credit for forecast material is given with the area forecast discussions in the Appendix.

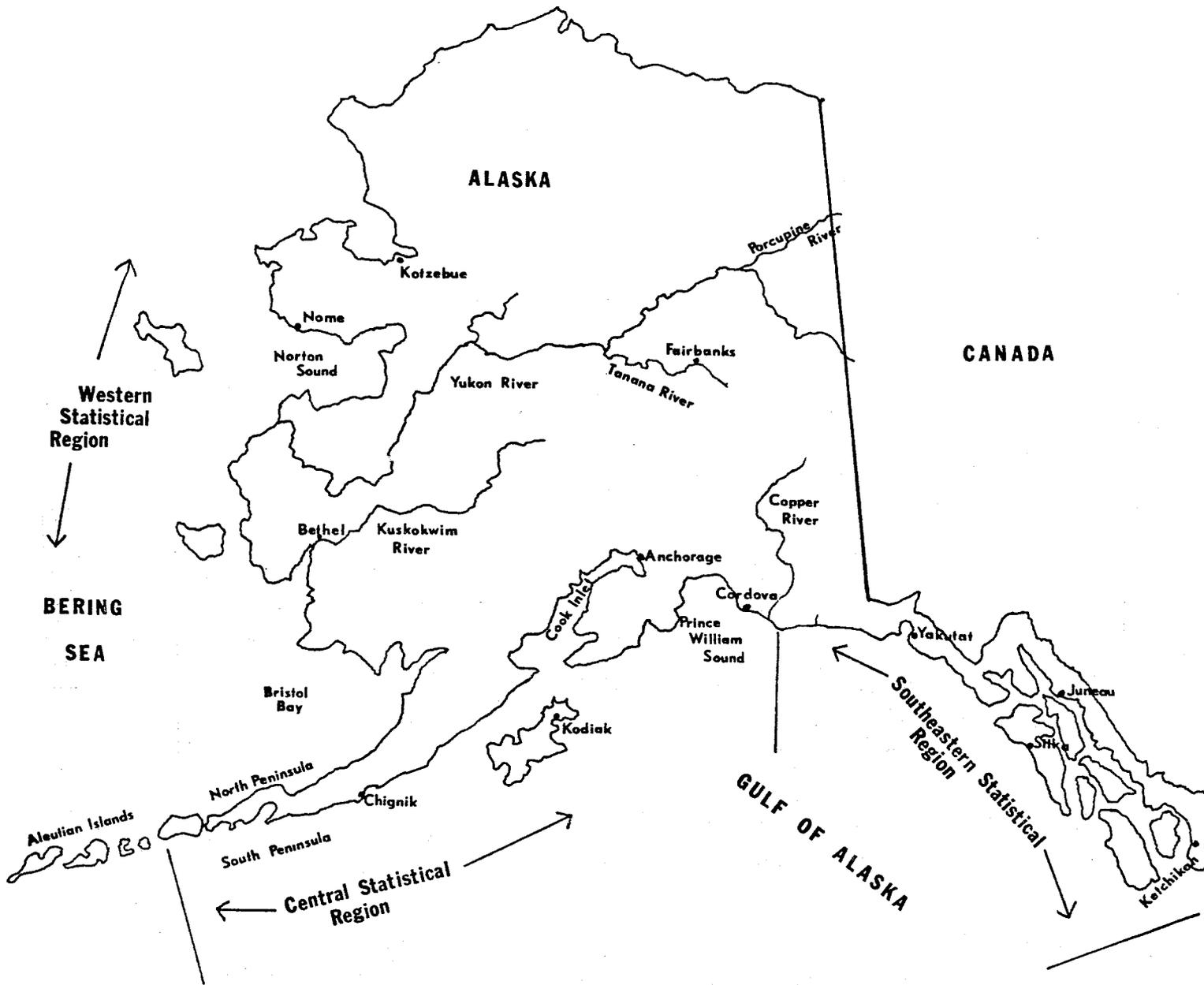


Figure 1. Alaska Department of Fish and Game Commercial Fisheries Statistical Regions.

REVIEW OF THE 1982 SEASON

A preliminary estimate of the 1982 commercial salmon harvest in Alaska is 109.1 million fish. Lingering price disagreements during the 1982 season delayed fishing in several areas. If fishermen and processors had reached accord before fisheries opened, it is almost certain that the statewide harvest would have exceeded the 113.3 million salmon taken in 1981. Painfully lower salmon prices may also have acted to discourage commercial fishing in some localities, and a record pink salmon run in Norton Sound went almost unfished because of the slack market. The 1982 catch fell below the Department's projection by 26 million salmon, 19% of the projection.

Statewide, both sockeye and pink salmon catches were appreciably below their projections, but the coho harvest was twice what had been expected. Most of the sockeye and much of the pink salmon deficit occurred in Bristol Bay fisheries; pink salmon catches were also smaller than anticipated in Kodiak, Cook Inlet, and southern Southeastern districts. Table 2 compares actual and forecast 1982 salmon returns for selected fisheries; 9 of the 12 forecasts were above realized returns in 1982. Preliminary catch estimates by fishing area and statistical region (Figure 1) are summarized in Table 3, and these estimates are presented in more detail by management region in Tables 4 through 7.

Southeastern Alaska

Pink salmon returns to northern Southeastern Alaska were considerably stronger than expected, and the catch of over 10 million fish was the largest since 1963. Pink salmon fisheries in southern districts did not do as well, however, and the catch of 12 million was less than 60% of that anticipated. In most areas, pink salmon spawning escapements were good.

Landings of sockeye salmon in Southeastern Alaska were the highest since 1945; catches were particularly impressive in Prince of Wales Island and Lynn Canal drift gill net, and Yakutat set gill net fisheries. Most chum salmon harvests continued to decline in 1982, but fall chum catches were good in Districts 2 and 15.

The Southeastern chinook catch climbed above the established guideline harvest level of 255,500 fish, primarily because catches in net fisheries were above average. The 280,000 chinook catch would have been appreciably higher if the chinook troll fishery had not been closed in late July after a harvest of 242,000 fish, including the 1981-1982 winter catch. Coho salmon harvests in Southeastern Alaska were the highest reported since 1951.

Cordova Area

Salmon returns to the Cordova area produced above-average to record commercial harvests for all species. The total harvest of 24.7 million fish surpassed the previous Cordova area record by over one million fish. The 20.3 million-fish catch of pink salmon established a new even-numbered year record for this species. Significant contributions to the pink salmon harvest came from returns to both private and State hatcheries in the Sound. Other highlights of the season included record chinook and coho salmon catches by the gill net fleet in the

Table 2. Comparison of actual¹ and forecast 1982 salmon returns, with errors and relative errors, for some major Alaskan salmon fisheries.

Area	Species	Thousands of Fish					
		(1) Harvest ¹	(2) Escapement ¹	(3) Return: ¹ (1) + (2)	(4) Forecast return	(5) Error: (4) - (3)	(6) Relative error: (5)/(3) X 100%
Southern Southeastern	Pink	12,400	4,330	16,730	27,800	11,070	66%
Northern Southeastern	Pink	10,500	3,340	13,840	7,600	-6,240	-45%
Southeastern Total	Pink	22,900	7,670	30,570	35,400	4,830	16%
Prince William Sound	Pink	20,300	2,100	22,400	24,400	2,000	9%
	Chum	1,350	326	1,676	1,700	24	1%
Cook Inlet-Southern and Outer Districts	Pink	363	168	531	1,050	519	98%
Kodiak	Pink	8,080	5,580	13,660	18,300	4,640	34%
Chignik	Pink	940	427	1,367	1,500	133	10%
	Sockeye ²	1,770	838	2,608	2,600	-8	-0%
South Peninsula ³	Pink	5,000	2,000	7,000	6,700	-300	-4%
Bristol Bay, Nushagak District	Pink	1,300	1,600	2,900	9,200	6,300	217%
Bristol Bay ⁴	Sockeye	15,100	7,090	22,190	34,600	12,410	56%
Kotzebue Sound	Chum	417	184	601	610	9	1%
TOTAL		77,520	27,983	105,503	136,060	30,557	29%

¹ Preliminary data, compiled 22 November 1982.

² The harvest includes estimated interceptions of Chignik-bound sockeye taken at Cape Igvak, Aniakchak, Hook Bay, and Stepovak Bay.

³ The harvest does not include June catches of migrating pink salmon bound for other areas.

⁴ Inshore harvest only.

Table 3. Preliminary 1982 Alaska commercial salmon harvest by species and fishing area¹.
(Thousands of fish)

Fishing Area	SPECIES					
	Chinook	Sockeye	Coho	Pink	Chum	All
Southern Southeastern	32.0	806.0	383.7	12,192.8	723.2	14,137.7
Northern Southeastern	11.9	619.7	307.4	10,195.9	458.6	11,593.5
Southeastern Region troll	242.0	2.5	1,300.0	480.0	5.6	2,030.1
Southeastern Statistical Region total	285.9	1,428.2	1,991.1	22,868.7	1,187.4	27,761.3
Cordova Area	49.4	2,372.3	615.0	20,262.7	1,345.7	24,645.1
Cook Inlet Area	19.9	3,147.6	765.4	1,278.1	1,524.2	6,735.2
Kodiak Area	1.2	1,204.8	343.5	8,076.2	1,266.2	10,891.9
Chignik	5.2	1,509.2	289.2	942.7	403.5	3,149.8
South Peninsula	8.0	2,208.0	249.0	6,601.0	2,219.0	11,285.0
Central Statistical Region total	83.7	10,441.9	2,262.1	37,160.7	6,758.6	56,707.0
Aleutian Islands		3.0		1,390.0	4.0	1,397.0
North Peninsula	30.0	1,418.0	240.0	9.0	286.0	1,983.0
Bristol Bay	253.3	15,148.0	654.0	1,451.0	936.0	18,442.3
Kuskokwim Area	79.7	97.6	569.0	18.1	325.1	1,089.5
Yukon Area	121.7		29.0		661.7	812.4
Norton Sound	5.9		91.6	230.3	183.4	511.2
Kotzebue Area					417.7	417.7
Western Statistical Region total	490.6	16,666.6	1,583.6	3,098.4	2,813.9	24,653.1
ALASKA TOTAL	860.2	28,536.7	5,836.8	63,127.8	10,759.9	109,121.4

¹ Compiled 22 November 1982

Table 4. Preliminary 1982 Southeastern Alaska commercial salmon harvest by species and management area¹.

(Thousands of fish)

Management Area	SPECIES					
	Chinook	Sockeye	Coho	Pink	Chum	All
Southern Southeastern						
Portland Canal gill net	2.7	187.1	26.4	347.0	82.1	645.3
Prince of Wales Is. gill net	1.8	185.3	40.5	23.6	16.5	267.7
Stikine River gill net	0.9	6.3	17.7	16.9	0.7	42.5
Southern districts seine	25.9	367.4	285.7	11,143.6	599.0	12,421.6
Annette Island trap	0.5	24.4	4.5	517.6	0.8	547.8
Annette Island gill net	0.2	35.5	8.9	144.1	24.1	212.8
Southern Southeastern total	32.0	806.0	383.7	12,192.8	723.2	14,137.7
Northern Southeastern						
Taku-Snettisham	2.8	78.5	28.1	100.9	34.9	245.2
Lynn Canal gill net	5.1	255.6	62.9	51.9	284.3	659.8
Yakutat gill net	1.5	214.7	135.7	9.4	5.9	367.2
Northern districts seine	2.5	70.9	80.7	10,033.7	133.5	10,321.3
Northern Southeastern total	11.9	619.7	307.4	10,195.9	458.6	11,593.5
Southeastern Region troll	242.0	2.5	1,300.0	480.0	5.6	2,030.1
SOUTHEASTERN REGION TOTAL	285.9	1,428.2	1,991.1	22,868.7	1,187.4	27,761.3

¹ Compiled 22 November 1982

Table 5. Preliminary 1982 Central Region Alaska commercial salmon harvest by species and management area¹.
(Thousands of fish)

Management Area	SPECIES					
	Chinook	Sockeye	Coho	Pink	Chum	All
Cordova Area						
Copper River	49.1	1,193.5	452.8	6.8	0.4	1,702.6
Bering River	0.2	131.6	144.9		0.3	277.0
Prince William Sound						
Hatcheries				1,319.5		1,319.5
Coghill District						
gill net		925.7	0.1	182.7	246.6	1,355.1
seine		16.7		1,042.3	144.8	1,203.8
Coghill District total		942.4	0.1	1,255.0	391.4	2,558.9
Unakwik District						
gill net		48.6		0.3	0.5	49.4
seine				88.8	0.5	89.3
Unakwik District total		48.6		89.1	1.0	138.7
Eshamy District						
Other districts	0.1	56.2	17.2	17,622.3	952.6	18,648.4
Prince William Sound total	0.1	1,047.2	17.3	20,255.9	1,345.0	22,665.5
Cordova Area total	49.4	2,372.3	615.0	20,262.7	1,345.7	24,645.1
Cook Inlet Area						
Upper Cook Inlet						
Northern District	2.3	110.1	77.4	72.8	36.7	299.3
Central District	16.6	2,902.7	643.3	653.5	1,289.7	5,505.8
Upper Cook Inlet total	18.9	3,012.8	720.7	726.3	1,326.4	5,805.1
Lower Cook Inlet						
Southern District	0.9	43.7	5.8	292.4	22.2	365.0
Kamishak District		18.0	38.6	43.8	108.9	209.3
Outer District	0.1	70.4		70.4	59.0	199.9
Eastern District		2.7	0.3	145.2	7.7	155.9
Lower Cook Inlet total	1.0	134.8	44.7	551.8	197.8	930.1
Cook Inlet Area total	19.9	3,147.6	765.4	1,278.1	1,524.2	6,735.2
Bristol Bay						
Naknek-Kvichak District	1.3	4,990.0	9.0	126.0	194.0	5,320.3
Nushagak District	200.0	5,999.0	388.0	1,300.0	456.0	8,343.0
Egegik District	5.0	2,414.0	64.0	2.0	82.0	2,567.0
Ugashik District	7.0	1,161.0	34.0		50.0	1,252.0
Togiak District	40.0	584.0	159.0	23.0	154.0	960.0
Bristol Bay total	253.3	15,148.0	654.0	1,451.0	936.0	18,442.3
CENTRAL REGION TOTAL	322.6	20,667.9	2,034.4	22,991.8	3,805.9	49,822.6

¹ Compiled 22 November 1982.

Table 6. Preliminary 1982 Arctic-Yukon-Kuskokwim Region Alaska commercial salmon harvest by species and management area¹.

(Thousands of fish)

Management Area	SPECIES					
	Chinook	Sockeye	Coho	Pink	Chum	All
Kuskokwim Area						
Kuskokwim River	48.2	33.1	447.7	1.6	278.0	808.6
Kuskokwim Bay	31.5	64.5	121.3	16.5	47.1	280.9
Kuskokwim Area total	79.7	97.6	569.0	18.1	325.1	1,089.5
Yukon River						
Lower Yukon River	116.1		29.0		634.1	779.2
Upper Yukon River	5.6				27.6	33.2
Yukon River total	121.7		29.0		661.7	812.4
Norton Sound	5.9		91.6	230.3	183.4	511.2
Kotzebue Area					417.7	417.7
ARCTIC-YUKON-KUSKOKWIM REGION TOTAL	207.3	97.6	689.6	248.4	1,587.9	2,830.8

¹ Compiled 22 November 1982

Table 7. Preliminary 1982 Westward Region Alaska commercial salmon harvest by species and management area¹.

(Thousands of fish)

Management Area	SPECIES					
	Chinook	Sockeye	Coho	Pink	Chum	All
Kodiak Area	1.2	1,204.8	343.5	8,076.2	1,266.2	10,891.9
Chignik	5.2	1,509.2	289.2	942.7	403.5	3,149.8
Alaska Peninsula and Aleutians						
South Peninsula	8.0	2,208.0	249.0	6,601.0	2,219.0	11,285.0
North Peninsula	30.0	1,418.0	240.0	9.0	286.0	1,983.0
Aleutian Islands		3.0		1,390.0	4.0	1,397.0
Alaska Peninsula and Aleutians total	38.0	3,629.0	489.0	8,000.0	2,509.0	14,665.0
WESTWARD REGION TOTAL	44.4	6,343.0	1,121.7	17,018.9	4,178.7	28,706.7

¹ Compiled 22 November 1982

Copper River District in addition to record coho production from the Bering River District. The most notable return was to the Coghill and Unakwik Districts where the commercial catch of nearly a million sockeye salmon was more than four times the previous record.

These excellent harvests were accompanied by escapements at or above desired levels for all species and districts where fishing was permitted. The only exception was in the Eshamy District where sockeye escapements fell short of goals, requiring a season-long closure.

Extended price negotiations kept most pink salmon fishermen in port until the end of July. Foreign processors operated in Prince William Sound for 10 days in early August, when domestic capacity was exceeded and delivery limits were required.

Cook Inlet Area

Lower Cook Inlet pink salmon runs, generally less abundant in even-numbered years, were moderately below forecast levels in 1982, and the Tutka Bay hatchery return was also weak, allowing a total harvest in the Southern and Outer Districts of 360,000 pinks. Although Kamishak District pink returns were not as large as had been expected, the catch of 44,000 fish was again above average. The Kamishak District chum catch was a record 110,000 fish, more than 3 times the District average. Sockeye catches in both the Kamishak and Outer Districts also set records. As in most areas, coho returns to Lower Cook Inlet were remarkably strong, and the 40,000-fish catch in the Kamishak District was 13 times the previous record.

The harvest of 5.8 million salmon in Upper Cook Inlet districts set a new record in 1982, despite the very poor pink salmon catch. Harvests of 3 million sockeye, 1.3 million chum, and 700,000 coho were all the largest ever recorded. Sockeye escapement goals were achieved in all monitored systems, and chum and coho escapements were excellent as well. In contrast, the pink salmon harvest of 700,000 fish was the third poorest even-numbered year catch on record. Escapements were considered adequate, however, probably because drift gill net fishermen actively avoided the low-priced pinks, preferring the more abundant and more valuable species. The harvest of 19,000 chinook salmon was somewhat above average. Chinook appeared to be available for longer than usual, and catches along the west side of the Inlet were high early in the season. Also, because fishing periods for east-side set nets were extended to allow larger sockeye catches, the incidental take of late-run Kenai River chinook was increased.

Kodiak Area

Although the harvest of 10.7 million salmon in the Kodiak area was only marginally lower than the 13 million taken in 1981, fisherman income declined nearly 50% because prices were lower. Pink salmon returns were weaker than expected and the catch was nearly 5 million fish less than forecast. Escapements were generally good to excellent, although below goals in a few eastern systems. Despite an intensive fishery, Karluk River pink escapement exceeded the goal by one million fish. The state hatchery at Kitoi Bay reported fair pink salmon returns, with survival ranging from 0.7% to 1.8%. The commercial harvest of

these fish was estimated at slightly less than 180,000. Nearly 1.2 million sockeye salmon were taken, the second largest sockeye catch in 34 years. Increased escapements in recent years to major sockeye producers such as the Red and Fraser Rivers are now yielding dividends. The Karluk River was a notable exception in 1982, however, and although there were massive closures in June and much of July, less than one-third of the desired sockeye escapement was obtained.

The Kodiak area chum harvest of 1.2 million fish was outstanding. Good escapements and favorable environmental conditions combined to produce the near-record return. With the exception of a few systems in the General District, escapements were excellent. Chum returns and catches were unusually strong in the Alinchak and Cape Igvak sections of the Mainland District. The total coho harvest of 315,000 fish set a new record. Coho escapements appeared good to excellent in most streams; illegal fishing and high fishing effort probably accounted for the reportedly poor-to-fair coho escapement on Shuyak Island. Chinook escapements in the Kodiak area were very good at approximately 10,000 fish.

Chignik

The early sockeye run was strong and the first day's catch of 315,000 fish was the largest one-day catch ever observed. The late run, however, was smaller than expected, requiring some fishing time restrictions. Chignik pink salmon returns were close to the forecast, with a harvest of about 900,000 fish.

Alaska Peninsula and Aleutians

South Peninsula pink salmon catches and escapements were close to forecast levels; the Aleutian pink harvest was not as large as expected but the low pink salmon price probably displaced fishing effort to other areas and species. On the north side of the Peninsula the coho catch was the highest on record, but the chum harvest far less than anticipated. South Peninsula chum and coho catches were better than expected.

Bristol Bay

The unexpectedly weak return of sockeye salmon to the Kvichak River and protracted price negotiations resulted in a sockeye harvest only half as large as forecast. Pink salmon returning to the Nushagak River were less than one-third as numerous as expected. Offsetting these disappointments, record catches of 250,000 chinook and 650,000 coho salmon were documented. Kvichak River sockeye escapement was poor, but sockeye and other species escapements elsewhere in the Bristol Bay area were excellent.

Arctic-Yukon-Kuskokwim Region

Chum salmon harvests in the Yukon, Kuskokwim, and Norton Sound areas were average or below; Yukon fall chum returns were particularly weak. The Kotzebue chum catch, very close to that forecast, was about 30% above recent levels. The chinook harvest of 80,000 fish in the Kuskokwim area was the largest ever recorded, although escapement observations suggest that the return was not a record. Very large coho salmon returns to the Yukon and Kuskokwim Rivers, and

to Norton Sound, allowed record harvests in the Kuskokwim area and in Norton Sound; the Yukon area coho catch was significantly above average. Although the pink salmon return to Norton Sound was extremely large, the harvest was small primarily because of poor market conditions.

PRELIMINARY FORECASTS OF 1983 SALMON RETURNS TO
SELECTED ALASKAN FISHERIES

The Department's salmon management program includes a number of salmon return forecast projects. Forecast fisheries are selected using several criteria, including economic importance, feasibility, compatability with existing programs, and management needs. Forecast fisheries are:

Southern Southeastern	-	pink salmon
Northern Southeastern	-	pink salmon
Prince William Sound	-	pink and chum salmon
Cook Inlet: Southern and Outer Districts	-	pink salmon
Kodiak	-	pink salmon
Chignik	-	pink and sockeye salmon
South Peninsula	-	pink salmon
Bristol Bay	-	pink and sockeye salmon
Kotzebue Sound	-	chum salmon

In 1982 about 70% of the total statewide harvest was taken in these fisheries.

A variety of information is used to make salmon return forecasts, including escapement magnitudes and distribution, egg deposition, survival to intermediate life stages, environmental conditions, and population age composition. The return, with upper and lower limits, is predicted for each forecast fishery. In general, based on past experience, the actual return can be expected to fall within the range (between the lower and upper limits) about 50% of the time. In 1982, 5 of the 12 forecasts were within their respective ranges. Nine of the 12 forecasts were above realized returns. The 1983 forecasts and ranges are summarized in Table 8.

Southeastern Alaska Pink Salmon

Pink salmon returns to southern Southeastern Alaska in 1983 are expected to be similar, in both magnitude and distribution, to those in 1982, although fewer fish are anticipated in the Ketchikan area. Pink runs in central districts will probably be weak; parent-year escapements were poor. In northern Southeastern, the only area promising a harvestable return is the outer coast of Chichagof and Baranof Islands. Pink salmon escapements to other areas were minimal at best, and winter temperatures were below average.

Table 8. Preliminary forecasts of salmon returns and commercial harvests for some major Alaskan fisheries in 1983.

(Thousands of Fish)

Area	Species	Forecast return	Escapement goal	Estimated harvest	Forecast return range ¹	Estimated harvest range ¹
Southern Southeastern ²	Pink	18,400	6,000	12,400	13,400 - 23,400	7,400 - 17,400
Northern Southeastern ²	Pink	4,500	4,600	1,100	1,500 - 7,500	500 - 4,100
Southeastern Total ²	Pink	22,900	10,600	13,500	14,900 - 30,900	7,900 - 21,500
Prince William Sound Total ²	Pink	18,600	1,700	16,900	13,100 - 25,900	11,400 - 24,200
	Chum	680	250	430	520 - 830	270 - 580
Cook Inlet--Southern and Outer Districts Total ²	Pink	2,700	360	2,400	1,500 - 4,000	1,100 - 3,600
Kodiak ²	Pink	14,800	2,200	12,600	11,100 - 17,100	8,800 - 14,900
Chignik	Pink	1,800	700	1,100	1,200 - 2,400	500 - 1,700
	Sockeye ³	1,600	660	960	1,300 - 2,000	600 - 1,300
South Peninsula ⁴	Pink	6,500	2,000	4,500	5,500 - 7,500	3,500 - 5,500
Bristol Bay, Nushagak District ⁵	Pink					
Bristol Bay ⁶	Sockeye	27,100	5,500	21,600	9,500 - 41,700	4,000 - 36,200
Kotzebue Sound	Chum	530	190	340	390 - 670	200 - 480
TOTAL		97,210	24,160	74,330		

¹ Compiled 22 November 1982. The forecast return and harvest ranges are estimated by several techniques. Based on past experience, about half of the realized returns and harvests can be expected to fall within their respective ranges.

² Includes supplemental hatchery production.

³ Including estimated interceptions in Cape Igvak, Aniakchak, Hook Bay, and Stepovak Bay fisheries.

⁴ Not including pink salmon taken in June near False Pass, South Unimak, and the Shumagin Islands, which are returning to other areas.

⁵ Pink salmon returns to Bristol Bay are negligible in odd-numbered years.

⁶ Inshore harvest only.

Prince William Sound Pink and Chum Salmon

While pink salmon escapement in Prince William Sound streams in 1981 was good, heavy rainfall appeared to have washed out some spawning areas. The forecast natural pink return of 14 million fish is, however, above average. Supplemental production is expected to boost total pink production by nearly 5 million. The expected chum salmon return of nearly 700,000 fish should allow a harvest of about 400,000.

Cook Inlet (Southern and Outer Districts) Pink Salmon

The cold 1981-1982 winter may have offset excellent Southern and Outer District pink salmon escapements, but a healthy natural return of nearly 2 million fish is expected in 1983. Supplemental production is expected to add about 900,000 pinks to the natural return, allowing an anticipated harvest of more than 2 million.

Kodiak Pink Salmon

Excellent pink salmon escapements and above average overwinter survival are expected to allow a harvest of about 13 million fish in the Kodiak area in 1983, including 700,000 from the Kitoi Bay hatchery.

Chignik Pink and Sockeye Salmon

A harvest of about 1 million pink salmon is anticipated in the Chignik area in 1983, similar to 1982. Forecast sockeye returns are down significantly in 1983, to 1.6 million fish, with an expected catch of about 1 million.

South Peninsula Pink Salmon

Another good return of pink salmon to the south side of the Alaska Peninsula is expected in 1983, allowing a harvest of 4.5 million fish.

Bristol Bay Sockeye Salmon

Available evidence points to a large sockeye salmon return to Bristol Bay in 1983. The harvest is expected to exceed 20 million fish.

Kotzebue Sound Chum Salmon

Chum salmon returns to Kotzebue Sound in 1983 should allow a commercial harvest of more than 300,000 fish, down slightly from 1982, but near average.

PROJECTED 1983 ALASKAN COMMERCIAL SALMON HARVESTS

Projections of the 1983 Alaskan commercial salmon harvest by statistical region and species are presented in Table 9. Table 10 gives the projections by management region and species. These projections are composed of forecast harvests and harvest projections (recent harvest averages, sometimes modified if additional information is available), for fisheries without forecasts. Chinook and coho returns are not forecast in any region. Only Prince William Sound and Kotzebue Sound have chum salmon forecasts. All regions have pink salmon forecasts, but several smaller pink runs are not forecast. Major sockeye runs in the Central and Western Statistical Regions are forecast; important exceptions are the Copper River, Cook Inlet, and Kodiak. Despite these gaps, 71% of the 1982 salmon harvest of 109 million fish was taken in forecast fisheries.

The 1983 statewide total commercial harvest projection is 94.9 million salmon.

Species Outlook

Pink Salmon

55% of the 1983 statewide total harvest projection, or 52 million fish

58% of the 1982 statewide total harvest, or 63 million fish

Decreased pink salmon returns are expected in Southeastern Alaska. Western Alaska pink salmon returns are minor in odd-numbered years.

Sockeye Salmon

32% of the 1983 statewide total harvest projection, or 31 million fish

26% of the 1982 statewide total harvest, or 29 million fish

Sockeye harvests are expected to be moderately lower in Southeastern and Central Alaska, but improved in Bristol Bay.

Chum Salmon

9% of the 1983 statewide total harvest projection, or 8.7 million fish

10% of the 1982 statewide total harvest, or 10.8 million fish

The comparatively large chum catch in Central Alaska in 1982 is not expected to recur in 1983. An increased chum catch is expected in Western Alaska.

Coho Salmon

3% of the 1983 statewide total harvest projection, or 2.8 million fish

5% of the 1982 statewide total harvest, or 5.8 million fish

Table 9. Preliminary projections of 1983 Alaskan commercial salmon harvests by statistical region and species¹.

Thousands of Fish

STATISTICAL REGION ²	SPECIES					
	Chinook	Sockeye	Coho	Pink	Chum	All
Southeastern	256	800	1,000	13,500	1,000	16,556
Central	39	6,030	910	37,600	3,580	48,159
Western	407	24,000	840	800	4,120	30,167
TOTAL ALASKA	702	30,830	2,750	51,900	8,700	94,882

¹ Compiled 22 November 1982. The projected 1983 harvests were obtained by summing harvest forecasts (Table 8) and harvest projections in the remaining fisheries.

² See Figure 1 for the definition of statistical regions.

Table 10. Preliminary projections of 1983 Alaskan commercial salmon harvests by management region and species¹.

Thousands of Fish

MANAGEMENT REGION ²	SPECIES					
	Chinook	Sockeye	Coho	Pink	Chum	All
Southeastern	256	800	1,000	13,500	1,000	16,556
Central	232	23,900	935	19,600	2,180	46,847
Arctic-Yukon-Kuskokwim	188	60	300	400	2,720	3,668
Westward	26	6,070	515	18,400	2,800	27,811
TOTAL ALASKA	702	30,830	2,750	51,900	8,700	94,882

¹ Compiled 22 November 1982. The projected 1983 harvests were obtained by summing harvest forecasts (Table 8) and harvest projections in the remaining fisheries.

² See Tables 4, 5, 6, and 7 for the definition of management regions.

Sharp declines from the record 1982 coho harvests are anticipated in all areas.

Chinook Salmon

1% of the 1983 statewide total harvest projection, or 700,000 fish

1% of the 1982 statewide total harvest, or 860,000 fish

Slightly smaller chinook salmon catches are expected in all areas.

Regional Outlook

Statewide

1983 statewide total harvest projection: 94.9 million fish

1982 statewide total harvest: 109.1 million fish

A decline of 13% in the statewide salmon catch is projected, mostly due to smaller expected pink salmon returns to Southeastern and Western Alaska.

Southeastern Statistical Region

17% of the 1983 statewide total harvest projection, or 17 million fish

25% of the 1982 statewide total harvest, or 29 million fish

Smaller catches of pink, coho, and sockeye are expected in Southeastern Alaska in 1983.

Central Statistical Region

51% of the 1983 statewide total harvest projection, or 48 million fish

52% of the 1982 statewide total harvest, or 57 million fish

Smaller harvests of coho and sockeye salmon are expected in Central Alaska in 1983.

Western Statistical Region

32% of the 1983 statewide total harvest projection, or 30 million fish

23% of the 1982 statewide total harvest, or 25 million fish

The increased harvest anticipated in Western Alaska in 1983 is mostly due to improved sockeye returns expected in Bristol Bay. The chum catch is also projected to increase; coho and pink catches to decline.

DISCUSSION

From 1975 until 1982, commercial salmon harvests in Alaska consistently increased, climbing from the 1974 statewide total catch of 22 million fish to 113 million in 1981. The decline to 109 million fish in 1982 is, practically speaking, insignificant, as Figure 2 demonstrates. A more substantial decrease, to about 95 million salmon, is expected in 1983. Viewed in historical perspective, however, a harvest of 95 million would be exceptional -- the statewide catch did not exceed 90 million fish after 1942 until 1979. Harvest projection errors since the Department began publishing projections in 1969, as a percent of the realized harvest, have ranged from 46% high in 1972 (see Table 1) to 34% low in 1981. If one of these extremes were realized in 1983, the statewide harvest could range from 65 million to over 140 million salmon.

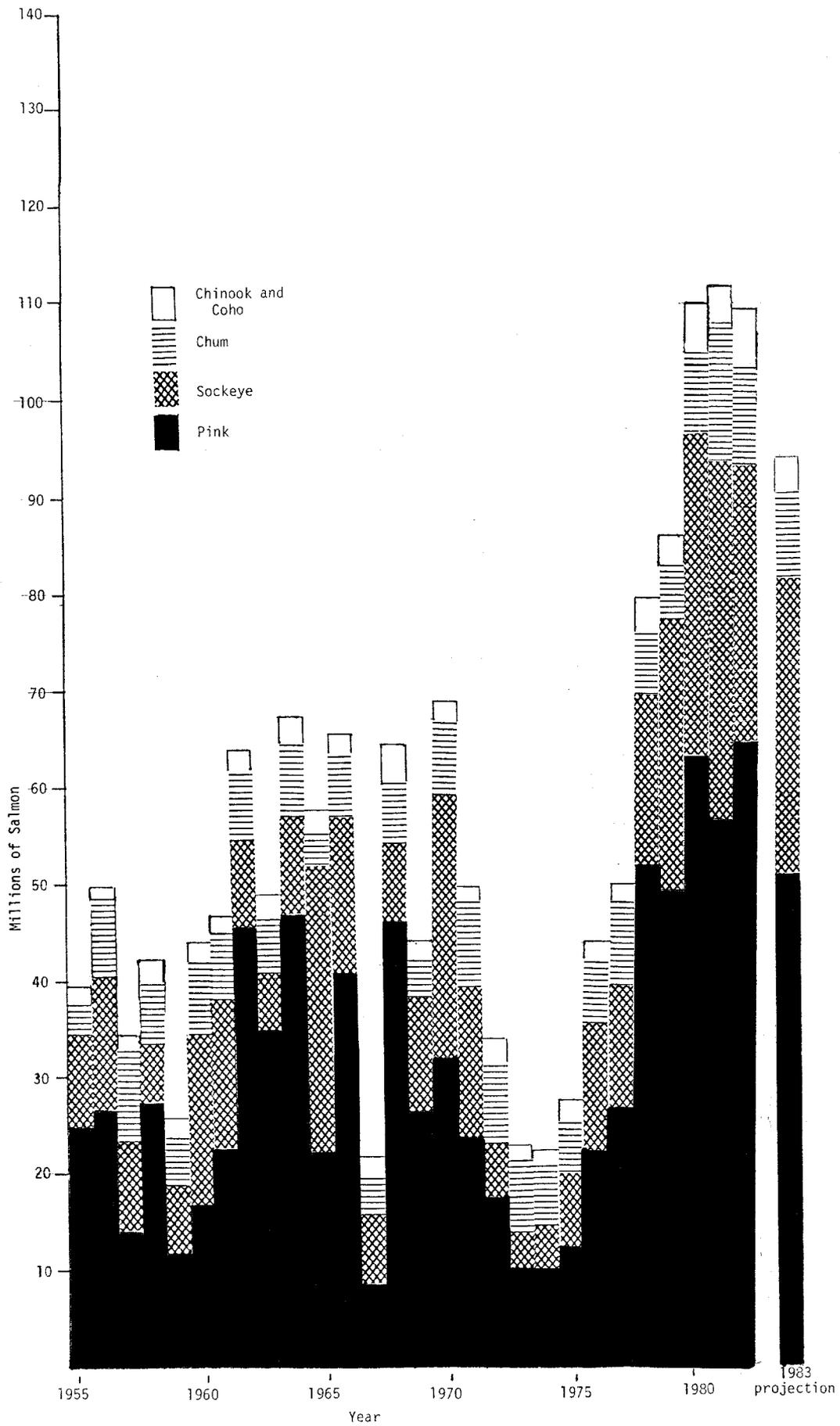


Figure 2. Alaskan commercial salmon harvests by species, 1955-1982, and the 1983 projected harvest.

APPENDIX. FORECAST METHODS AND DISCUSSION

FORECAST AREA: Southeastern Alaska

SPECIES: Pink Salmon

PRELIMINARY FORECAST OF 1983 RETURN:

	<u>Point</u>	<u>Range</u>
Southern Southeastern:		
Return Estimate:	18.4 million	13.4 million to 23.4 million
Escapement Goal:	6.0 million	
Harvest Estimate:	12.4 million	7.4 million to 17.4 million
Northern Southeastern:		
Return Estimate:	4.5 million	1.5 million to 7.5 million
Escapement Goal:	4.6 million	
Harvest Estimate:	1.1 million	500,000 to 4.1 million
Total Southeastern:		
Return Estimate:	22.9 million	14.9 million to 30.9 million
Escapement Goal:	10.6 million	
Harvest Estimate:	13.5 million	7.9 million to 21.5 million

FORECAST METHODS

Separate forecasts are prepared for pink salmon returns to northern and southern Southeastern Alaska because of differences in migration routes and other population characteristics of the pink salmon returning to the two areas. The forecast for the 1983 pink salmon return to southern Southeastern was based on a multiple regression analysis which incorporated escapements, rainfall in the fall of the parent year, and winter air temperatures. The northern Southeastern forecast was based primarily on a regression analysis with the pre-emergent fry index and spring air temperatures. Several other forecast formulas were examined but none appeared as reliable as the ones used.

DISCUSSION OF THE 1983 FORECAST

Southern Southeastern: A total of 18.4 million pink salmon are expected to return to southern Southeastern Alaska (Districts 1 through 8) in 1983.

The distribution of the catch should be similar to that in 1982 with slightly less overall return to District 1.

The return to District 1 will be from the second life cycle since the extremely low return to this District in 1979. Although parent-year escapements were improved significantly, they were still almost 300,000 fish below the escapement goal and over 600,000 below the escapements that produced the 1982 return.

Returns to Districts 2 and 3 are expected to be similar to those experienced in 1982. Escapements for the 1983 return year were very similar and environmental conditions, while not as favorable, were near average.

As was the case in 1982 considerable care needs to be exercised to avoid overexploiting the portion of the run returning to Districts 5 through 8. Parent-year escapements for the 1982 return were the lowest and second lowest in Districts 6 and 7, respectively, since the extremely poor escapements in 1969. The District 5 escapement index was only slightly better than half the escapement goal established for this District.

Northern Southeastern: The only area in northern Southeastern that shows much promise of a harvestable return is the outer coast of Chichagof and Baranof Islands. Of the total parent-year escapement in 1981 (3.88 million pink salmon) over half (53%) was in the District 13 area. Most other areas had escapements at or below parent-year levels which, combined with below-average winter temperatures, reduces chances of a harvestable surplus.

Of the total District 13 escapement (1.91 million pinks), 1.62 million was in the outer coastal areas and the remaining 0.29 million was in Peril Straits' streams. The adjusted pre-emergent fry index for the overall district was by far the best in northern Southeastern at 204.7 fry per square meter. The majority of the harvestable surplus in northern Southeastern is expected in the outside areas of this District.

The fry indexes in Districts 9 and 10 were both lower than they have been since the early 1970's, probably as a result of below-average escapements and the hard winter. Little harvest is expected in either of these Districts.

The District 11 parent-year escapements were near levels seen during the past 4 years. In Seymour Canal, the only area sampled for pre-emergent fry, escapements were very low (70% below the recent 20-year average) so most of the return will probably be needed for escapements. The Taku River streams, however, had very good escapements and may produce harvestable returns.

In Districts 12 and 14, escapements were generally good compared to recent years. The fry index in District 12 was not as high as it has been in the past 4 years, however, and while harvestable surpluses are likely in some areas, little overall harvest is expected from this District. In District 14 the fry index was just above the average for the past 16 years which is disappointing because 1981 pink salmon escapements were 20% above the average for the same period. Parent-year escapements in

District 14, while good by comparison with recent years, were still 65% below the escapement goal established for the area and most of the return to these streams will probably be needed to meet escapement requirements.

Doug Jones
Fishery Biologist
Juneau

Karl Hofmeister
Fishery Biologist
Ketchikan

FORECAST AREA: Prince William Sound

SPECIES: Pink Salmon

PRELIMINARY FORECAST OF 1983 RETURN:

NATURAL PRODUCTION	<u>Point</u>	<u>Range</u>
Return Estimate:	13.7 million	10.1 million to 17.3 million
Escapement Goal:	1.5 million	
Harvest Estimate:	12.2 million	8.6 million to 15.8 million

SUPPLEMENTAL PRODUCTION:

Return Estimate:	4.9 million	3.0 million to 8.6 million
Required Brood Stock:	200,000	
Hatchery Harvest Estimate:	1.4 million	
Common Property Harvest Estimate:	3.3 million	1.4 million to 7.0 million
Total Harvest Estimate:	4.7 million	2.8 million to 8.4 million

TOTAL PRODUCTION

Return Estimate:	18.6 million	13.1 million to 25.9 million
Escapement and Brood Stock:	1.7 million	
Harvest Estimate:	16.9 million	11.4 million to 24.2 million

FORECAST METHODS

Natural Production: The 1983 forecast is predicated on a multiple linear regression analysis of brood-year pre-emergent fry indices, Prince William Sound March-April air temperatures for the following year, and subsequent return-per-spawner ratios. The data used are from post-earthquake, odd-numbered years only.

The 1981 brood year escapement was estimated at 2.9 million fish; the resultant pre-emergent fry index, in fry per square meter, was 316. The 1982 March-April air temperature was 32.8°F, about 3.9°F lower than the

1978 and 1980 air temperatures which are considered important environmental factors contributing to the large 1979 and 1981 returns. The forecast return-per-spawner is 4.72, compared to an average of 5.26 for 1965 to 1979.

The forecast return of 13.7 million fish is above the average of 9.5 million for the years 1965 through 1981 due to the large pre-emergent fry index. Another factor to be considered in evaluating this forecast is the large 1981 brood-year escapement.

Supplemental Production: The 1983 return will be the result of Prince William Sound Aquaculture Corporation (PWSAC) and Alaska Department of Fish and Game fed and unfed fry releases. The PWSAC fry release was 70.1 million fed fry, while the Department release consisted of a 13.9 million unfed fry release and a 33.0 million transplant of unfed fry.

Adult return estimates were determined by estimated fry-to-adult low, mean, and high survival rates on fed and unfed fry as independently experienced by both hatchery facilities.

DISCUSSION OF THE 1983 FORECAST

Natural Production: The estimated 1981 escapement of 2.9 million was nearly twice the desired goal of 1.5 million; escapement in all management districts exceeded established goals.

Production from this escapement was adversely affected, however, by record rainfalls in the fall of 1981, causing considerable washout of spawning gravels. The relatively cold winter of 1981-82 did not seem to greatly affect potential production in that very few dead pre-emergent fry were found during spring sampling; this indicates that winter water flows remained at levels sufficient to avoid spawning gravel freezing or low oxygen content.

One apparent effect that the cold winter did have was to retard developmental rates of the fry; many observed pre-emergent fry had more yolk sac remaining than usual. This may affect adult return timing in 1983. Coupled with the previously mentioned fall rainfall, this may lower production rates of the early return fish and retard the average return timing overall.

Supplemental Production: Prince William Sound's hatchery returns are expected to contribute 3.3 million pinks to the common property fishery; range estimates for this harvest are 1.4 million and 7.0 million. Broodstock and hatchery sales fish total 1.6 million fish. Returns bound for the Department facilities should contribute to the fishery from mid-July to mid-August and Prince William Sound Aquaculture Corporation's returns should make significant contributions from late July to mid-August.

SPECIES: Chum Salmon

PRELIMINARY FORECAST OF 1983 RETURN:

NATURAL PRODUCTION	<u>Point</u>	<u>Range</u>
Return Estimate:	680,000	520,000 - 830,000
Escapement Goal:	250,000	
Harvest Estimate:	430,000	270,000 - 580,000

FORECAST METHODS

Natural Production: The 1983 Prince William Sound forecast is the result of linear regression analysis of brood-year returns of 3-year-old fish and 4-year-old fish the following year. Brood years used for this analysis were 1966 through 1978 excluding brood years 1969, 1972, and 1974. These years were excluded because of very high 4-year-old to 3-year-old ratios when 3-year-old production was quite low, while the following 4-year-old production was very high. The 4-year-old to 3-year-old ratios for the excluded years were 48.5, 32.6, and 20.1, respectively. The remaining years have ratios ranging from 5.03 to 12.12.

Chum escapement in the 1979 brood year was 98,000 fish. In 1982 this escapement produced an estimated 72,000 3-year-olds. Using this figure, the linear analysis gives an estimated 507,000 4-year-olds. The average annual contribution of 4-year-olds in Prince William Sound is 75% of the total return; the forecast total of 676,000 fish is derived by dividing .75 into 507,000, thus accounting for the 3-year-old and 5-year-old returns from the 1980 and 1978 brood years.

This analysis has a correlation of 0.97. The range is an 80% confidence interval.

DISCUSSION OF THE 1983 FORECAST

Most of the 1983 returns will be heading for streams in the northern portion of the Sound: the Eastern, Northern, Coghill, and Northwestern Districts. Some minor production should also occur in the southeastern districts. As in 1982, the majority of harvestable surpluses will be contributed by middle and late run fish.

As in 1982, the number of supplementally produced chum salmon is expected to be minimal; no forecast was made.

Michael L. McCurdy
Fisheries Research Biologist
Cordova

FORECAST AREA: Cook Inlet, Southern and Outer Districts

SPECIES: Pink Salmon

PRELIMINARY FORECAST OF 1983 RETURN:

NATURAL PRODUCTION	<u>Point</u>	<u>Range</u>
Return Estimate:	1.8 million	890,000 to 2.8 million
Escapement Goal:	320,000	
Harvest Estimate:	1.5 million	570,000 to 2.5 million
SUPPLEMENTAL PRODUCTION		
Return Estimate:	890,000	600,000 to 1.2 million
Required Brood Stock:	40,000	
Harvest Estimate:	850,000	560,000 to 1.2 million
TOTAL PRODUCTION		
Return Estimate:	2.7 million	1.5 million to 4.0 million
Escapement and Brood Stock:	360,000	
Harvest Estimate:	2.4 million	1.1 million to 3.6 million

FORECAST METHODS

The 1983 pink salmon forecast for the Southern and Outer Districts of Cook Inlet is derived from a linear regression between indices of pre-emergent fry density in nine major spawning streams and the subsequent adult returns, odd-numbered years only (1965-1979). Pre-emergent fry density is estimated in these streams each spring and the estimates are weighted by the average escapement for that stream. The resultant individual stream indices are combined to yield a single, weighted pre-emergent fry index for all nine streams.

The Tutka Lagoon pink salmon hatchery has added a new dimension to the Southern District pink salmon return and since 1978 has provided from 35% to 70% of the entire Southern District pink salmon catch. The hatchery released 10 million short-term reared fry and 5.2 million unfed fry into Tutka Bay in 1982. Survival rates for reared fry have ranged between 5% and 16% and from 2% to 7% for unfed fry. The 1982 plankton levels in Tutka Bay were extremely high and should have increased growth of the young fry resulting in good survival rates.

DISCUSSION OF THE 1983 FORECAST

The 1981 pink salmon escapement of 410,000 was the second highest on record since 1964. Temperatures during the winter of 1981-82 were much lower than in recent years, resulting in large numbers of dead eggs and a 25% decrease in fry densities in 1982.

The forecast method using odd-numbered year run data only was very successful in 1981 and is believed to be a good estimate for the 1983 return. Average return per spawner should be at least 4 which would produce a natural return of 1.6 to 2.0 million pink salmon. Although fry densities were less than half of the past two odd-years in Port Dick, production from Island Creek could still help to provide an excellent harvest in that Subdistrict. Fishing should be good in all bays of the Southern District and if streams in the Nuka Bay area of the Outer District produce similarly to 1981 levels, the natural run may exceed the midpoint estimate of 1.8 million. Tutka Bay should have an excellent return from hatchery releases of 10 million short-term-reared fry and 5.2 million unfed fry. Using survival ranges of 2 to 5% for unfed and 5 to 9% for reared unfed fry gives an estimated hatchery return of from 600,000 to 1.2 million. Survival rates of reared fry in the 1981 return approached 17% and if such survival rates occur again, which is unlikely, the return could be as high as 2 million pinks.

Thomas R. Schroeder
Area Biologist
Homer

FORECAST AREA: Kodiak

SPECIES: Pink Salmon

PRELIMINARY FORECAST OF 1983 RETURN:

NATURAL PRODUCTION	<u>Point</u>	
Return Estimate:	14.0 million	10.7 million to 15.4 million
Escapement Goal:	2.0 million	
Harvest Estimate:	12.0 million	8.7 million to 13.4 million
SUPPLEMENTAL PRODUCTION		
Return Estimate:	850,000	370,000 to 1.7 million
Required Brood Stock:	160,000	
Harvest Estimate:	690,000	210,000 to 1.5 million
TOTAL PRODUCTION		
Return Estimate:	14.8 million	11.1 million to 17.1 million
Escapement and Brood Stock:	2.2 million	
Harvest Estimate:	12.6 million	8.8 million to 14.9 million

FORECAST METHODS

The 1983 Kodiak management area pink salmon return forecast was determined as follows: A point estimate for the total management area return was calculated from a multiple linear regression analysis with the past 17 years pre-emergent fry density data. Variables used in the analysis were the indexed live fry densities and the average March-April ambient air temperatures taken in Kodiak. The range is an 80% confidence interval.

DISCUSSION OF THE 1983 FORECAST

Pre-emergent fry sampling in the spring of 1982 indicated good to excellent overwinter survival from the excellent brood year escapement in 1981. Sampling resulted in an unweighted index of 224 live fry/m² for the Kodiak-Afognak Island complex. This fry index for the 1983 return is one of the highest on record.

Distribution of the brood year escapement resulted in 66% of the fish entering the pre-emergent index streams. Sampling was delayed in some areas (Afognak and Mainland) because of a late breakup. Heavy rains during the fall did not appear to have scoured the creeks seriously.

Marine survival of the 1982 pink salmon return appears to have been lower than in recent years. The lower end of the forecast range takes this into consideration.

In 1983, from 11.1 to 17.1 million pink salmon are expected to return to the Kodiak Management Area. Escapement of two million pinks is desired, leaving 8.8 to 14.9 million pinks available for harvesting.

A breakdown of the expected return by major geographical district is outlined below. All district catch projections assume escapement goals are met.

Afognak District: Pre-emergent fry densities were good. Given adequate marine survival a return of 700,000 pink salmon is expected. The desired escapement level is 150,000 pinks, leaving approximately 550,000 fish available for harvesting.

Supplemental production from the Kitoi Bay hatchery is expected to result in a total return of approximately 370,000 to 1.7 million pinks from the 47.8 million fry released in the spring of 1981. Hatchery brood stock requirements are approximately 160,000 fish leaving 210,000 to 1.5 million pinks available for harvesting.

Westside District: Overall fry densities for these districts were excellent. Scouring from heavy fall and winter rains did not appear to be a problem as it was for the 1982 return. Given adequate marine survival, 4.8 million pinks are expected to return to this district. The desired escapement is 400,000, leaving approximately 4.4 million pinks available for harvesting.

Alitak District: Fry survival, overall, was average. Humpy River showed signs of scouring from ice floes; however, fry survival in Deadman River was excellent. A total of 2.2 million pinks are expected to return to the Alitak District. The escapement goal is 400,000 fish, leaving approximately 1.8 million pinks available for harvesting.

General District: Most streams sampled in this district had good to excellent overwinter fry survival. Given adequate marine survival a total return of 5.2 million pinks is expected. The desired escapement for this district is 650,000 pinks, leaving approximately 4.5 million available for harvesting.

Mainland District: Overall fry survival for this district was fair to good. Because of a late breakup three streams were not sampled. A total return of 1.1 million pinks is expected to this district. The escapement goal is 400,000 fish, leaving approximately 720,000 pinks for the harvest.

David Prokopowich
Ass't. Area Management Biologist
Kodiak Management Area

FORECAST AREA: Chignik

SPECIES: Pink Salmon

PRELIMINARY FORECAST OF 1983 RETURN:

	<u>Point</u>	<u>Range</u>
Return Estimate:	1.8 million	1.2 million to 2.4 million
Escapement Goal:	700,000	
Harvest Estimate:	1.1 million	500,000 to 1.7 million

FORECAST METHODS

The 1983 Chignik pink salmon return forecast was determined using pre-emergent fry densities in a linear regression for the entire Chignik area and for each fishing district, with adjustments made by incorporating average return per spawner data from 1975 to 1982.

Linear regression analysis of pre-emergent fry densities for the Chignik area as a whole was used to estimate the high return limit. The low limit was calculated by the average return per spawner from 1980 through 1982. The mid-point estimate is an average of expected returns for each fishing district and mean return per spawner.

DISCUSSION OF THE 1983 FORECAST

The Chignik pre-emergent fry sampling program began in 1975. In the spring of 1982 pre-emergent sampling produced record high densities in the Perryville, Eastern, and Central Districts; the Western District 1982 densities were exceeded only in 1979. The 1981 total escapement (1983 return year) was 170,000 fish, below the 1977-1981 average of 770,000.

Record pre-emergent fry densities combined with lowered brood-year escapement and expected return per spawner should produce a total Chignik area return of about 1.8 million pink salmon. The Perryville District is expected to receive a return of 500,000; the Western District 750,000, and the combined Eastern, Central, and Chignik Bay Districts 550,000.

The total area return range is 1.2 to 2.4 million fish. The Chignik area escapement goal is set at 700,000 which should result in a catch of 1.1 million with a harvest range of 500,000 to 1.7 million pink salmon.

Tyler R. Gilmer
Ass't. Area Management Biologist
Peninsula/Aleutians Area

FORECAST AREA: Chignik

SPECIES: Sockeye Salmon

PRELIMINARY FORECAST OF 1983 RETURN:

EARLY RUN	<u>Point</u>	<u>Range</u>
Return Estimate:	1.0 million	890,000 to 1.2 million
Escapement Goal:	400,000	
Harvest Estimate:	640,000	490,000 to 790,000
LATE RUN		
Return Estimate:	580,000	370,000 to 800,000
Escapement Goal:	260,000	
Harvest Estimate:	320,000	110,000 to 540,000
TOTAL		
Return Estimate:	1.6 million	1.3 million to 2.0 million
Escapement Goal:	660,000	
Harvest Estimate:	960,000	600,000 to 1.3 million

FORECAST METHODS

The early run forecast model is a multiple linear regression which predicts the return of 3-ocean sockeye (fish which have spent one or two years in fresh water, and three years in the ocean) on the basis of 1) parent-year escapement level; 2) the number of 4-year-old fish returning in the previous year; and 3) the mean length of 4-year-old males in the previous year. Approximately 85% of the fluctuation in yearly returns of 3-ocean sockeye is explained by these three variables. The estimate is increased by 50,000 fish to account for returns of the minor age classes.

The late run is forecast by a multiple regression relating the return of 3-ocean sockeye to the mean winter (November-March) air temperature at the spawning grounds in the brood year and the number of 2-ocean fish returning in the previous year. The predicted return of 3-ocean sockeye is increased by 50,000 fish to account for returns of other age classes.

Range estimates for both early and late run forecasts are the point estimate plus or minus one standard deviation of the point estimate.

DISCUSSION OF THE 1983 FORECAST

Early Run: A stepwise multiple regression computer program was used to select from among eight variables obtained from Department and University of Washington Fisheries Research Institute data those that significantly improved the accuracy of early-run forecasts. Data for all years between 1964 and 1982 were included, except 1970 and 1974 for which some information was missing. The model derived from this analysis incorporates potential brood production (measured as parent-year escapement) and size-dependent brood maturity (number and size of 4-year-old fish in the previous year) as predictors of overall brood production (return of the major age classes). Predicted returns are within 150,000 fish of estimated actual returns in 15 of the 18 years for which data are available. Pre-emergent fry densities were extremely low in 1979, primarily because of severe high water scouring. This apparent poor survival could drop the actual return into the lower portion of the range.

Late Run: The late-run forecast is based on the strong negative correlation between mean winter (November-March) air temperature and brood production for all years since 1965. This correlation indicates that in years with warm winters brood production is poor. Although the biological basis for this relationship is not yet clear, it explains roughly 80% of yearly variation in late-run strength when combined with the relationship between returns of 2-ocean fish and returns of 3-ocean fish in the following year. The relatively mild winter of 1977-78 (the average November-March temperature was 0.3°C) suggests a weak return from the brood. This is substantiated by a comparatively poor showing of 60,000 2-ocean fish in 1982.

Larry Nicholson
Area Management Biologist
Chignik Area

FORECAST AREA: South Peninsula

SPECIES: Pink Salmon

PRELIMINARY FORECAST OF 1983 RETURN:

	<u>Point</u>	<u>Range</u>
Return Estimate:	6.5 million	5.5 million to 7.5 million
Escapement Goal:	2.0 million	
Harvest Estimate:	4.5 million	3.5 million to 5.5 million

FORECAST METHODS

The 1983 South Peninsula pink salmon forecast was determined using pre-emergent fry densities and average return per spawner. The forecast does not include the June fishery on pink salmon migrating to other areas. Linear regression with pre-emergent fry densities and actual returns for the years 1978 through 1982 was employed to arrive at a point estimate. A regression for all years of pre-emergent sampling (1975 through 1982) was used to determine the low end of the range. The upper end of the range was calculated by using the average return per spawner for 1979 through 1982. Spring climatic conditions were also considered in adjusting the range.

DISCUSSION OF THE 1983 FORECAST

The South Peninsula 1982 forecast proved very successful and it is felt that the 1983 forecast should produce similar results with another year's data available. The data points for linear regression have expanded to eight, 1975 through 1982. Average return per spawner has ranged from 3.4 to 2.5 during the past four years. The pre-emergent sampling program has also continued to stabilize.

The 1983 forecast is again based on a set of index streams. Other streams are also still being sampled for future incorporation into the data base when enough data has been accumulated.

Spring climatic conditions along the Peninsula were unseasonably cold with repeated heavy freezes and thaws. These climatic changes in an odd-numbered year return required a downward adjustment of the forecast return from the value predicted by the linear regression.

Pre-emergent sampling in the spring of 1982 (brood year for the 1983 return) produced an average density of 86 fry/m² which is very near the 1980 and 1981 average densities of 87 and 88, respectively. The 1983 return should be slightly smaller than the 1982 return.

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FORECAST AREA: Bristol Bay

SPECIES: Sockeye Salmon

PRELIMINARY FORECAST OF 1983 RETURN:

	<u>Point</u>	<u>Range</u>
Return Estimate:	27.1 million	9.5 million to 41.7 million
Escapement Goal:	5.5 million	
Harvest Estimate:	21.6 million	4.0 million to 36.2 million

FORECAST METHODS

Most Bristol Bay sockeye salmon mature 4 to 6 years from the time of parental spawning. The run in 1983 will, therefore, be the progeny of the escapements of 1977, 1978, and 1979. The total Bristol Bay forecast is the sum of the forecasts of individual river system returns, each based on one or more of the following methods.

- (1) Escapement-return relationships, based on historical data, provide estimates of total production from each brood-year escapement. Average marine maturity schedules are then applied to estimate the numbers of adult salmon returning each year.
- (2) On the Kvichak and Wood Rivers, numbers of smolt migrating to the ocean are estimated annually. The return of adult salmon each year is estimated using these smolt counts, past survival data, and average maturity schedules. Environmental data are also considered in estimating Kvichak smolt survival.
- (3) For each river system, relationships between the number of adult fish returning a year earlier and the number of adult fish from the same parent escapement and fresh water age group that return the following year are utilized.

The range is an 80% confidence interval.

DISCUSSION OF THE 1983 FORECAST

The 1983 Bristol Bay sockeye salmon return forecast is 27.1 million. Escapement requirements are 5.5 million sockeye. This suggests a potential harvestable surplus of 21.6 million. Point estimates of allowable harvest by district in descending order of magnitude are: Naknek-Kvichak 10.2 million, Nushagak 4.5 million, Egegik 2.8 million, Ugashik 3.6 million, and Togiak 489,000.

SPECIES: Pink Salmon

Pink salmon returns to the Nushagak District of Bristol Bay are negligible in odd-numbered years.

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and

Henry J. Yuen
Fishery Research Biologists
Anchorage

FORECAST AREA: Kotzebue Sound

SPECIES: Chum Salmon

PRELIMINARY FORECAST OF 1983 RETURN:

	<u>Point</u>	<u>Range</u>
Return Estimate:	530,000	390,000 to 670,000
Escapement Goal:	190,000	
Commercial Harvest:	340,000	200,000 to 480,000
Subsistence Harvest:	30,000	
Total Harvest Estimate:	370,000	230,000 to 510,000

FORECAST METHODS:

The Kotzebue Sound chum salmon forecast is based on similarities of survivorship (expressed as return/spawner) between the different age classes resulting from a single brood year. For example, high survival of 3-year-old fish in 1982 should indicate a high survival of 4-year-old fish in 1983, since both age classes resulted from the 1979 escapement.

DISCUSSION OF THE 1983 FORECAST

With a 16-year data base the regressions generated from 3, 4, and 5-year-old survivorship are highly significant. The forecast 1983 chum salmon return is 530,000 fish, an average run. The three age classes will stem from escapements in 1978, 1979, and 1980. Escapements in 1978 and 1979 were both low and will probably result in poor returns of 4 and 5-year-old fish. The 3-year-old portion of the 1983 return is the result of a very strong escapement in 1980. The return in 1983 is expected to be comprised of 124,000 3-year-olds, 301,000 4-year-olds, and 103,000 5-year-old chum salmon.

The forecast return for 1982 was 610,000 chum; this proved to be very close to the actual return of 601,000.

Brian Bigler
Fisheries Biologist
Kotzebue

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