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ALASKA DEPARTMENT OF FISH AND GAME
DIVISION OF COMMERCIAL FISHERIES MANAGEMENT AND DEVELOPMENT

COOK INLET SOCKEYE SALMON STOCK STATUS, 1996:

A Brief Summary Report For The Alaska Board Of Fisheries

Regional Information Report¹ 2A95-41

Submitted by:

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¹ *Contribution 95-41 from the Soldotna area office. The Regional Information Report Series was established in 1987 to provide an information access system for all unpublished divisional reports. These reports frequently serve diverse ad hoc informational purposes or archive basic uninterpreted data. To accommodate timely reporting of recently collected information, reports in this series undergo only limited internal review and may contain preliminary data; this information may be subsequently finalized and published in the formal literature. Consequently, these reports should not be cited without prior approval of the author or the Commercial Fisheries Management and Development Division.*

Introduction

The Upper Cook Inlet (UCI) management area consists of those marine waters north of the latitude of Anchor Point (Figure 1). The commercial salmon fishery is conducted with the use of drift gill nets (582 permits) and set gill nets (740 permits). The fishery focuses on sockeye salmon, with this species commonly accounting for over 90% of the exvessel value. The preponderance of the sockeye salmon harvest occurs during July. The fishery has enjoyed unprecedented success in recent years with the ten highest annual harvests all having occurred since 1982 (Table 1). The major sockeye salmon systems in Upper Cook Inlet are the Kenai, Kasilof, Susitna and Crescent Rivers, Packers Creek and Fish Creek. Sockeye salmon escapements into these streams are monitored by either sonar or weir and each system has an escapement objective (Table 2).

1996 Sockeye Salmon Forecast

Prior to each fishing season the Upper Cook Inlet research staff prepares a prediction of the coming season's sockeye salmon run strength, utilizing the most appropriate data set or combinations of data.

PRELIMINARY FORECAST OF 1996 RUN:

	Forecast Estimate (millions)	Forecast Range (millions)
Total Run	4.8	0.7 - 8.9
Escapement Goal	1.5	
Harvest Estimate	3.3	

Forecasted runs to individual systems are: Kenai River = 2,517,000; Kasilof River = 650,000; Susitna River = 491,000; Crescent River = 144,000; Fish Creek = 233,000; Packers Creek = 117,000. In addition 622,000 are forecast for all unmonitored minor systems throughout the Upper Cook Inlet Area.

FORECAST METHODS:

Spawner, sibling, and smolt data, if available, were examined for each system. Forecasts for all systems, except Kenai age 1.3, were made from two models: one using the relationship between adult return and spawner data and the other the relationship between adult return and sibling data. Forecasts for age-1.3 Kenai River sockeye salmon were made by averaging results from the relationship

between adult return and fall fry estimates and the relationship between adult return and sibling data. An approximate eighty percent confidence interval was calculated using the squared deviation between past forecasts and actual returns as the forecast variance (mean square error).

FORECAST DISCUSSION

The actual total run of sockeye salmon to UCI in 1995 was 4.6 million fish, while the preseason forecast was 3.9 million. Most of the error associated with the 1995 forecast is attributable to the production from minor systems that had not been accounted for in the forecast. The commercial harvest estimate of 2.7 million was very close to the actual harvest of 2.9 million.

The 1996 forecast includes an estimate for minor system production for the first time. Historically, between 1984 and 1995 the mean absolute error of the forecast was 30% and the average forecast error was -22%. Only in two of the past 12 years has the forecast been greater than the actual return. Historical forecast performance data suggest that forecast error may be reduced by including an estimate of minor system production in our forecast model.

Individual forecasts for most systems are within recent historical trends, so there are no reasons to suspect the individual forecast are in error. However, the Kenai River forecast has great uncertainty associated with it. The sibling model used to predict the age-1.3 (five year old) component of run estimated an adult return of 2.9 million sockeye salmon. However, estimates of the number of fry rearing in Kenai and Skilak Lakes suggest that the age-1.3 return could be only 700,000 sockeye salmon. Since we have no way to determine which data set would provide a more accurate prediction, we used the average of these two estimates for the 1996 forecast. If the lower estimate is correct, the harvest would be reduced by 1.1 million sockeye salmon. Conversely, if the higher estimate is correct, the harvest would be increased by 1.1 million sockeye salmon.

1996 Sockeye Salmon Management Outlook

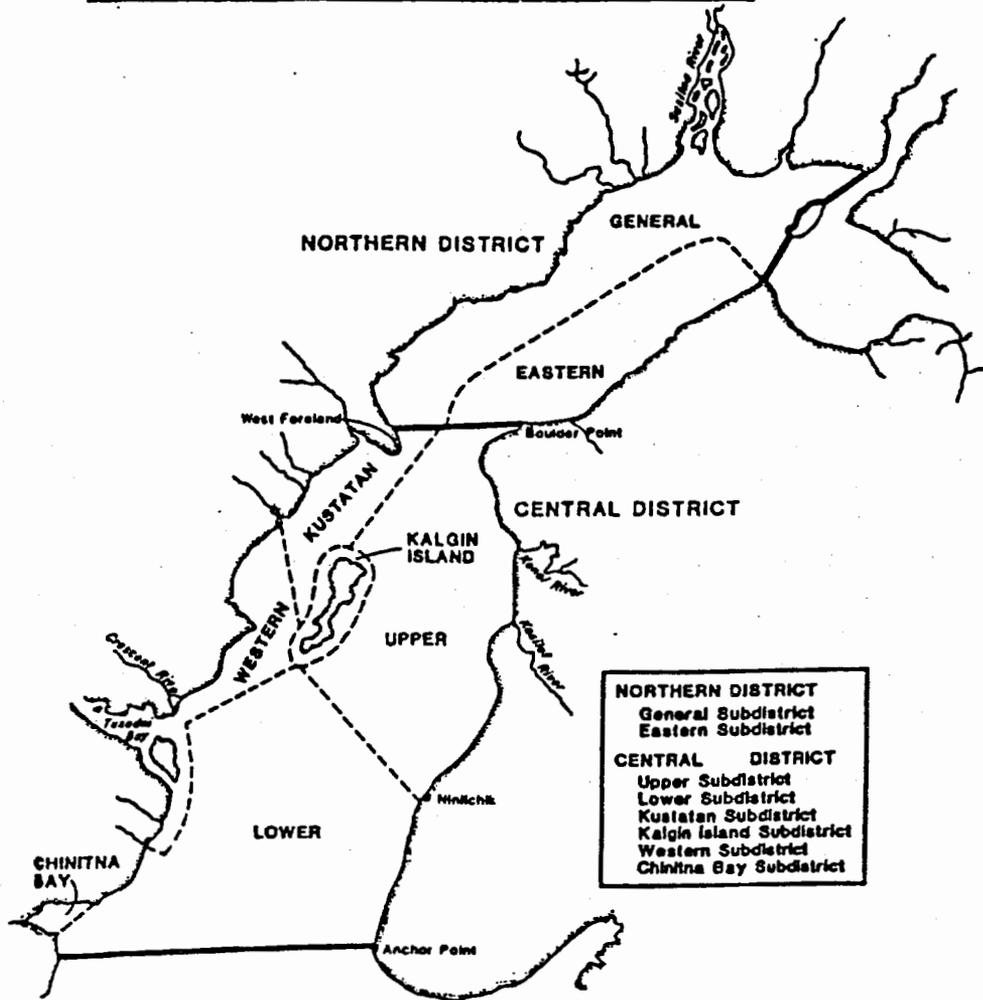
The forecast harvest of 3.3 million sockeye salmon for 1996 is well below the average of the past fifteen years of 4.5 million. Past forecasts have been prone to substantial error, largely due to extreme variations in returns to the Kenai River (Figure 2). If the 1996 forecast is accurate, the management outlook would include a relatively conservative fishery with segments of the fishery experiencing some loss in fishing time during the July sockeye salmon management period to achieve escapements to weaker systems. Given the uncertainty of forecasting, however, no rigid management strategy can be

contemplated or invoked prior to the season. The return will be assessed as the season progresses and the appropriate actions drafted at that time.

Expanding the outlook past the 1996 season is subject to even greater uncertainty. The 1997 season should produce a return in the 7 million range, leaving approximately 5.5 million sockeye in excess of escapement needs. Based on very preliminary hydroacoustic fry estimates, the 1998 season will produce far fewer sockeye, due primarily to reduced production of Kenai stocks. It is too early to predict with any confidence the magnitude of this expected decline.

Figure 1.

UPPER COOK INLET SALMON DISTRICTS



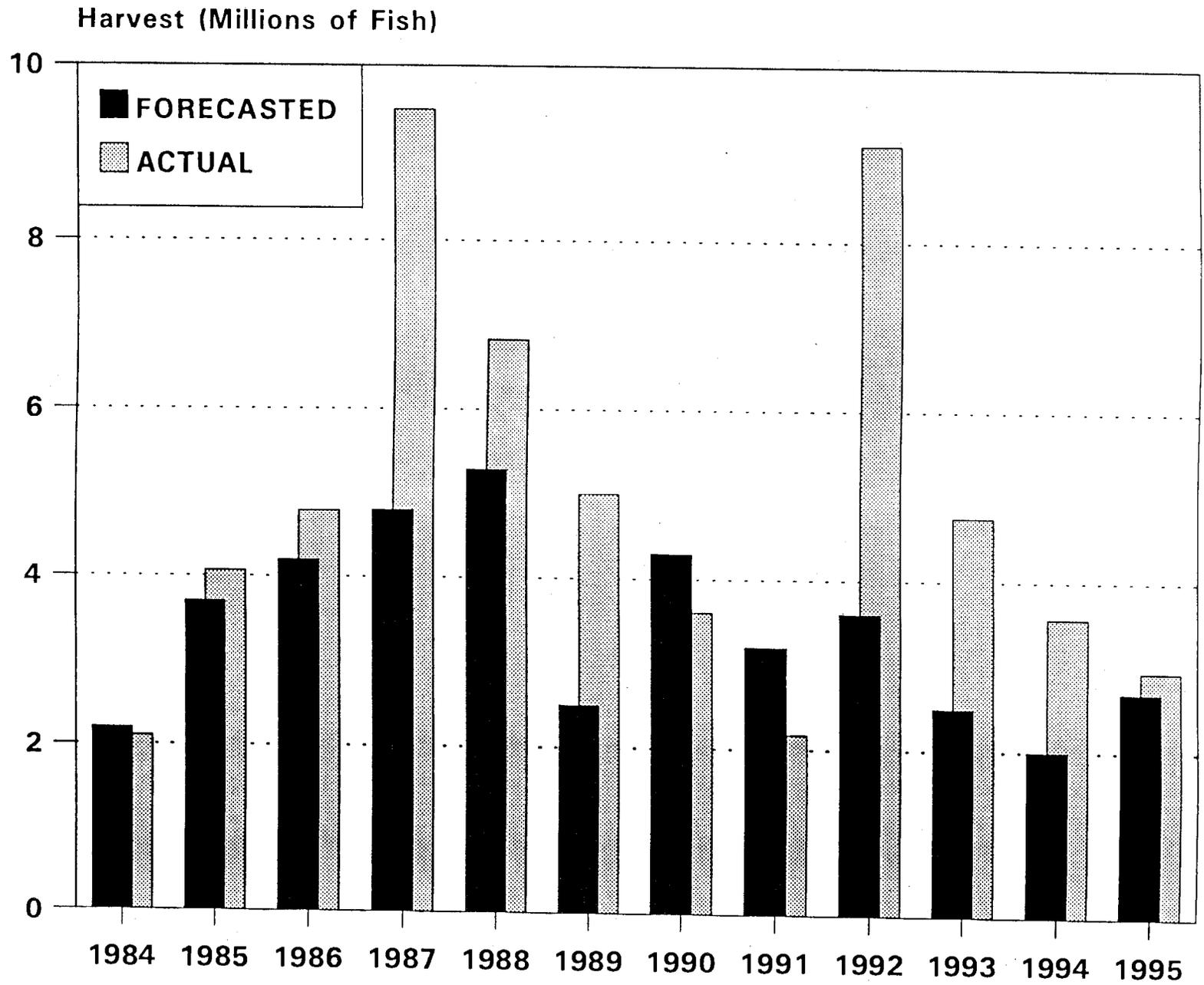


Figure 2. Comparison of forecast and actual sockeye salmon harvests.

Table 1. Upper Cook Inlet commercial salmon harvest by species, 1954-1995.

Year	Chinook	Sockeye	Coho	Pink	Chum	Total
1954	63,780	1,207,046	321,525	2,189,207	510,068	4,291,626
1955	45,926	1,027,528	170,777	101,680	248,343	1,594,254
1956	64,977	1,258,789	198,189	1,595,375	782,051	3,899,381
1957	42,158	643,712	125,434	21,228	1,001,470	1,834,002
1958	22,727	477,392	239,765	1,648,548	471,697	2,860,129
1959	32,651	612,676	106,312	12,527	300,319	1,064,485
1960	27,512	923,314	311,461	1,411,605	659,997	3,333,889
1961	19,737	1,162,303	117,778	34,017	349,628	1,683,463
1962	20,210	1,147,573	350,324	2,711,689	970,582	5,200,378
1963	17,536	942,980	197,140	30,436	387,027	1,575,119
1964	4,531	970,055	452,654	3,231,961	1,079,084	5,738,285
1965	9,741	1,412,350	153,619	23,963	316,444	1,916,117
1966	8,544	1,852,114	289,837	2,005,745	532,756	4,688,996
1967	7,859	1,380,062	177,729	32,229	296,837	1,894,716
1968	4,536	1,104,904	469,850	2,278,197	1,119,114	4,976,601
1969	12,397	692,175	100,777	33,383	269,847	1,108,579
1970	8,336	732,605	275,399	814,895	776,229	2,607,464
1971	19,765	636,303	100,636	35,624	327,029	1,119,357
1972	16,086	879,824	80,933	628,574	630,103	2,235,520
1973	5,194	670,098	104,420	326,184	667,573	1,773,469
1974	6,596	497,185	200,125	483,730	396,840	1,584,476
1975	4,787	684,752	227,379	336,333	951,796	2,205,047
1976	10,865	1,664,150	208,695	1,256,728	469,802	3,610,240
1977	14,790	2,052,291	192,599	553,855	1,233,722	4,047,257
1978	17,299	2,621,421	219,193	1,688,442	571,779	5,118,134
1979	13,738	924,415	265,166	72,982	650,357	1,926,658
1980	13,798	1,573,597	271,418	1,786,430	390,675	4,035,918
1981	12,240	1,439,277	484,411	127,164	833,542	2,896,634
1982	20,870	3,259,864	793,937	790,648	1,433,866	6,299,185
1983	20,634	5,049,733	516,322	70,327	1,114,858	6,771,874
1984	10,062	2,106,714	449,993	617,452	680,726	3,864,947
1985	24,088	4,060,429	667,213	87,828	772,849	5,612,407
1986	39,240	4,787,982	756,830	1,299,360	1,134,173	8,017,585
1987	39,661	9,500,186	451,404	109,801	349,139	10,450,191
1988	29,060	6,834,342	560,022	469,972	708,573	8,601,969
1989	26,742	5,010,698	339,201	67,430	122,027	5,566,098
1990	16,105	3,604,064	500,634	603,630	351,197	5,075,630
1991	13,535	2,177,576	425,724	14,663	280,223	2,911,721
1992	17,171	9,108,340	468,911	695,859	274,303	10,564,584
1993	18,719	4,754,698	306,822	100,918	122,767	5,303,924
1994	20,260	3,567,392	580,567	520,481	299,300	4,988,000
1995	17,857	2,951,827	446,954	133,575	529,422	4,079,635
Average	20,531	2,332,494	325,669	739,397	604,003	4,022,094

Table 2. Escapement goals and counts of sockeye salmon in selected streams of Upper Cook Inlet, 1968-1995.

Year	Kenai River		Kasilof River		Fish Creek	
	Escapement Goal	Escapement Estimate ¹	Escapement Goal	Escapement Estimate ¹	Escapement Goal	Escapement Estimate ²
1968	0	88,000	0	93,000	0	19,616
1969	150,000	53,000	75,000	46,000	0	12,456
1970	150,000	73,000	75,000	37,000	0	25,000
1971	150,000	--	75,000	--	0	31,900
1972	150,000-250,000	318,000	75,000-150,000	112,000	0	6,981
1973	150,000-250,000	367,000	75,000-150,000	40,000	0	2,705
1974	150,000-250,000	161,000	75,000-150,000	64,000	0	16,225
1975	150,000-250,000	142,000	75,000-150,000	48,000	0	29,882
1976	150,000-250,000	380,000	75,000-150,000	140,000	0	14,032
1977	150,000-250,000	708,000	75,000-150,000	155,000	0	5,183
1978	350,000-500,000	399,000	75,000-150,000	117,000	0	3,555
1979	350,000-500,000	285,000	75,000-150,000	152,000	0	68,739
1980	350,000-500,000	464,000	75,000-150,000	187,000	0	62,828
1981	350,000-500,000	408,000	75,000-150,000	257,000	0	50,479
1982	350,000-500,000	620,000	75,000-150,000	180,000	50,000	28,164
1983	350,000-500,000	630,000	75,000-150,000	210,000	50,000	118,797
1984	350,000-500,000	345,000	75,000-150,000	232,000	50,000	192,352
1985	350,000-500,000	501,000	75,000-150,000	503,000	50,000	68,577
1986	350,000-500,000	501,000	150,000-250,000	276,000	50,000	29,800
1987	400,000-700,000	1,597,000	150,000-250,000	249,000	50,000	91,215
1988	400,000-700,000	1,021,500	150,000-250,000	202,000	50,000	71,603
1989	400,000-700,000	1,599,959	150,000-250,000	158,206	50,000	67,224
1990	400,000-700,000	658,908	150,000-250,000	144,289	50,000	50,000
1991	400,000-700,000	645,000	150,000-250,000	238,000	50,000	50,500
1992	400,000-700,000	994,760	150,000-250,000	183,178	50,000	71,385
1993	400,000-700,000	813,617	150,000-250,000	149,939	50,000	117,619
1994	400,000-700,000	1,003,446	150,000-250,000	205,117	50,000	95,107
1995	400,000-700,000	630,447	150,000-250,000	204,935	50,000	115,101

Year	Susitna River		Crescent River		Packers Creek	
	Escapement Goal	Escapement Estimate ¹	Escapement Goal	Escapement Estimate ¹	Escapement Goal	Escapement Estimate ²
1978	200,000	94,000	0	N/C	0	N/C
1979	200,000	157,000	50,000	87,000	0	N/C
1980	200,000	191,000	50,000	91,000	0	16,477
1981	200,000	340,000	50,000	41,000	0	13,024
1982	200,000	216,000 ³	50,000	59,000	0	15,687
1983	200,000	112,000 ⁴	50,000	92,000	0	18,403
1984	200,000	194,000 ⁵	50,000	118,000	0	30,684
1985	200,000	228,000 ⁵	50,000	129,000	0	36,850
1986	100,000-150,000 ⁶	92,000 ⁶	50,000-100,000	N/A	0	29,604
1987	100,000-150,000 ⁶	66,000 ⁶	50,000-100,000	119,000	0	35,401
1988	100,000-150,000 ⁶	52,347 ⁶	50,000-100,000	57,716	15,000-25,000	18,607
1989	100,000-150,000 ⁶	96,269 ⁶	50,000-100,000	71,064	15,000-25,000	22,304
1990	100,000-150,000 ⁶	140,379 ⁶	50,000-100,000	52,180	15,000-25,000	31,868
1991	100,000-150,000 ⁶	105,000 ⁶	50,000-100,000	44,500	15,000-25,000	41,275
1992	100,000-150,000 ⁶	66,057 ⁶	50,000-100,000	58,227	15,000-25,000	28,361
1993	100,000-150,000 ⁶	141,694 ⁶	50,000-100,000	37,556	15,000-25,000	40,869
1994	100,000-150,000 ⁶	128,032 ⁶	50,000-100,000	30,355	15,000-25,000	30,788
1995	100,000-150,000 ⁶	121,220 ⁶	50,000-100,000	52,311	15,000-25,000	29,473

¹ Derived from sonar counters unless otherwise noted.

² Weir counts.

³ Poor field conditions make this a minimum estimate; mark/recapture estimate from Su-Hydro studies was 265,000.

⁴ Minimum estimate. Combining Yentna sonar with Sunshine Station mark/recapture estimate yields 176,000.

⁵ Yentna River sonar count combined with Sunshine Station mark/recapture estimate.