Sockeye Salmon Stock Assessment and Evaluation In Southeast Alaska, 1983-84

Technical Report for the period July 1, 1983 to June 30, 1984 under Fed Aid Contract No. AFC-70.

By

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Regional Information Report [1] No. 1J88-36

Alaska Department of Fish and Game
Commercial Fisheries Division
Juneau, Alaska

December 1988

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ABSTRACT

Sockeye salmon studies conducted in Lynn Canal during the 1983 season yielded information on the stock composition of catch, escapements to the respective spawning systems, returns from known brood year escapements, timing of the two major stocks in the catch and escapement, and other data applicable to the in-season management of the Lynn Canal sockeye salmon fishery. The 1983 sockeye escapements to Chilkoot and Chilkat Lakes were 80,089 and 134,002 fish, respectively. A harvest of 241,269 Chilkoot and 127,842 Chilkat sockeye salmon was realized.

The last of the 1977 brood year progeny returned to Chilkoot and Chilkat Lakes in 1983 as 6-year-old fish. The resulting spawner:recruit ratio for the Chilkat stock was 1:5.1 and Chilkoot 1:3.25, the highest ever observed.

Escapement enumeration weir operations were conducted at Crescent and Speel Lakes during the 1983 salmon season. Escapements of 19,476 and 10,362 sockeye salmon, respectively, were recorded at these two sites. Sockeye salmon escapements to the Situk River and Tahltan Lake were 68,100 and 21,256 fish.

INTRODUCTION

This report presents the results of the 1983 field activities conducted by the Alaska Department of Fish and Game. The species of interest was sockeye salmon (Oncorhynchus nerka) and the area was Southeastern Alaska. The area of primary concern was Lynn Canal (Figure 1), however, results of other sockeye investigations are also presented in this report. These other areas resulted from the Departments involvement in studies related to the interception of stocks originating in U.S. and Canadian spawning systems by each other's fisheries.

EVALUATION AND UPDATE OF ESCAPEMENT GOALS PREVIOUSLY SET FOR CHILKOOT AND CHILKAT LAKES

Introduction

Escapement goals for Chilkoot and Chilkat Lakes have been in effect since 1976. These goals were set as a range of 80-100,000 for Chilkoot and 60-70,000 for Chilkat. As these goals were preliminary, they were scheduled for evaluation when returns from known brood year escapements began to appear. The adult populations of these stocks are comprised of primarily 4-, 5- and 6-year-old fish, which meant that a total return from the 1976 Chilkoot brood year would not have occurred until 1982, with the return from the 1977 brood year in 1983. This brood year information was the basis for evaluating the production potential of brood year escapements of varying magnitude and developing escapement :recruit curves.

Objectives

1) Determine the spawner: recruit ratio of sockeye salmon returning to Chilkoot and Chilkat Lakes from the respective brood year escapements in an effort to evaluate the survival from the various escapement levels.

2) Determine the strength of the respective runs (Chilkoot and Chilkat Lakes) in-season.

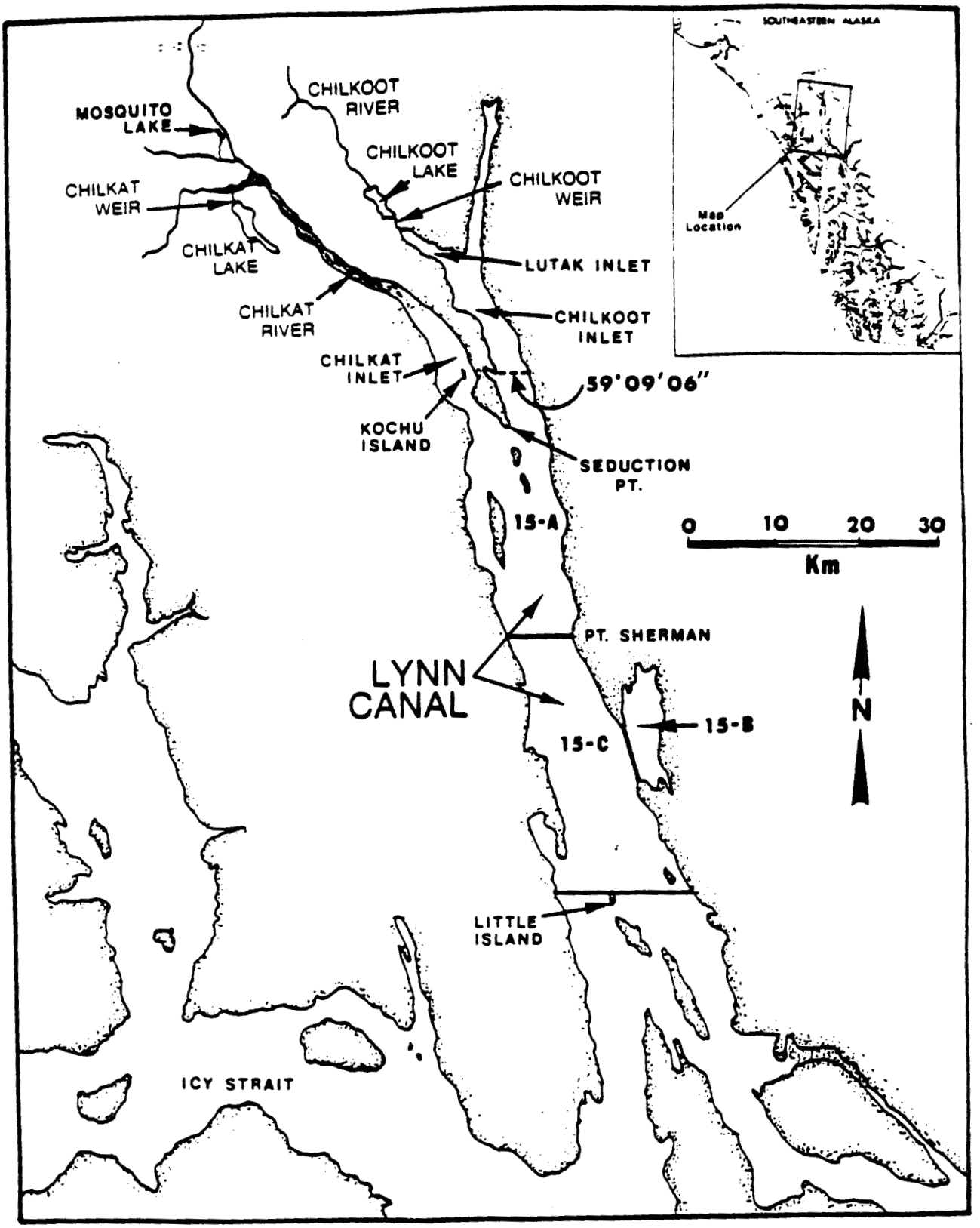

Figure 1. Lynn Canal Fishery areas and supporting sockeye salmon spawning systems, Chilkoot and Chilkat Lakes.

3) Explore various methods of in-season escapement projections prior to the arrival of fish at Chilkat Weir.

Escapement Enumeration

Escapement enumeration provided in-season information on run timing, relative magnitude, and age composition of the escapements to Chilkoot and Chilkat Lakes.

Methods:

Picket weirs were used at Chilkoot and Chilkat Lakes to control the movement of fish into the respective lakes so they could be counted and scale samples collected. Fish were counted through the weir by removing two or more pickets through which fish were allowed to pass. At Chilkoot, sockeye were captured for scale sampling by dip netting them as they passed through the "counting gate". Salmon were captured for sampling at Chilkat Weir with an 80 foot beach seine. The objective was to sample at both weirs in proportion to the run size through time; in 1983 the sampling level was set at 3% of the run.

Results:

Escapements to Chilkoot and Chilkat Lakes are presented in Table 1. The 1983 sockeye salmon escapement of 134,002 Chilkat Lake was the highest recorded in the history of the weir. The season began with the first fish appearing on 22 June. By 30 June 1,168 sockeye had been passed. Average daily escapements by month were as follows: June, 42 sockeye/day; July, 1,523 fish/day; August, 627/day; September, 1,736/day and October, 467/day. Escapement data are presented graphically as a moving 3-day average in Figure 2. The peak daily escapement (5,871) occurred on 11 September.

The 1983 sockeye salmon escapement to Chilkoot Lake was 80,089 fish. Average daily escapements by month were as follows: June, 508; July, 1, 387;

Table 1. Annual salmon escapements through Chilkoot and Chilkat Weirs, for the years 1967-1983.

Area/ Year	Sockeye	Coho	Chum	Pink	Total	Period Operated
Chilkat						
1967	22,343				22,343	6/13-09/15
1968	41,256	168		4	41,428	6/07-09/13
1969	44,555				44,555	5/27-09/16
1970	41,085				41,085	5/29-09/17
1971	49,342	1,063			50,405	5/25-10/28
1972	51,860	518			52,378	6/03-10/12
1973	50,554	167			50,721	6/07-10/15
1974	84,237	161			84,398	5/30-10/12
1975	41,508	644			42,152	6/04-11/06
1976	69,984	204			70,188	6/03-09/27
1977	40,334				40,334	6/03-09/27
1978	69,498	390			69,888	6/05-11/05
1979	80,588	965			81,553	6/09-11/11
1980	85,066				85,066	6/05-11/05
1981	84,125	1,150			85,275	6/08-10/23
1982	78,986	157			79,143	6/24-10/06
1983	134,002	1,027			135,029	6/22-11/12
Chilkoot						
1976	71,294	942	242	5,368	72,478	5/23-10/31
1977	97,212	1	165		102,746	5/28-09/12
1978	35,452	1,179	227		36,858	6/06-11/07
1979	95,948	899	253		97,100	6/05-11/06
1980	96,217	628	720		97,565	6/02-10/05
1981	81,890	1,479	269		83,638	6/04-10/12
1982	101,973	5	507		102,485	6/03-09/14
1983	80,087	1,740	501	11,227	93,555	6/04-11/01

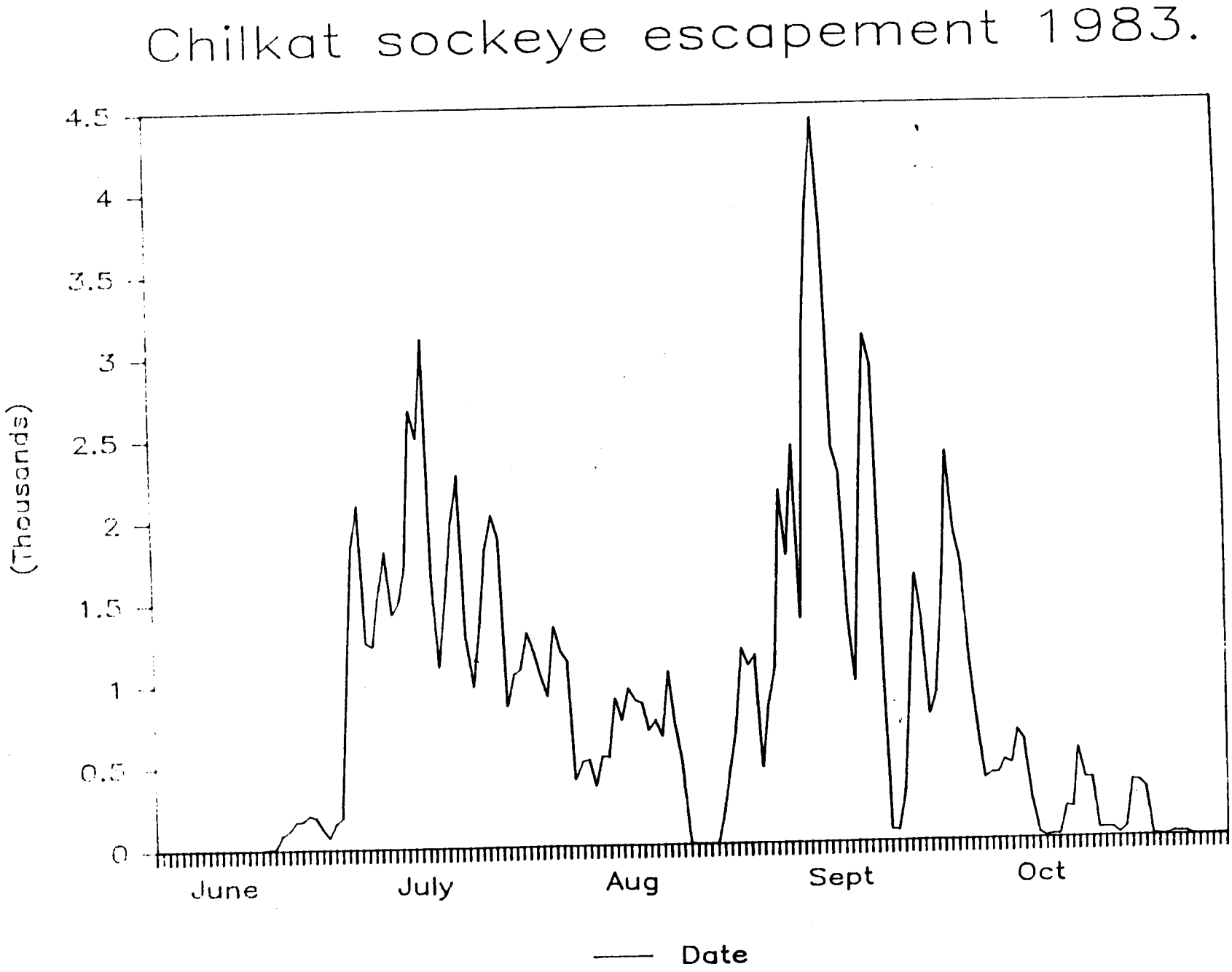

Figure 2. Chilkat Lake daily sockeye salmon escapement expressed as a moving 3-day average, 1983.

August, 505; September, 221; and October, 3. Figure 3 presents the daily escapement data for Chilkoot Lake as a moving three day average. The peak daily escapement (4,183) occurred on 20 July.

Figures 4 and 5 present the 1983 daily cumulative escapements for Chilkoot and Chilkat Lakes vs. the average cumulative escapements from 1976-82 for the respective stocks. The cumulative escapement for Chilkoot Lake in 1983 was relatively close to the 1976-86 average through time, with the season total falling 2,768 sockeye short of this average of 82,855. The Chilkat sockeye escapement of 134,002 was 68,495 fish higher than the 1971-82 average.

Discussion:

The 1983 escapement to Chilkat Lake exceeded the escapement goal for this system by 43,002 sockeye. Timing of the 1983 Chilkat escapement followed a pattern different from other years. This timing difference showed a strong early segment not seen in earlier years of weir operation at Chilkat Lake. This strong early segment led some to believe that the late segment might not materialize, which resulted in a more conservative management approach than might otherwise have been taken.

The Chilkoot escapement closely followed the previous 1976-82 average. The timing between the fishery and the weir has traditionally been so close that changes in abundance in the fishery are readily reflected in the weir counts. The timeliness of the weir counts was such as to provide for a positive in-season application of the weir data to management.

Harvest

Analysis of harvest records has provided research and management with a means of observing variations in run timing and harvest patterns. The continuation of harvest record collection and data analysis provides a comparison between years that may be used in-season to estimate run strength.

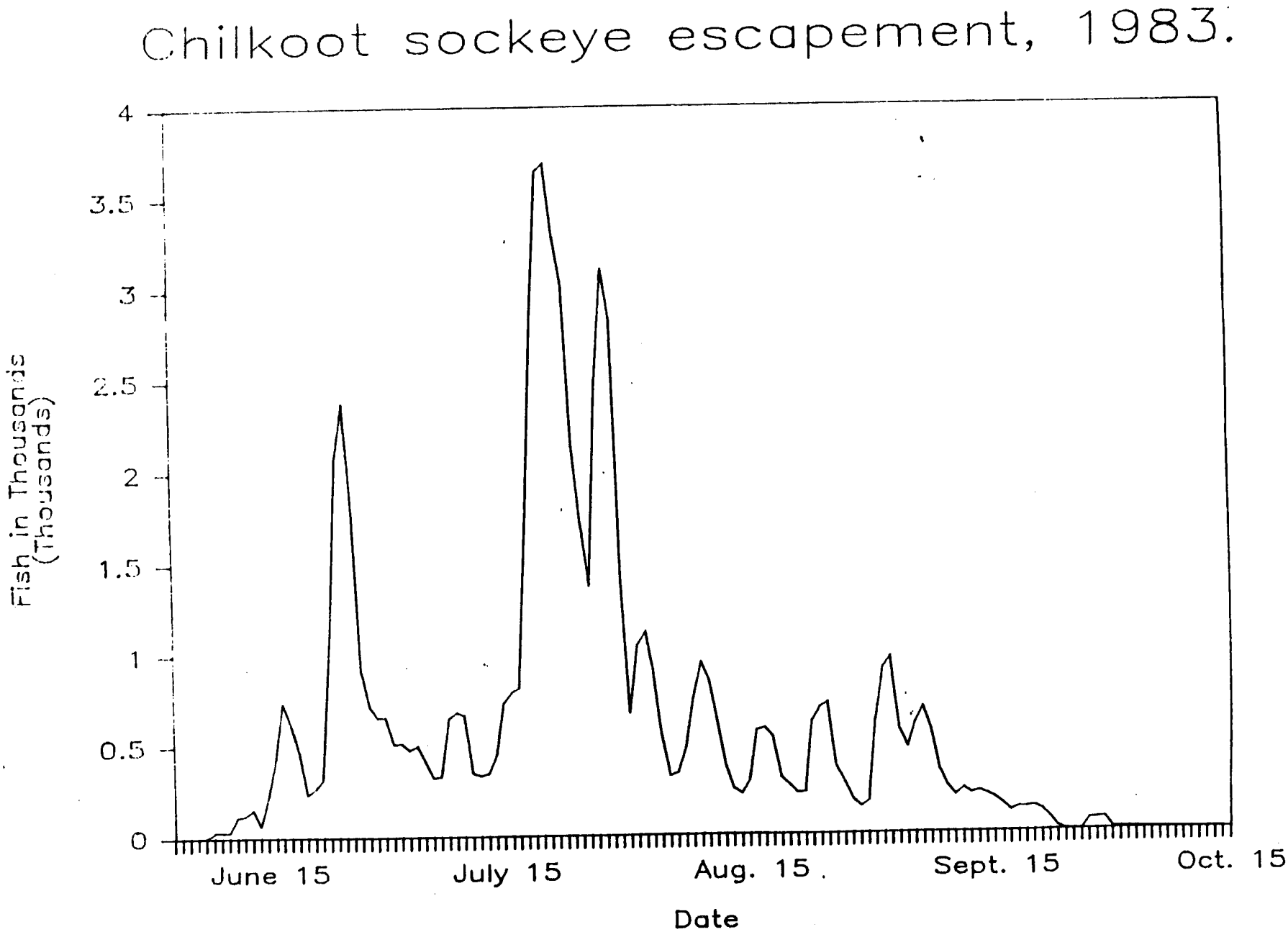

Figure 3. Chilkoot Lake daily sockeye salmon escapement expressed as a moving 3-day average, 1983.

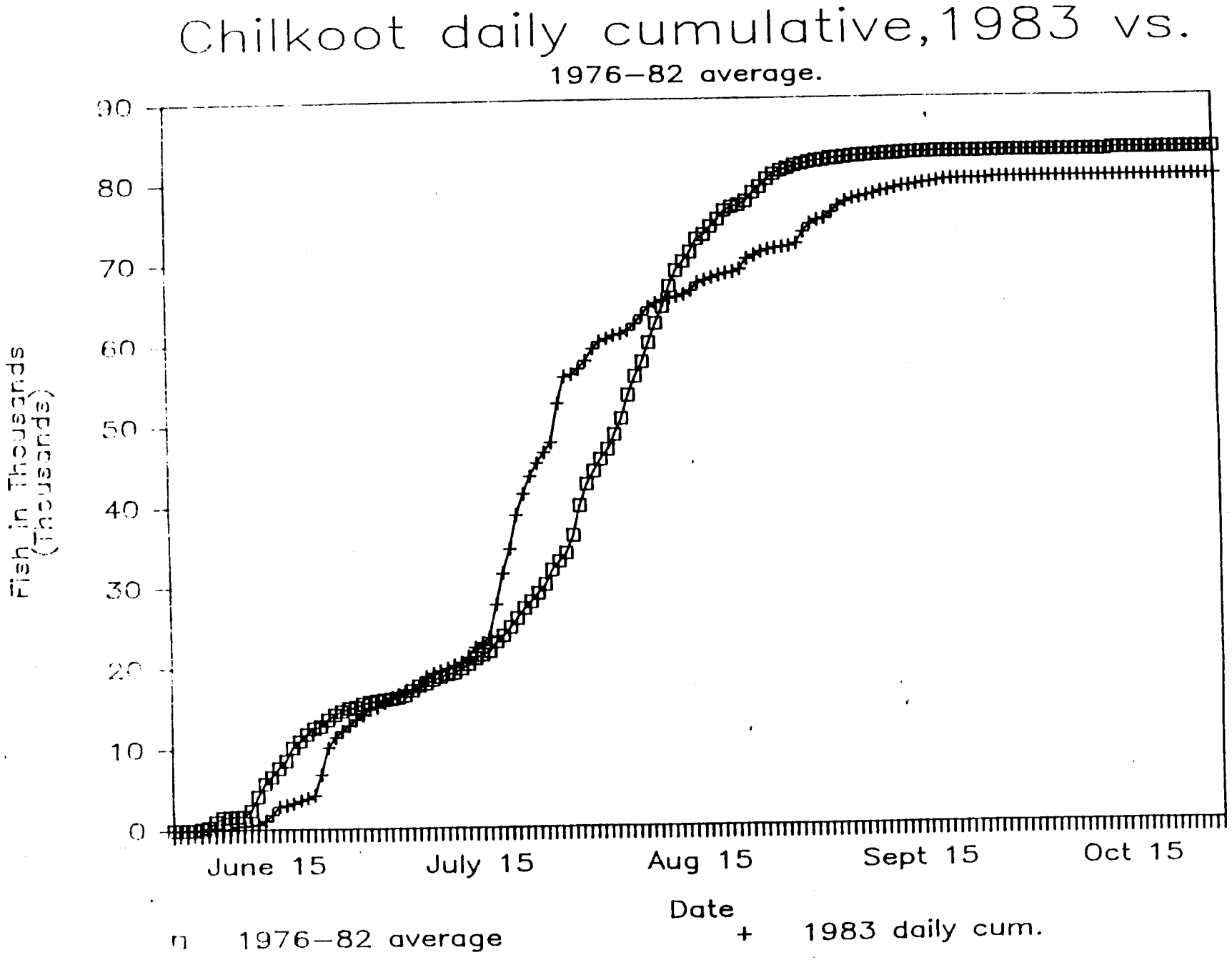

Figure 4. Chilkoot Lake daily cumulative escapement, 1983 vs. 1976-82 average.

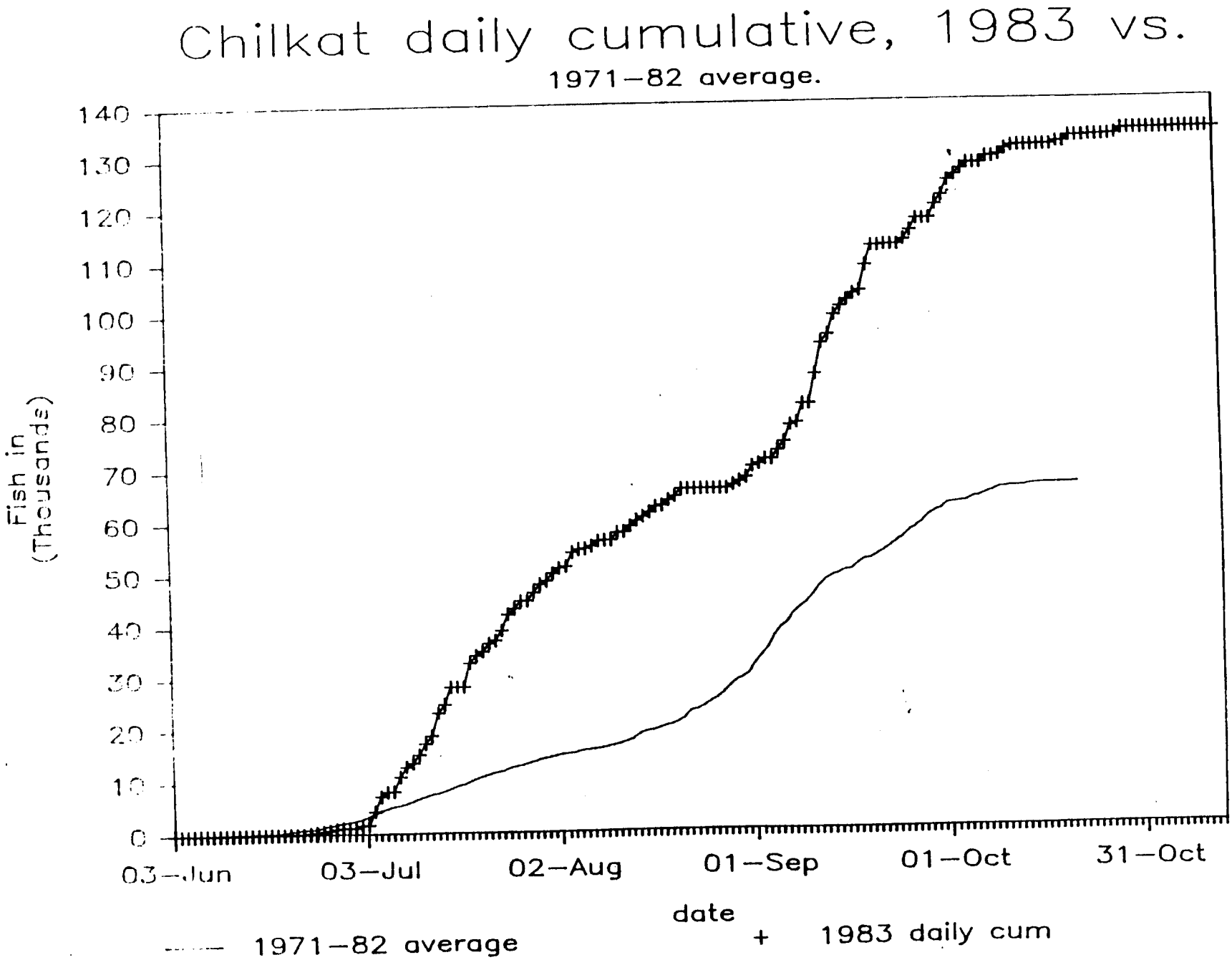

Figure 5. Chilkat Lake daily cumulative escapement, 1983 vs. 1976-82 average.

Methods:

The harvest of the Lynn Canal gillnet fishery was monitored through the use of fish tickets which were collected by management personnel at the close of each weekly fishing period. Tickets not collected were subsequently submitted by the processors at a later date. Numbers of fish harvested during each fishing period were ascertained from the fish tickets received. Stock identification analysis performed by the Departments Stock Biology Group (McPherson 1986), in conjunction with the harvest data, provided numbers of sockeye harvested by stock.

Results:

The 1983 sockeye fisheries in Lynn Canal produced a harvest of 369,311 fish (Tables 2 and 3). The stock identification work revealed the catch to be comprised of 127,842 Chilkat and 241,469 Chilkoot fish. The combined totals of the two stocks produced a record Lynn Canal catch, and record return to both systems. Figure 6 presents the 1983 gillnet harvest of sockeye salmon as a proportion of the weekly catch represented by the respective stocks. Except for weeks 26 (20-26 June) and 27 (27 June-3 July) when the weekly harvest of Chilkat fish exceeded the harvest of Chilkoot fish the weekly harvest of Chilkoot sockeye exceeded that of Chilkat sockeye. Figure 7 describes the harvest of each stock entering the Lynn Canal gillnet catch in terms of its respective proportion of the seasons total catch during each week of the fishery. The peak harvest of Chilkoot fish occurred in week 29 (11-17 July) and accounted for approximately 13% of the total Lynn Canal sockeye catch for 1983. The harvest of Chilkat fish experienced two peaks, the first in week 31 (25-31 July) and the second in week 33 (8-14 August); these peaks ranged from 5.2-5.5% of the seasons total catch.

Discussion:

During the 1983 season, the Lynn Canal fishery recorded the largest catch of sockeye salmon since statehood. The return to Chilkoot Lake was the largest of the two systems and represented 55% of the total return. The Chilkoot stock contributed approximately 65% of the Lynn Canal sockeye

Table 2. Annual catch and escapement of Chilkat Lake sockeye salmon, 1976-83.

Year	Escapement	Catch	Total Run Size
1976	69,980	68,618	138,598
1977	40,334	34,765	75,099
1978	69,498	87,718	157,216
1979	80,588	132,868	213,456
1980	85,066	36,841	121,907
1981	84,125	48,956	133,081
1982	78,986	124,162	203,148
1983	134,002	127,842	261,844

Table 3. Annual catch and escapement of Chilkoot Lake sockeye salmon, 1976-83.

Year	Escapement	Total Catch	Run Size
1976	71,294	58,422	129,716
1977	97,212	125,311	222,523
1978	35,452	20,689	56,141
1979	95,948	76,170	172,118
1980	96,217	16,628	112,845
1981	81,890	44,367	126,257
1982	101,973	149,366	251,339
1983	80,087	241,469	321,556

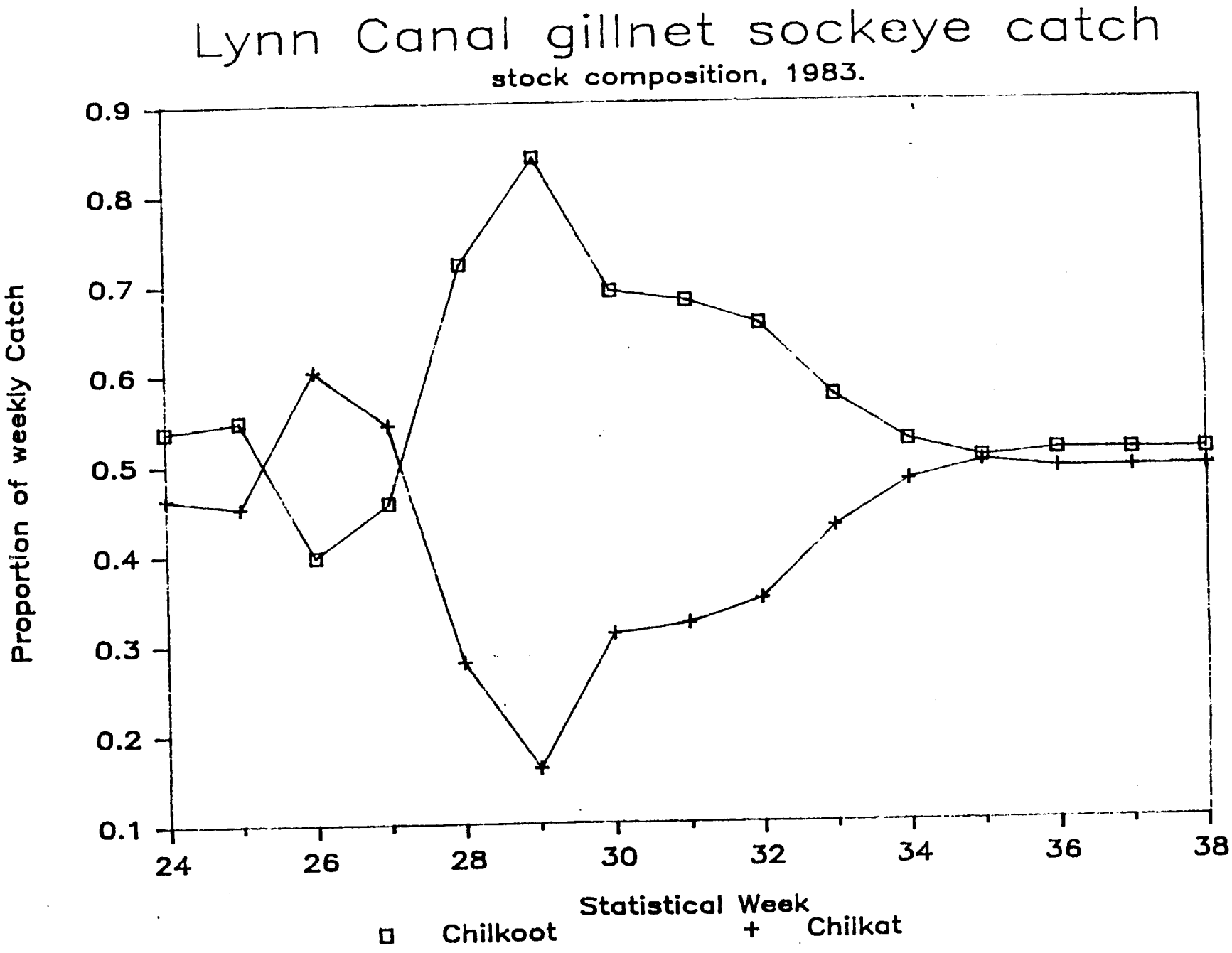

Figure 6. Weekly Lynn Canal harvests of Chilkoot and Chilkat Lake sockeye salmon expressed as a proportion of the weekly total, 1983.

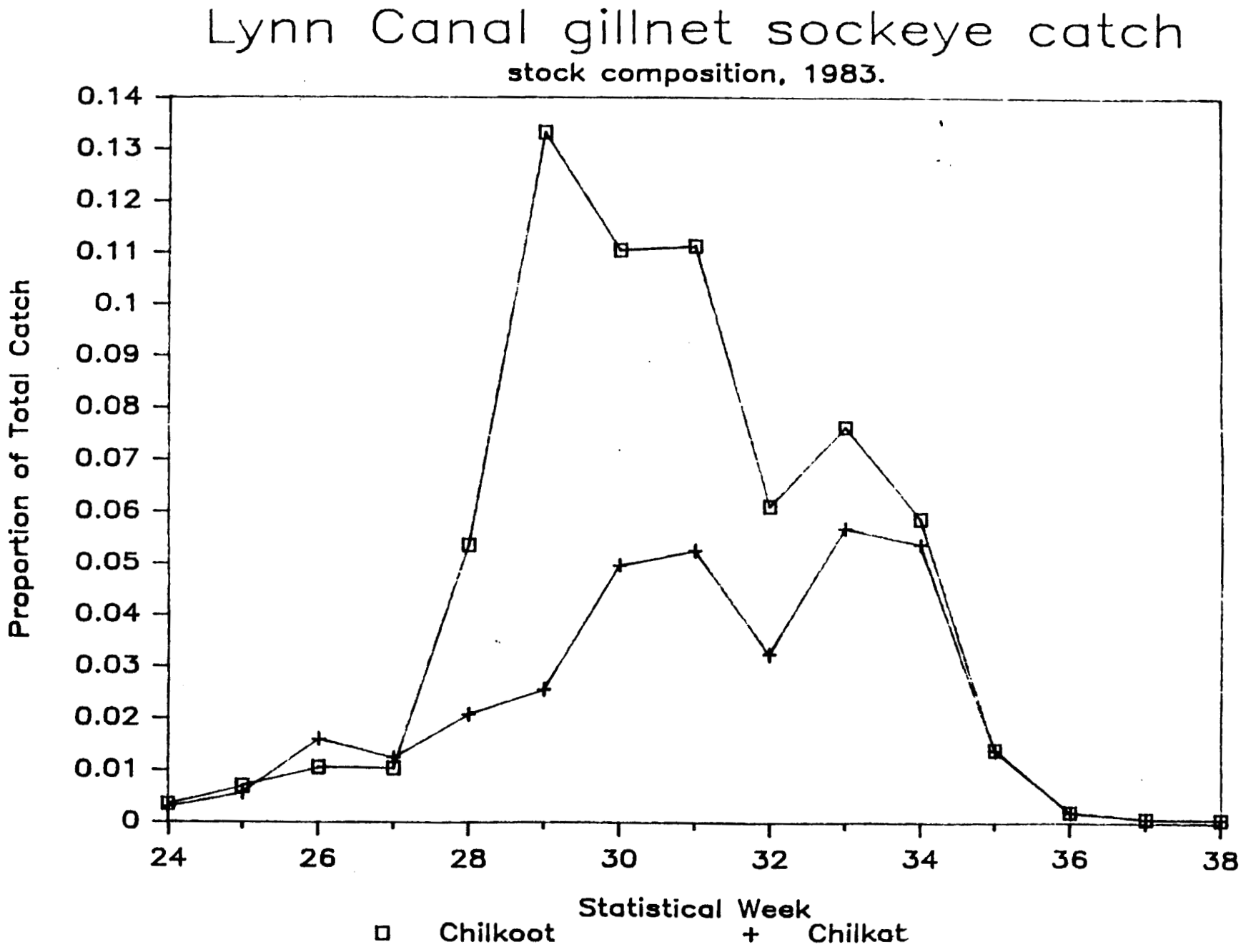

Figure 7. Weekly Lynn Canal harvests of Chilkoot and Chilkat Lake sockeye salmon expressed as a proportion of the season total, 1983.

harvest. The Chilkat stocks might have supported a larger harvest; however, the Chilkat run exhibited an unusually strong early segment which had not been observed prior to the 1983 season. It was not known if the strong early segment preceded an unusually strong protracted run or if it represented an early peak to a short run. The uncertainty generated by the early, strong escapement was cause for a conservative management approach for this stock.

The fact that the Chilkoot fish had historically shown a short lag time between the fishery and the weir allowed management to rely more heavily on the escapement information gathered at Chilkoot Weir. The availability of reliable in-season escapement data allowed management to take a less conservative approach to the management of the Chilkoot stocks than had been used on the Chilkat sockeye.

The return to Chilkoot, which had previously been comprised of predominantly 5-year-old fish, appeared unusually large for a system that 5 years earlier (1978) had received an escapement of only 35,000 fish. Two factors appear to have contributed to the 1983 Chilkoot return; 1) since 1975 Juneau and the surrounding area has experienced a series of increasingly mild winters (Figure 8) which possibly contributed to increased fry survival during the freshwater stage of the life cycle. This, in conjunction with the possibility of improved marine survival helped to generate the unusually high returns observed in 1983. 2) The Chilkoot stock has been observed, prior to 1983, to be comprised of predominantly 5-year-old fish; however, the 1983 return contained an unusually high percentage of 6-year-old fish which contributed substantially to the record return. The combined effects of the mild climactic conditions and the return of 6-year-old fish from the 1977 brood year are credited with producing the record Chilkoot return.

Age Analysis

Age analysis was performed on samples collected from the catch and escapement. The resulting data were used to credit the numbers of fish in the various age classes to their respective brood years.

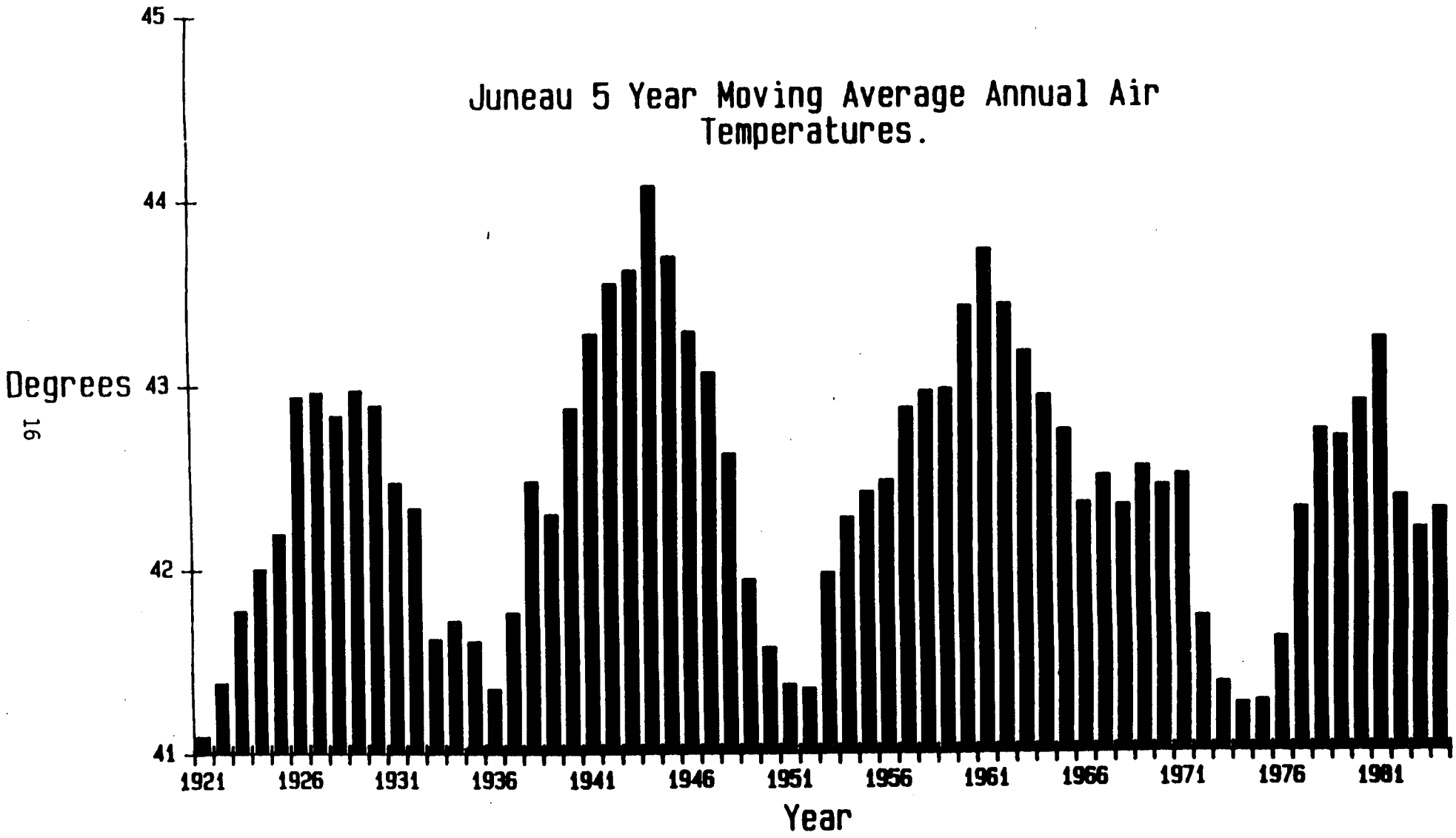

Figure 8. Average annual Juneau air temperatures expressed as a 5 year moving average, 1921-84.

Methods:

Scales were collected from fish entering the escapement at Chilkoot and Chilkat Weirs and from the Lynn Canal catch as it was unloaded at Excursion Inlet Cannery. Scales were selected from the preferred area of the fish . Scale impressions were made in cellulose acetate (Clutter and Whitesel 1956). Scale age analysis and stock identification were performed by ADF&G Stock Biology Group staff (McPherson 1986).

Results:

Age analysis of the escapements to Chilkoot and Chilkat Lakes showed that the dominant age group returning to Chilkoot Lake was the 1.3[1] age which represented 61% of the samples (Table 4). The second most abundant group, which comprised 25% of the escapement, was age 2.3; age 1.2 comprised 13% of the escapement. The Chilkat Lake escapement was comprised of 33% 2.2, 32% 1.3 and 28% 2.3 age fish; age 1.2 and 1.1 fish represented 3% and 1% of the escapement, respectively (Table 4).

Table 5 presents a comparison of the age structure of the escapement and catch along with an expansion of the catch and escapement to represent the total return to both systems. The Chilkoot catch was comprised of 72.2% 1.3 and 24.2% 2.3 age fish; 1.2 and 2.2 age fish combined made up 3.2% of the Chilkoot catch. The total Chilkoot run was comprised of 69.3% 1.3 and 24.5% 2.3 age fish; the balance of the run consisted of fish in the 1.2, 2.2, and other age classes. The harvest of Chilkat fish was made up of 51% 2.3, 23.3% 1.3 and 19.9% 2.2 age fish; the total run consisted of 39.3% 2.3, 27,9% 1.3, 26.4% 2.2, and the balance 1.2 and other age class fish.

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1 European formula-Number of freshwater annuli-decimal-number of saltwater annuli. Total age is the sum of these two numbers plus 1.

Table 4. Ages of sockeye salmon returning to Chilkat and Chilkoot Lakes, 1967-83.

Area/ Year	Relative Age Frequency in Percent						Sample Size
	1.1	1.2	1.3	2.2	1.4	2.3	
Chilkat							
1967	0	20	74	4	0	1	139
1968	2	33	40	24	0	12	440
1969	0	12	44	21	0	21	621
1970	1	18	73	3	0	5	929
1971	1	19	72	3	0	5	1,011
1972	0	12	37	11	0	39	322
1973	0	15	59	11	0	15	648
1974	0	7	54	20	0	19	497
1975	0	6	35	38	0	21	140
1976	0	11	17	57	0	15	258
1977	0	10	47	22	0	21	318
1978	0	18	47	20	0	15	343
1979	0	2	67	14	0	17	276
1980	0	8	25	12	1	53	125
1981	0	3	43	10	0	44	595
1982	0	2	10	48	0	36	1,632
1983	1	3	32	33	0	28	2,862
Chilkoot							
1976	0	14	62	9	0	15	307
1977	0	5	88	0	0	7	328
1978	0	9	76	4	0	11	282
1979	0	9	88	1	0	2	303
1980	0	6	94	0	0	0	32
1981	0	12	86	0	0	2	1,183
1982	0	19	78	0	1	1	1,691
1983	0	13	61	1	0	25	1,791

Table 5. Expanded catch, escapement, and total return of sockeye salmon to Lynn Canal (District 15) by age class and lake system based on scale analysis, 1983.

System		Age Class 1.2	2.2	1.3	2.3	Other	Total
Chilkoot							
Catch	Numbers	7,120	710	174,335	58,519	785	241,469
	Percent	2.9%	0.3%	72.2%	24.2%	0.3%	100.0%
Escapement	Numbers	9,746	1,271	48,726	20,225	375	80,343
	Percent	12.1%	1.6%	60.6%	25.2%	0.5%	99.5%
Total Run	Numbers	16,866	1,981	223,061	78,744	1,160	321,812
	Percent	5.2%	0.6%	69.3%	24.5%	0.4%	100.0%
Chilkat							
Catch	Numbers	2,990	25,446	29,753	65,195	4,439	127,823
	Percent	2.3%	19.9%	23.3%	51.0%	3.5%	100.0%
Escapement	Numbers	3,730	43,715	43,258	37,810	5,694	134,207
	Percent	2.8%	32.6%	32.2%	28.2%	4.2%	100.0%
Total Run	Numbers	6,720	69,161	73,011	103,005	10,133	262,030
	Percent	2.6%	26.4%	27.9%	39.3%	3.9%	100.0%

Discussion:

The percentage of occurrence of 1.3 (5-year-old) Chilkoot fish from the 1978 brood year in 1983 decreased 17% from the previous year and the 2.3 fish from the 1977 brood year showed a significant increase over previous years. This increase of 6-year-old fish appeared to have been partially responsible for the unanticipated large return from a low brood year escapement.

The age structure of the Chilkat Lake escapement appeared to be relatively equally distributed between the 1.3, 2.2, and 2.3 age groups. This pattern appeared to be consistent with those observed during previous years. A comparison of the age structure of the Chilkat catch with that of the escapement showed that the 2 ocean fish (1.2 and 2.2) experienced a higher percentage of occurrence in the escapement than in the catch; this might be explained by selectivity of the gear towards the larger 3 ocean fish.

Smolt

Sockeye smolt have been sampled at Chilkoot and Chilkat Lakes, since 1972, to monitor changes in growth, age and scale characteristics. A record of these parameters allows us to determine if freshwater scale growth differences between stocks are sufficient to use for the purpose of stock identification.

Methods:

Random samples of sockeye smolt were collected at Chilkoot and Chilkat Lakes beginning on 4 and 22 June, respectively. An attempt was made to collect approximately 10 samples per day at each weir. Smolt were captured with a fyke net fished from the down stream side of the weir at Chilkoot Lake. A long handled dip net was used to capture smolt at Chilkat Weir. A scale smear was taken from each smolt sampled. The smear was spread on a thin plastic strip which was then placed in a coin envelope.

Information regarding the sample was written on the coin envelope and included; date, location, species, fork length and sample number.

Scales were read by placing the plastic strip, which retained the scales, on the stage of a microfiche projector where the scales were read.

Results:

Table 6 presents the results of the analysis of the smolt samples for the years of record. Sockeye smolts from the 1983 outmigration which possessed one freshwater annulus and originated in Chilkoot Lake averaged 59mm and comprised 78% of the sample; Chilkat Lake smolts of the same age averaged 106mm and made up 97% of the sample. Two annuli Chilkoot smolt averaged 62mm in length and represented 22% of the sample. Only one, two annuli smolt was collected at Chilkat weir in 1983; this fish was 122mm long.

Discussion:

Smolt samples collected at Chilkoot and Chilkat Lakes in 1983 demonstrated significant differences between the two stocks in growth rates of one annulus smolt. This difference was significant at the 99% confidence level. Chilkoot demonstrated an increase in the occurrence of two check (two annuli) smolt in comparison with past years. The absence of two annuli smolt in the Chilkat sample precluded any comparison of freshwater growth rates between this stock and the Chilkoot smolt. The lack of two check smolt in the Chilkat sample may have been attributed to the fact that sampling of this stock was delayed until the weir was installed on June 22; the outmigration of smolt usually begins near June 1 with the older fish leaving first. This delay may have resulted in the older two check fish being missed.

Brood Year Returns

The analysis of returns from known brood year escapements has provided a means of evaluating the production potential of various levels of spawning escapement to the respective spawning systems. The existence of weirs on the outlets of Chilkoot and Chilkat Lakes and the ability to identify the numbers of each stock being harvested, has provided accurate information on the total return from the respective brood year escapements.

Table 6. Sockeye salmon smolt length analysis by age class, 1972-83.

			One Annulus			Two Annuli		
Year	Location	Sample Size	Average length(mm)	Range(mm)	%	Average length(mm)	Range(mm)	%
1973	Chilkoot	472	70	58-90	22	71	61-82	78
1974	Chilkoot	346	64	51-80	63	74	51-91	37
1975	Chilkoot	113	64	53-77	22	74	58-82	78
1976	Chilkoot	302	60	50-75	87	70	62-105	13
1977	Chilkoot	288	66	52-78	86	71	60-79	14
1978	Chilkoot	110	62	53-71	100	—	—	0
1979	Chilkoot	0	—	—	—	—	—	0
1980	Chilkoot	228	59	49-81	100	—	—	0
1981	Chilkoot	277	57	43-85	98	64	52-72	2
1982	Chilkoot	174	67	46-69	64	64	56-74	36
1983	Chilkoot	140	59	45-68	78	62	56-73	22
1972	Chilkat	288	103	86-118	5	118	91-146	95
1973	Chilkat	404	91	71-111	84	101	82-137	16
1974	Chilkat	113	88	82-115	85	104	91-104	15
1975	Chilkat	106	90	80-115	15	110	85-126	85
1976	Chilkat	165	97	83-122	71	111	93-139	29
1977	Chilkat	0	—	—	—	—	—	
1978	Chilkat	131	98	74-123	93	109	96-120	7
1979	Chilkat	0	—	—	—	—	—	
1980	Chilkat	178	100	90-115	92	101	96-114	8
1981	Chilkat	212	107	90-134	89	108	98-135	11
1982	Chilkat	199	106	90-116	93	116	108-125	7
1983	Chilkat	116	106	98-117	97	122	122	3

Methods:

Brood year returns were calculated by first determining the stock composition of the catch by week. The percent composition of the sample assigned to each stock was then multiplied by the total of that week's catch to determine the total number of each stock harvested. The scales were also analyzed to determine the age of the fish in the sample (Clutter and Whitesel 1956). Following the analysis of the scale samples, the numbers of fish in each age group was assigned to the appropriate brood year by stock. This process was repeated for each week the fishery was in progress. The total for each age group for all weeks by stock was assigned to the appropriate brood year. This process was repeated for samples collected from the escapements to Chilkoot and Chilkat Lakes. The sum of the escapements and harvest originating from the respective brood years for each stock represented the production from that brood year escapement.

Results:

Sockeye salmon which returned as 6-year-old fish in 1983 represented the last of the production from the 1977 brood year.

Spawner: recruit ratios for the Chilkat stock (Table 7) ranged from 1:2.2 (1972 brood year) to 1:5.1 (1977 brood year) and spanned a period of 6 years. By 1983, completed returns from only two brood years of Chilkoot sockeye had been recorded (Table 8); these returns converted to spawner: recruit ratios of 1:1.7 to 1:3.2, for the 1976 and 1977 brood years, respectively.

Discussion:

The spawner: recruit ratios shown for the 1977 brood year in Tables 7 and 8 are higher than shown in the report covering the 1982 (Bergander) reporting period. This apparent discrepancy was due to the fact that the 1982 report contained an estimated projection of the return of 6-year-old fish from the 1977 brood year. The ratios presented in the 1983 report included the higher than usual return of 6-year-old fish from the 1977 brood year which

Table 7. Returns of Chilkat Lake sockeye salmon stocks, 1970-77 brood years.

Brood Year	Brood Year Escapement	Return	Years of Return	Esc: Recruit
1970	41,085	28,338	1976	
1971	49,342	116,693	1976;77	
1972	51,860	112,911	1976;77;78	1:2.2
1973	50,554	125,679	1977;78;79	1:2.5
1974	84,237	250,729	1978;79;80	1:3.0
1975	41,508	128,772	1979;80;81	1:3.1
1976	69,984	166,827	1980;81;82	1:2.4
1977	40,334	205,106	1981;82;83	1:5.1

Table 8. Returns of the Chilkoot Lake sockeye salmon stock, 1976-77 brood years.

Brood Year	Brood Year Escapement	Return	Year of Return	Esc: Recruit
1970	N/A	13,615	1976	
1971	N/A	114,940	1976;77	
1972	N/A	218,966	1976;77;78	
1973	N/A	54,303	1977;78;79	
1974	N/A	161,167	1978;79;80	
1975	N/A	124,491	1979;80;81	
1976	71,294	123,489	1980;81;82	1:1.73
1977	97,212	306,094	1981;82;83	1:3.25

was higher than previously observed; this contributed to an under-estimate of the contribution of 6-year-old fish from the 1977 brood year as reported in 1982.

The results of the spawner:recruit analysis of the brood year escapements observed to date have shown a general upward trend; however, the limited number of data points precluded the formulation of any statistically valid conclusions. Climactic conditions over the past 8-10 years have become increasingly milder (Figure 8), which have contributed to higher survival and production.

Continued monitoring of the returns from known brood year escapements of these stocks will be necessary to accumulate spawner:recruit data encompassing a variety of escapement levels and environmental conditions before an accurate assessment of the escapement goals can be made.

MONITOR SOCKEYE SALMON STOCKS IN OTHER SOUTHEAST ALASKA SYSTEMS AND FISHERIES

Introduction

Escapement and harvest data have been collected at numerous spawning systems and fisheries in Southeast Alaska during the course of conducting research directed towards U.S./Canada studies and commercial fisheries management related activities. The results of some of these activities are included in this report in an effort to consolidate these data.

Objectives

1) Maintain escapement records for other major sockeye salmon spawning systems in the Region.

2) Collect scale samples for age determination and explore the potential for stock identification through scale analysis in other Southeastern Alaska escapements and fisheries.

Methods:

Weirs were used to enumerate escapements to the following sockeye salmon spawning systems: Crescent, Speel, (Figure 9) and Situk Lakes (Figure 10). Tahltan Lake (Figure 11) escapements were recorded by the Canadian Department of Oceans and Fisheries at a weir located on the outlet of Tahltan Lake. Scale samples, sex, and A.W.L. data were collected from the escapements to each of these systems.

Results:

The 1983 season was the first year Speel Lake Weir had been operated during the sockeye season and an escapement of 10,362 sockeye was recorded. Crescent Lake Weir had been operated as a sockeye weir in 1977-78; escapements recorded during these years were 1,174 and 1,042 fish, respectively. The sockeye salmon escapement to Crescent Lake in 1983 was 19,476 fish.

Tables 9 and 10 present the annual escapements to Tahltan and the Situk River for the period of record. Escapements to Tahltan Lake ranged from 1,471 (1965) to 51,354 (1972). Situk Lake escapements through 1975 were peak counts taken from aerial surveys, with the exception of 1971 which was a total count taken at a weir. From 1976 through 1983 all escapements were counted at a weir. Situk River Weir sockeye escapements ranged from 61,720 (1981) to 216,632 (1977). A sharp decline in the weir counts of sockeye escaping to the Situk River was noted in 1980 and continued through 1983.

Age analysis of the Cresent Lake escapement for 1983 showed that the age structure of the escapement was comprised of 63% 4-year-old, 23.3% 5-year-old, and 8.5% 6-year-old fish; the remaining 5.2% were 3-year-old fish. A total of 32.3% of the escapement originated from the 1977 and 1978 brood years, 62.7% came from the 1979 and 5.0% 1980 brood years (McGregor 1984).

The age structure of the Speel Lake escapement was comprised of 71.5% 5-year-old, 24.6% 4-year-old, 2.2% 6-year-old, and 1.7% 3- year-old fish. The Tahltan Lake escapement was made up of 89.8% 5-year-old fish; the remainder consisted of 4 and 6-year-old fish.

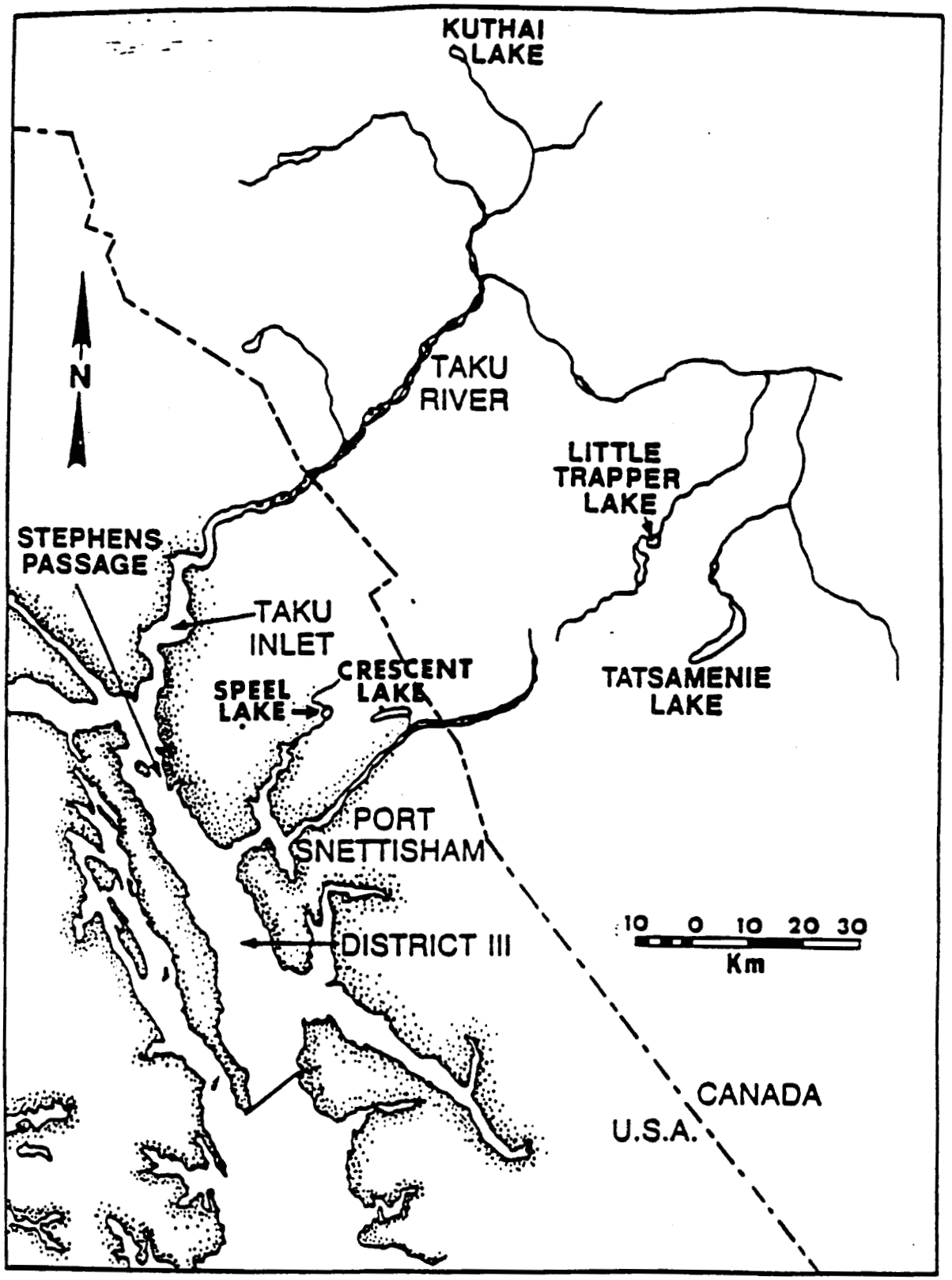

Figure 9. The Taku River and Port Snettisham sockeye salmon spawning systems.

Figure 10. The Situk River and Yakutat salmon spawning systems.

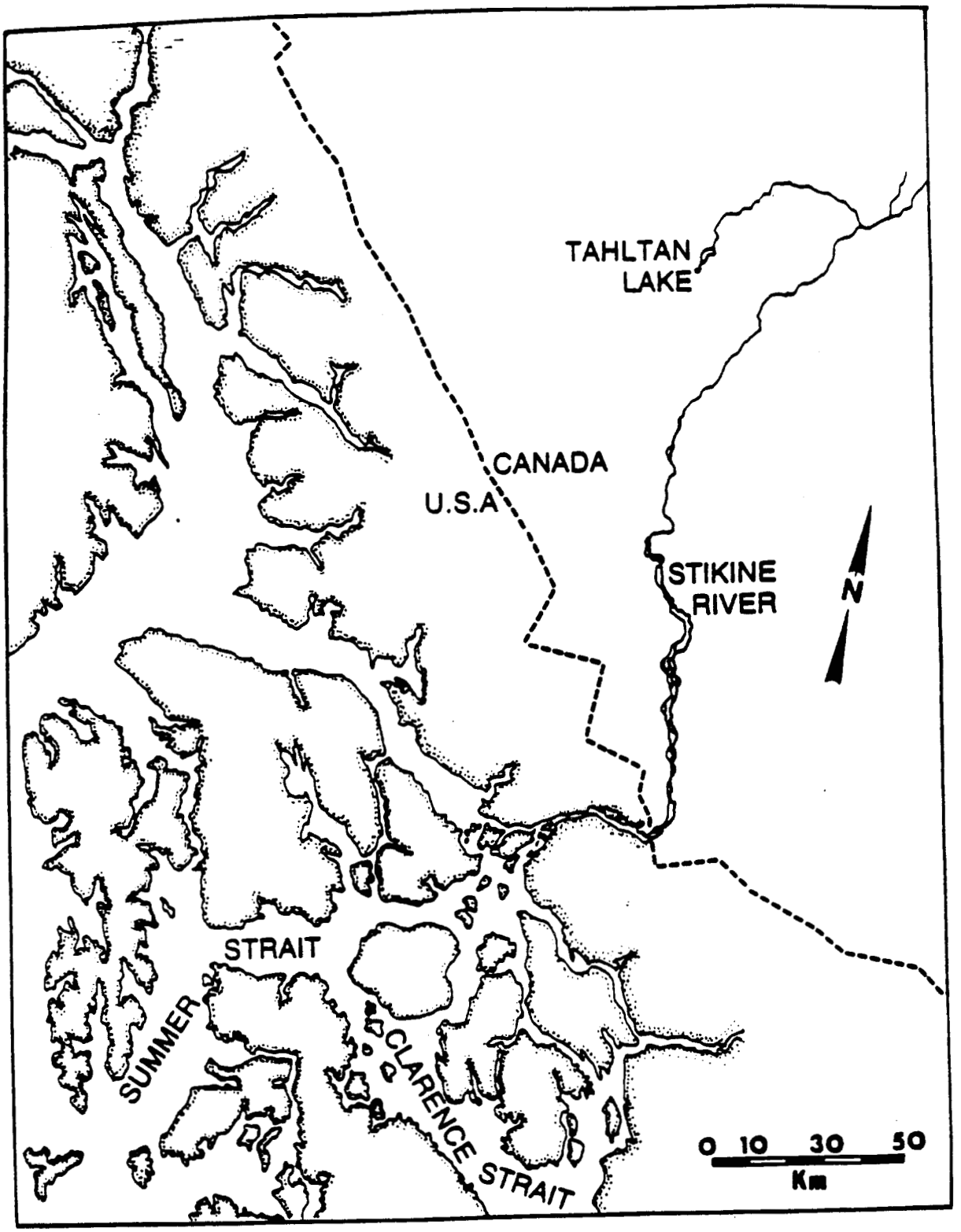

Figure 11. The Stikine River drainage and adjacent fishing areas.

Table 9. Annual sockeye salmon escapement through Tahltan Weir, 1959- 1983.

Year	Number of Fish	Period of Operation
1959	4,311	N/A
1960	7,000	N/A
1961	16,619	N/A
1962	15,000	N/A
1963	1,780	N/A
1964	19,352	N/A
1965	1,471	N/A
1966	21,580	N/A
1967	38,801	7/12-8/25
1968	19,729	7/07-8/27
1969	11,706	7/09-8/18
1970	8,269	7/06-9/07
1971	18,523	7/20-8/18
1972	51,354	7/03-8/21
1973	2,877	7/11-9/07
1974	8,106	7/04-9/13
1975	23,911	7/26-8/28
1976	23,111	8/02-8/21
1977	23,978	7/24-8/24
1978	22,978	7/11-8/26
1979	10,211	7/24-9/17
1980	12,000	7/16-8/19
1981	50,790	7/17-8/28
1982	28,257	7/11-9/03
1983	21,256	7/05-9/07

Table 10. Annual sockeye salmon escapement to the Situk River, 1960-83.

Year	Number of Sockeye In Escapement	Period of Operation
1960	26,900	N/A
1961	61,000	N/A
1962	31,000	N/A
1963	26,500	N/A
1964	41,300	N/A
1965	58,000	N/A
1966	75,000	N/A
1967	48,000	N/A
1968	41,000	N/A
1969	40,800	N/A
1970	59,000	N/A
1971	138,000	N/A
1972	80,400	N/A
1973	46,000	N/A
1974	40,000	N/A
1975	50,000	N/A
1976	116,989	6/10-8/22
1977	216,632	6/07-8/17
1978	147,174	6/06-8/18
1979	130,000	5/31-8/18
1980	79,059	6/06-7/29
1981	61,720	6/05-8/15
1982	75,501	
1983	68,100	6/17-8/16

Discussion:

The 1983 escapement to Crescent Lake appeared to be unusually high considering the escapement that would have generated a return of 5-year-old fish. However, an examination of the age analysis performed by McGregor on samples taken from this stock revealed that only 23.8% of the escapement was made up of 5-year-old fish; the major portion of the escapement (63%) originated from the 1979 brood year. Unfortunately, the sockeye weir at Crescent Lake was not run in 1979 and we have no record of that years brood year escapement. If harvest of the 1983 Crescent Lake sockeye run is assumed to have been zero, the return per spawner from the 1978 brood year would have been approximately 4.6:1. However, since a fishery was in progress in District 111 during the 1983 season it is highly probable that Crescent Lake fish were intercepted, making the estimated spawner:recruit ratio of 4.6:1 a minimum.

SUMMARY AND CONCLUSIONS

Brood Year Analysis

The analysis of brood year returns of Chilkoot and Chilkat Lakes sockeye stocks has demonstrated a general upwards trend in production. This indicates an increased quality of forage and spawning area in the freshwater habitat to support the returns observed in recent years. The relatively mild climactic conditions that have prevailed over the past 8-10 years are believed to have contributed to the increased production. Continued monitoring of the returns from known brood year escapements will be essential to evaluate the adequacy of the different escapements through a series of various climactic conditions.

ACKNOWLEDGEMENTS

Appreciation is due to the following individuals who were most helpful in developing this report: Scott McPherson and Andrew McGregor who were responsible for the collection of scale samples from the catch and analysis of scale samples from the catch and escapement; Gary Gunstrom, Region I Research Biologist, for his editorial assistance; Julie Anderson and June Grant for their assistance in typing and final preparation of this report; and, the many field technicians who collected the basic data essential to this report.

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