Volume 21

Study G-I-D

STATE OF ALASKA

Jay S. Hammond, Governor

Annual Performance Report for

INVENTORY AND CATALOGING OF THE SPORT FISH AND SPORT FISH WATERS IN UPPER COOK INLET

by

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RESEARCH PROJECT SEGMENT

State:	Alaska	Name:	Sport Fish Investigations of Alaska
Project No.:	F-9-12		
Study No.:	G-I	Study Title:	INVENTORY AND CATALOGING
Job No.:	G-I-D	Job Title:	Inventory and Cataloging of the Sport Fish and Sport Fish Waters in Upper Cook Inlet

Period Covered: July 1, 1979 to June 30, 1980

ABSTRACT

Ten lakes were gill-netted in the fall to determine relative growth and survival rates of landlocked coho salmon, Oncorhynchus kisutch (Walbaum). Data concerning age, growth and catch rates are presented and discussed for various managed lakes.

A creel census, conducted on five streams opened to chinook salmon, O. tshawytscha (Walbaum), fishing, estimated a harvest of 1,651 chinook salmon in 9,532 man-days of effort. Catch rates ranged from .018 chinook salmon per hour on Montana Creek to .074 per hour on Chunilna Creek.

Chinook salmon populations in Matanuska-Susitna Valley streams were estimated to total 16,651, which was 16 percent lower than the record 1976 escapement. Escapements for each stream are presented and discussed.

Examination of 627 chinook salmon scales revealed that Age 1.4 chinook accounted for 55.8 percent of the catch during the fishery. The age structure of the catch is discussed for each stream and compared to the spawning population on those streams where carcass recoveries were conducted.

Angler-caught chinook salmon were classified into age groups utilizing length frequency distribution and scale examination methods to determine the accuracy of length frequency analysis. It was determined that length frequency distribution accurately predicted the frequency of Age 1.2 chinook salmon in all streams. Overlapping of length classes was encountered with Age 1.3 and 1.4 chinook salmon on all streams. The accuracy of predicting the incidence of Age 1.3 and 1.4 chinook salmon was highest on those streams dominated by Age 1.4 chinook salmon.

Coho salmon escapement counts, conducted in established index areas, revealed above average numbers in most streams.

BACKGROUND

A fish stocking program was initiated in 1960 and has continued to provide angling opportunities in waters which originally contained no natural game fish populations. Numerous lakes have been rehabilitated and various fish species introduced at differential densities.

Coho salmon and rainbow trout have been the predominant species used for stocking although Arctic grayling are planted in several lakes when they are available.

Each fall stocked gamefish populations are sampled to evaluate relative survival, growth rates and stocking densities. During the winter months of each year, chemical parameters are checked in lakes having a history of past winter kills or low winter dissolved oxygen levels.

Chinook salmon populations in Cook Inlet declined to extremely low levels in the 1960's and have since then been intensively managed to restore runs to historic levels. Upper Cook Inlet chinook salmon have been protected by complete closures on both sport and commercial fisheries since 1973. Prior to 1973, a very limited sport and commercial harvest was allowed in some areas. Since chinook salmon populations contain a mixture of 3- to 6-year old fish, it will take many years to determine the results of these management efforts.

Escapement counts have been conducted on various streams in the Matanuska-Susitna Valleys since 1969 to evaluate the effectiveness of various chinook salmon management programs. Chinook salmon carcass data collected from several streams reveal the age structure of these populations which aids in evaluating returns from parent escapements.

In 1976, escapement counts in the Susitna River drainage revealed the largest recorded chinook salmon escapement. These high levels continued in 1977-78 and, as a result, the Alaska Board of Fisheries allowed a limited chinook salmon fishery on five streams in the Matanuska-Susitna Valleys in 1979. A maximum catch quota was also established for each stream and a punch card was required of each angler. The bag limit was one chinook salmon per day and five per season over 20 inches in length.

To determine optimum chinook salmon escapement levels, it is necessary to monitor harvest levels. In 1979, a creel census was initiated on all five streams to assess effort and harvest and determine when quotas were attained.

Coho salmon runs during the early 1970's had declined to very low levels in Matanuska-Susitna Valley streams. Part of the decline was believed to have been caused by low stream flows that existed during the dry years of 1968-1970. Because the timing of coho salmon runs through the Cook Inlet commercial fishery coincides with that of all other species except chinook salmon, it is difficult to manage coho salmon by manipulation of the commercial fishery. Management tools that have been utilized include protection of spawning grounds, regulation of various sport fishing methods and means, restriction to weekend-only fishing and emergency closures when runs appear to be lagging.

Each year, coho salmon escapement counts are conducted in index areas located on selected streams to monitor general population trends. In 1975, coho salmon populations increased substantially and since then it appears that populations are slowly recovering from the early 1970 declines.

Table 1 lists all species mentioned in the report and Figure 1 is a map of the study area.

RECOMMENDATIONS

1. Surveys should be conducted on lakes not previously surveyed and on lakes that have not been recently surveyed, as time permits, to provide useful data for lake management programs.

2. Monitoring coho and chinook salmon escapements in selected streams of the area should be continued to evaluate current management practices.

3. Harvest and fishing effort should be determined on those streams open to chinook salmon fishing.

4. Scale samples should be collected from angler-caught chinook salmon to further evaluate the accuracy of length-frequency distribution as a method for determining age groups.

5. Monitoring of flows and temperatures in selected streams in the Matanuska-Susitna Valleys should be continued to obtain baseline data which will be useful in determining the effect of low water years on coho salmon production.

OBJECTIVES

1. To determine and record environmental characteristics of existing and potential fishery waters of the job area.

2. To investigate, evaluate and develop plans for enhancement of anadromous and resident fish stocks.

3. To determine chinook salmon harvest levels and fishing effort on those streams open to chinook salmon fishing.

4. To make recommendations for the proper management of various sport fish waters in the area and to direct future studies.

TECHNIQUES USED

Monofilament gill nets 6 ft x 125 ft, having five mesh sizes ranging from 1/2 in to 2 in bar measure, were used to collect fish specimens. Nets were set for approximately 24 hours in each lake. All captured fish were weighed to the nearest gram and fork lengths were recorded to the nearest millimeter.

Table 1. List of Common Names, Scientific Names and Abbreviations.

Common Name	Scientific Name and Author	Abbreviation
Chinook Salmon	Oncorhynchus tshawytscha (Walbaum)	KS
Sockeye Salmon	Oncorhynchus nerka (Walbaum)	RS
Coho Salmon	Oncorhynchus kisutch (Walbaum)	SS
Arctic Grayling	Thymallus arcticus (Pallas)	GR
Rainbow Trout	Salmo gairdneri Richardson	RT
Dolly Varden	Salvelinus malma (Walbaum)	DV
Whitefish	Prosopium ssp.	WF

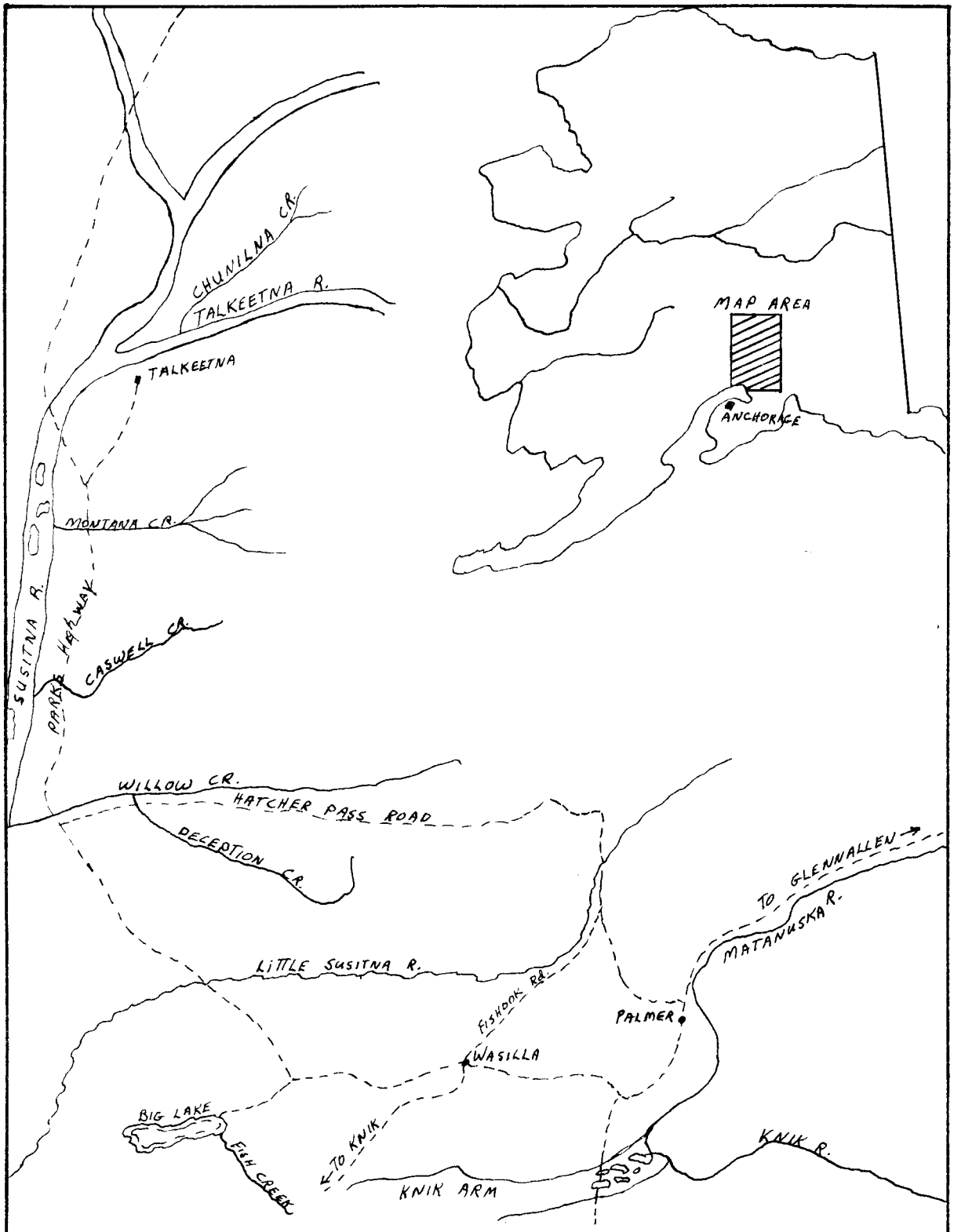

Figure 1. Study Area in Matanuska-Susitna Valleys.

The creel census during the chinook salmon fishery was statistically designed to estimate harvest and effort on five streams. The sampling day was divided into five 4-hour periods between the hours of 4 a.m. and 12 midnight. Two randomly selected periods were sampled on each weekday, while on each weekend day and holiday all five periods were sampled.

During sampling periods, angler counts were conducted on those areas of the stream that received the greatest fishing intensity. The frequency of angler counts varies on each stream depending on the length of time necessary to complete a count. Counts were conducted hourly on Caswell Creek, since the fishery was restricted to a very small area and it took only a few minutes to conduct a count. Since the Little Susitna River has numerous access routes and angler distribution was very wide, counts were limited to two on each weekday and four on each weekend day.

Since the area open to chinook salmon fishing on the Little Susitna River extends more than 70 stream miles, it was necessary to conduct a census at two major access points which are approximately 40 stream miles apart. Catch and effort estimates were calculated separately for each access point and then summed.

During the sampling periods, only completed anglers were interviewed. Information collected from anglers included number of hours fished, number and species of fish caught, punch card and fishing license numbers and whether they were boat or shore anglers. Chinook salmon over 20 inches in length were weighed to the nearest pound, and scales were collected and placed in coin envelopes with appropriate biological data recorded on each envelope. Chinook salmon were measured from the tip of snout to fork and from mid-eye to fork. Both measurements were recorded to the nearest 0.1 cm. All lengths in this report are from tip of snout to fork of tail measurements.

Chinook salmon scales were mounted on gum paper and then pressed onto acetate. Scales were examined using a scale projector.

Chinook salmon spawning populations were enumerated by aerial, boat and stream bank surveys, while spawning coho salmon were enumerated by foot surveys within established index areas. Chinook salmon carcass data were collected and age classes were estimated by length frequencies.

FINDINGS

Lake Stocking Evaluations

Ten stocked lakes containing landlocked coho salmon were sampled with variable mesh gill nets in 1979 (Table 2). Due to a late freeze-up, all but Christiansen and Benka Lakes were netted during ice free periods. Gill net catches of both Age 0+ and Age I+ coho salmon were high in most lakes. Although Age 0+ coho salmon are too small to be effectively captured in gill nets, catches still ranged from 0.13 fish/hour in Lucille Lake up to 1.81 fish/hour in Victor Lake. Five of the eight lakes containing Age I+ coho salmon had catches ranging from 1.31 to 2.36 fish/ hour.

Table 2. Gill Net Results and Stocking Histories of Managed Lakes, Matanuska-Susitna Valleys, 1979.

Lake	Date Sampled	Species	Age Class	Length (mm) n	Length (mm) $\bar{x}$	Length (mm) ± SD	Length (mm) Range	Catch Net Hr.	Date Stocked	Total Number	Per Lb.	Per Acre
Benka	12/20/79	SS	I+	2	173	7.78	167-178	.04	7/10/78	17,250	188	150
Christiansen	12/20/79	SS	I+	111	217	14.99	160-258	2.36	7/10/78	17,900	188	100
Echo	11/1/79	SS	0+	17	110	5.41	95-119	0.74	9/19/79	4,606	59	200
Finger	11/1/79	SS	0+	34	111	5/41	101-125	0.69	5/21/79	73,030	670	200
		SS	I+	65	206	28.47	153-252	1.31	5/23/79	72,527	627	200
Loon	10/30/79	SS	0+	21	112	9.73	95-150	0.46	5/21/79	10,800	670	100
		SS	II+	17	332	21.87	290-365	0.37	6/08/77	10,800	623	100
Lucille	11/2/79	SS	0+	6	113	3.33	110-117	0.13	5/21/79	72,500	670	200
		SS	I+	75	207	26.91	160-263	1.60	5/23/78	72,527	627	200
Memory	10/30/79	SS	I+	40	245	21.87	193-286	1.70	7/11/78	12,500	277	150
		SS	III+	2	319	41.01	290-348	0.09	6/01/76	16,600	298	200
Prator	10/31/79	SS	I+	100	180	25.55	125-250	2.08	7/11/78	9,800	277	100
		SS	III+	12	333	37.11	280-380	0.25	6/01/76	9,800	298	100
Rocky	10/30/79	SS	0+	32	111	3.88	103-118	0.67	5/23/79	5,900	650	100
		SS	I+	33	195	23.42	161-248	0.70	7/11/78	8,900	277	150
Victor	11/01/79	SS	0+	39	172	18.77	142-201	1.81	5/23/79	2,800	650	200
		SS	I+	2	253	41.72	223-282	0.09	7/11/78	2,800	277	200

As in past years, most Age 0+ coho salmon averaged about 110 mm in length after 6 to 7 months residency in a lake. This growth rate appears to be very uniform in all Matanuska Valley lakes when coho salmon are planted in May or June in waters already containing fish populations. Coho salmon stocking rates vary from 100 to 200 fish per surface acre depending on lake fertility.

It is well documented that coho salmon growth rates are dependent on fish densities. Occasionally, natural occurrences arise that dramatically show the density dependent nature of coho salmon growth rates. Memory Lake, which is stocked every other year, experienced a partial winter kill in 1977 and was not stocked in the spring of 1977. Existing coho salmon populations were extremely low when coho salmon were stocked in 1978. After 6 months' residency, they averaged 154 mm in length. Victor Lake was not stocked in 1977. In 1978, it was stocked but, during the 1978-79 winter, a severe winter kill occurred almost eliminating the population. Victor Lake coho salmon that were restocked in 1979 averaged 172 mm in length after 5 months' residency.

The average length of Age I+ coho salmon after 18 months in Matanuska Valley lakes is 215 mm.

Chinook Salmon Studies

Creel Census:

A creel census was conducted on the Little Susitna River and Chunilna Creek from May 25 through July 6, and on Caswell, Montana and Willow Creeks during four consecutive weekends commencing June 9.

Since no chinook salmon fishing had been conducted on any of the streams since 1972, it was difficult to predict fishing patterns when establishing the census sampling scheme. Some sampling problems were encountered during the fishery, the most notable of which occurred during the weekend-only fisheries. When fish became available in Willow, Caswell and Montana Creeks, it appeared that the catch and effort from midnight to 4 a.m. on Saturday was high and this period was the only period not sampled. This occurred every weekend on Caswell but only the last 2 weekends on Willow and Montana Creeks. The census takers became aware of this problem when interviewing anglers who had fished during this period. A subsequent check of Caswell Creek was made during this period and the highest angler counts of the day were recorded; this confirmed the reports. Appropriate expansion factors were utilized to accomodate this problem in determining total estimated harvest.

The total chinook salmon harvest for the five east side Susitna River streams was estimated at 1,651, and 9,532 man-days of effort were expended with a mean catch per hour of 0.040 (Table 3). The overall area catch quota of 2,100 chinook salmon was not obtained. Individual stream quotas were reached only on Chunilna Creek with a quota of 300 and estimated catch of 358. Catch rates on the five streams ranged from 0.018 chinook salmon per hour in Montana Creek to 0.074 per hour in Chunilna Creek.

The average length of an angler-day varied considerably between streams and appeared to be dependent on accessibility and availability of fish. Bank anglers and boat anglers averaged 3.25 and 6.00 hours per day, respectively, on all streams combined.

Catch and effort estimates were derived from interviews with 3,215 completed anglers, which represented 34.0% of the total estimated effort. The best coverage occurred on Willow and Chunilna Creeks where 43.5% and 45.0%, respectively, of the total number of anglers were interviewed, while only 23.0% were contacted on Montana Creek. Completed anglers caught 689 chinook salmon, which represents 42.0% of the total estimated catch. On Willow Creek, 60.0% of the total harvest of chinook salmon were examined and only 34.2% were checked on the Little Susitna River.

Tables 4 and 5 show angling effort and catch by weekly period. Since the fishery was new, most anglers were not aware of the run timing in Little Susitna River and Chunilna Creek. In Little Susitna River, 43.1% of the effort occurred during the May 25-June 15 period when only 8.0% of the catch occurred. On Chunilna Creek, 30.2% of the effort occurred during this first 3-week period but no catch was recorded. In Chunilna Creek, there has traditionally been a fishery for resident fish species and some of the effort was directed toward these species prior to the arrival of chinook salmon. Anglers that were unsuccessfully fishing for chinook salmon often switched to fishing for other species that were available. The estimated catch of these other species during the chinook salmon fishery is shown in Table 6.

Caswell Creek was the only weekend stream that had chinook salmon available during every weekend, and the highest catch occurred during the second weekend period of June 16-17. No chinook salmon were caught the first 2 weekends on Montana Creek and only 15 were caught on Willow Creek. Since chinook salmon do not enter Caswell Creek, the fishery is at its confluence with the Susitna River which is a resting area. It appears that those chinook salmon showing up at Caswell Creek are bound for tributaries further up the Susitna River drainage and that Willow and Montana Creek chinook salmon come up the Susitna River somewhat later. It is unknown why chinook salmon were available at Caswell Creek, which is located between Willow and Montana Creeks, and not available at the other two streams. The composition of the catch at Caswell Creek was also much different from any other stream. The male:female sex ratio was 4.6:1.0, and 50.0% of the catch was under 28 inches which indicates a large number of "jacks" are coming into this area.

Angling effort and catch continued to increase as the season progressed and the last week of the fishery (June 30-July 6) 34.5% of the seasonal effort was recorded and 43.7% of the seasonal catch was taken. Figure 2 shows the increase in effort and harvest by weekly period. This graphically shows that the catch and effort had not yet peaked and the fishery was still building at the conclusion of the season.

On those streams opened throughout the week, 57.5% of the effort and 60.0% of the catch occurred during the 12 noon to 8 p.m. sampling periods. On weekend-only streams, 48.5% and 48.7% of the effort and catch, respectively, occurred during the same period but it is known that a higher percentage of the catch and effort occurred during the unsampled 12 midnight to 4 a.m. period.

Table 3. Effort and Harvest Data of the Chinook Salmon Sport Fishery, Matanuska-Susitna Valleys, 1979.

Stream	Quota	Harvest	Sex Ratio Male Female	Effort Man-Days	Catch/Hour	Harvest per Angler-Day
Caswell Creek	200	155	4.6 : 1.0	1,070	.028	0.14
Chunilna Creek	300	358	1.3 : 1.0	1,160	.074	0.31
Little Susitna River	1,000	728	1.3 : 1.0	3,857	.042	0.19
Montana Creek	300	125	1.3 : 1.0	2,470	.018	0.05
Willow Creek	300	285	2.0 : 1.0	975	.051	0.29
Total	2,100	1,651	1.6 : 1.0	9,532	.040*	0.17

* The figures in the last two columns are weighted; the total/averages are accurate.

Table 4. Angling Effort by Weekly Period During the Chinook Salmon Fishery, Upper Cook Inlet, 1979.

Date	Chunilna Creek		Little Susitna River		Willow Creek		Caswell Creek		Montana Creek		Total	
	Man-Days	%	Man-Days	%	Man-Days	%	Man-Days	%	Man-Days	%	Man-Days	%
05/25-06/01	96	8.2	688	17.8							784	8.2
06/02-06/08	89	7.7	429	11.1							518	5.4
06/09-06/15	166	14.3	547	14.2	145	14.9	193	18.0	321	13.0	1,372	14.4
06/16-06/22	211	18.2	486	12.6	99	10.1	311	29.1	279	11.3	1,386	14.6
06/23-06/29	212	18.3	725	18.8	386	39.6	284	26.5	576	23.3	2,183	22.9
06/30-07/06	386	33.3	982	25.5	345	35.4	282	26.4	1,294	52.4	3,289	34.5
Total	1,160		3,857		975		1,070		2,470		9,532	

Table 5. Chinook Salmon Catch By Weekly Period, 1979.

Date	Chunilna Creek		Little Susitna River		Willow Creek		Caswell Creek		Montana Creek		Total	
	Catch	%	Catch	%	Catch	%	Catch	%	Catch	%	Catch	%
05/25-06/01	0		0								0	
06/02-06/08	0		8	1.1							8	0.5
06/09-06/15	0		50	6.9	0		16	10.3	0		66	4.0
06/16-06/22	38	10.6	204	28.0	15	5.3	65	42.0	0		322	19.4
06/23-06/29	94	26.3	239	32.8	116	40.7	36	23.2	49	39.2	534	32.3
06/30-07/06	226	63.1	227	31.2	154	54.0	38	24.5	76	60.8	721	43.7
Total	358		728		285		155		125		1,651	

Table 6. Catch Rates and Harvest Estimates of Miscellaneous Species Caught During the Chinook Salmon Fishery at Chunilna Creek, 1979.

Species	Catch/Hour	Harvest per Angler-Day	Harvest
Rainbow Trout	0.10	0.42	511
Dolly Varden	0.16	0.65	794
Arctic Grayling	0.05	0.21	257
Whitefish	0.03	0.11	139
Sockeye Salmon	0.02	0.09	107

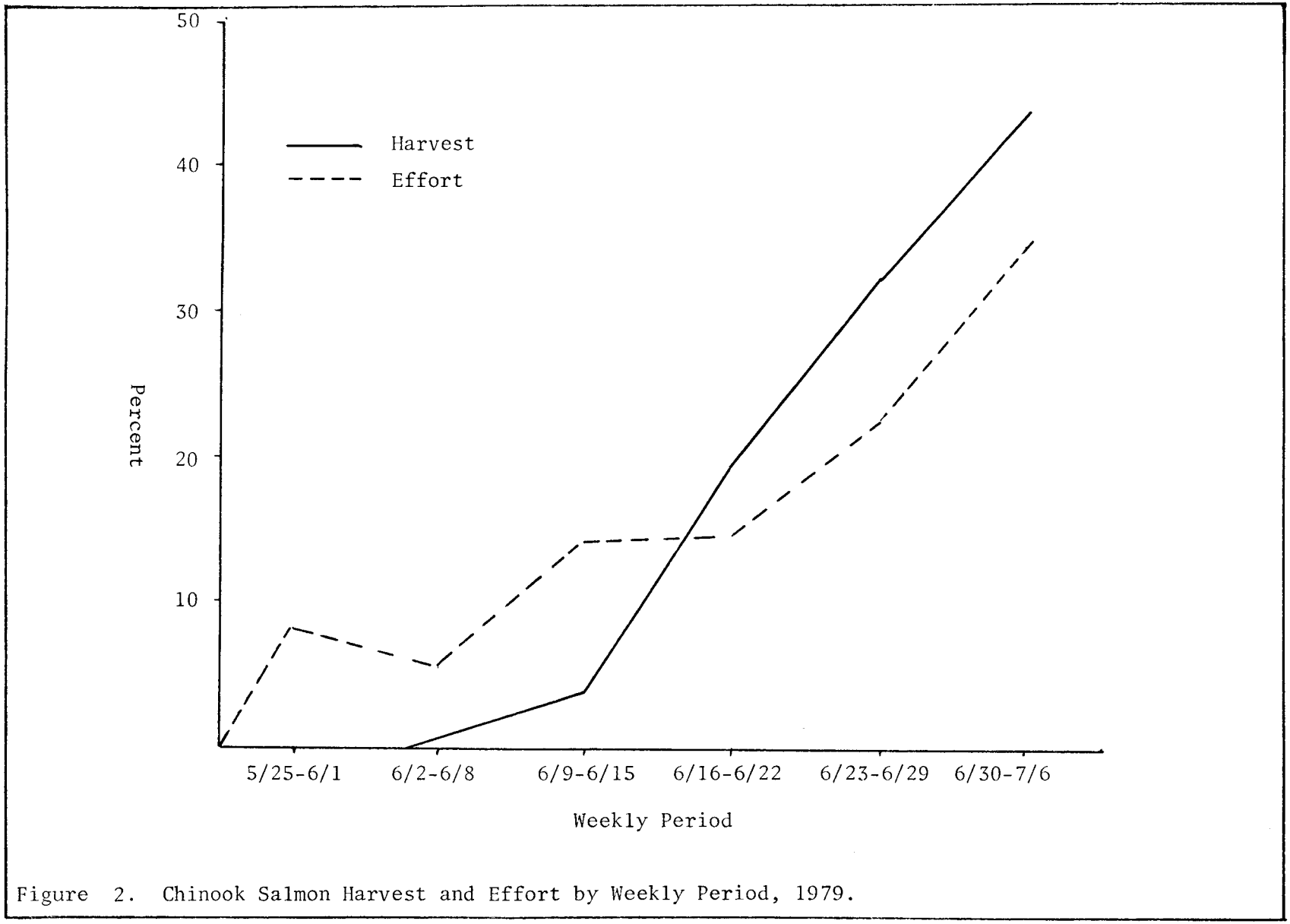

Figure 2. Chinook Salmon Harvest and Effort by Weekly Period, 1979.

The Little Susitna River and Chunilna Creek experienced high water conditions the last 10 days of the season which is believed to have reduced the catch since this occurred during the time when runs were building to a peak. Total rainfall in the Willow to Talkeetna area during June 24-27 varied from 1.7 to 2.3 inches.

Escapement:

In 1979, chinook salmon escapement surveys on east side Susitna River tributaries and tributaries of the Talkeetna and Chulitna Rivers were conducted from July 23 to August 1. Counts were hampered during the entire survey period by heavy rains which resulted in high discharges in many streams. Despite repeated efforts, counts were not completed on six streams. A total of 5,454 chinook salmon were observed during escapement surveys. Watsjold (1974) found that, during aerial surveys, chinook salmon were observed in alpine streams with 70.0% efficiency and were observed in streams flowing through heavily forested areas with 55.0% efficiency. Based on these findings and the fact that the six uncounted streams represented 53.0% of the observed escapement over the past 3 years, it was estimated that the 1979 chinook salmon escapement was 15,000. An additional 1,651 chinook salmon were taken by anglers which, if added to the 1979 escapement, would make the estimate 16.0% lower than the highest recorded escapement of 19,900 in 1976. However, it was the third highest count obtained since counts began in 1970 (Table 7).

Individual stream counts are presented in Table 8. Moose Creek and the North Fork of Kashwitna River had record escapements. Even though counting conditions were poor on four streams (Table 8), when the sport catch for each of the streams is added to the escapement, Chunilna Creek nearly equals its highest recorded escapement of 1,237 in 1976 and Willow Creek is only 33 fish below its second highest escapement of 1,166 reached in 1978. If counting conditions had been ideal, it is felt that counts would have revealed near record escapement levels in many of the streams.

Population Structure:

Chinook salmon carcasses were collected from Willow and Montana Creeks. Length frequency distribution has always been used to determine chinook salmon age structure on those streams where carcasses were examined. Since no chinook salmon scales have been available for ageing from east side Susitna River tributaries prior to 1979, length frequency classes developed from ageing of west side tributary chinook salmon have been used throughout the Susitna River, including the east side tributaries.

A chinook salmon fishery, initiated in 1979 on east side tributaries, permitted collection of scales to determine the accuracy of assessing age solely by length frequency. Although the Little Susitna River is not a Susitna River tributary, it was included in the analysis because it is part of the Upper Cook Inlet drainage.

Table 7. Chinook Salmon Escapement Counts and Population Estimates, East Side Susitna River Tributaries and Tributaries of the Chulitna and Talkeetna Rivers, 1973-1979.

Year	Observed Counts	Estimated Counts
1973	8,086	8,900
1974	3,556	4,100
1975	1,247	1,500
1976	16,753	19,900
1977	14,199	17,028
1978	12,853	15,365
1979	5,454*	15,000

* Count does not include six streams which, in the past 3 years, represented 53% of the observed escapement.

Table 8. Observed Chinook Escapement Counts, Upper Cook Inlet, 1973-1979*.

Stream	Ground Surveys						
	1973	1974	1975	1976	1977	1978	1979
Willow Creek	1,074	402	177	1,660	1,065	1,166**	848**
Upper Deception Creek						495	238
Montana Creek	527	280	229	1,445	1,443	881**	1,094**
Moose Creek	36	32	55	116	153	237	253
Prairie Creek	4,190	1,498	369	6,513	5,790	5,154	
Troublesome Creek						192	
	Aerial Surveys***						
	1973	1974	1975	1976	1977	1978	1979
Chunilna Creek	(292)	(283)	(101)	(1,237)	769	(997)	(864)**
Kashwitna River (North Fork)	(183)	103	(33)	(203)	(336)	(362)	(457)
Little Willow Creek	(371)	(139)	(103)	(833)	(598)	(436)	(324)**
Sheep Creek	(482)	202	42	(455)	(630)	(1,209)	778
Indian River	(122)	102	31	537	393	114	285
Portage Creek	(174)	260	32	702	374	140	190
Chulitna River (East Fork)	(42)	41	7	112	168	59	
Chulitna River (Middle Fork)	(219)	159	55	1,870	1,782	900	
Chulitna River (Main Stem)				124	229	62	
Goose Creek		41	13	160	(133)	(283)	
Little Susitna River	(374)			(405)			
Honolulu				24	36	13	37
Byers Creek				53	69		28
Troublesome Creek				92	95		58
Bunco Creek				112	136	153	

* Prairie Creek, Chulitna River, Goose Creek and Bunco Creek were uncountable due to high water conditions in 1979.

** Poor counting conditions.

*** Helicopter surveys in parentheses, all other aerial counts are fixed-wing aircraft.

The length frequency classes that have previously been used to determine age structure are as follow: Age 1.2 (51-75 cm), Age 1.3 (76-95 cm), and Age 1.4 (96 cm and over). Although these are the dominant age groups of Susitna River chinook salmon, there are occasionally other age groups with an additional year in freshwater or saltwater. Some error will exist in utilizing the length classes simply because these additional age groups cannot be accounted for using this method.

It should be noted that during scale analysis it became apparent the area of freshwater growth on numerous scales from all east side streams showed peculiar growth patters. After formation of the freshwater annulus, growth appeared to increase and then was briefly interrupted before rapid saltwater growth began. Since very little is known about the migration of juvenile chinook salmon through the Susitna River, these patterns cannot be interpreted.

Angler-caught chinook salmon were grouped according to age solely on the basis of length frequency and then compared to the age structure as determined from scale analysis. Although scale analysis is the most accurate method, it is very time-consuming when simply compared to recording lengths. Table 9 shows the comparison of the two methods used in determining age composition of chinook salmon populations. It is apparent that the length frequency method is extremely accurate in predicting the frequency of Age 1.2 chinook salmon on the five streams, as there was only 0.1% difference between the two methods. The inaccuracy of the length frequency method is reflected in Age 1.3 and Age 1.4 chinook salmon. This method predicted 5.6% fewer Age 1.3 and 7.5% more Age 1.4 chinook salmon than actually occurred. There were a lot more Age 1.3 (31%) that fell into the 96 cm and over class than there were Age 1.4 (3.7%) chinook salmon that fell into the 76-95 cm class. This occurred to some extent on each of the five streams. The greatest discrepancies occurred on Chunilna Creek, while the differences on the other four streams were similar and considerably less than Chunilna Creek. Chunilna Creek was also the only stream that had a dominant catch of Age 1.3 chinook salmon. All other streams, except Caswell Creek, were dominated by Age 1.4 chinook salmon. It was noted during scale analysis that many of the Age 1.3 chinook salmon, exceeding 95 cm in length, had saltwater growth patterns atypical of normal Age 1.3 scales. This indicates that these larger fish may have been exposed to conditions favorable to growth that were not encountered by the majority of Age 1.3 chinook salmon. It appears that the length frequency method is most accurate when assessing chinook salmon populations that are predominately Age 1.4.

The degree of overlapping in sizes that is occurring between Age 1.3 and Age 1.4 chinook salmon may be predictable. Another year of data will be required to determine if the same patterns persist. If similar results are obtained, the data will be statistically analyzed to determine which length frequency classes most accurately reflect the age groups; possibly a compensation factor can be formulated to allow for the overlap in sizes.

Tables 10 through 13 show age and length data collected from chinook salmon carcasses and angler-caught chinook salmon on Willow and Montana Creeks. In all instances, carcass data reflected a higher percentage of Age 1.4 chinook salmon than were caught by anglers. The sport catch reflected a

Table 9. Comparison of Scale Analysis and Length Frequency Distributions to Determine Chinook Salmon Age Composition, 1979.

Age	Willow Creek				Little Susitna River				Chunilna Creek			
	Length Frequency		Scale Analysis		Length Frequency		Scale Analysis		Length Frequency		Scale Analysis	
	n	%	n	%	n	%	n	%	n	%	n	%
1.2	17	11.2	17	11.2	29	12.5	30	12.9	26	17.1	26	17.1
1.3	22	14.5	28	18.4	37	16.0	48	20.7	47	30.9	63	41.4
1.4	113	74.3	105	69.1	166	71.5	150	64.7	79	52.0	58	38.2
2.3							1	0.4				
1.5			2	1.3			2	0.9			4	2.6
2.4							1	0.4			1	0.7
Total	152		152		232		232		152		152	

Age	Caswell Creek				Montana Creek				Total			
	Length Frequency		Scale Analysis		Length Frequency		Scale Analysis		Length Frequency		Scale Analysis	
	n	%	n	%	n	%	n	%	n	%	n	%
1.2	28	50.0	28	50.0	5	14.3	5	14.3	105	16.8	106	16.9
1.3	11	19.6	12	21.4	8	22.9	9	25.7	125	19.9	160	25.5
1.4	17	30.4	16	28.6	22	62.8	21	60.0	397	63.3	350	55.8
2.3											1	0.2
1.5											8	1.3
2.4											2	0.3
Total	56		56		35		35		627		627	

Table 10. Age and Length Data from Chinook Salmon Carcasses, Willow Creek, 1979*

	Female Length (cm				Male Length (cm)				Total Combined Sexes			
Age	n	%	$\bar{x}$	± SD	n	%	$\bar{x}$	± SD	n	%	x	± SD
1.1					1	1.2	36.0		1	0.4	36.0	
1.2					3	3.8	65.7	6.43	3	1.4	65.7	6.43
1.3	8	5.9	90.5	1.85	10	12.7	83.9	7.43	18	8.4	86.8	6.46
1.4	128	94.1	103.8	4.35	65	82.3	114.9	6.69	193	89.8	107.6	7.42
Total	136	100.0	103.0	5.28	79	100.0	108.1	17.15	215	100.0	104.9	11.44

* Age and length data determined by length frequency analysis.

Table 11. Age and Length Data from Angler-Caught Chinook Salmon, Willow Creek, 1979*.

	Female Length (cm				Male Length (cm)				Total Combined Sexes			
Age	n	%	$\bar{x}$	± SD	n	%	$\bar{x}$	± SD	n	%	$\bar{x}$	± SD
1.2					18	16.4	65.7	5.97	18	11.0	65.7	5.97
1.3	9	16.7	88.6	3.57	15	13.6	87.0	4.54	24	14.6	87.6	4.19
1.4	45	83.3	105.2	5.38	77	70.0	112.4	8.87	122	74.4	109.7	8.48
Total	54	100.0	102.5	8.08	110	100.0	101.3	19.69	164	100.0	101.7	16.75

* Age and length data determined by length frequency analysis.

Table 12. Age and Length Data from Chinook Salmon Carcasses, Montana Creek, 1979*.

	Female Length (cm				Male Length (cm)				Total Combined Sexes			
Age	n	%	$\bar{x}$	± SD	n	%	$\bar{x}$	± SD	n	%	$\bar{x}$	± SD
1.2					13	24.1	65.4	8.33	13	12.4	65.4	8.33
1.3	8	15.7	91.9	2.70	7	12.0	83.7	3.95	15	14.3	88.1	5.30
1.4	43	84.3	102.1	3.65	34	62.9	113.4	7.82	77	73.3	107.1	8.90
Total	51	100.0	100.5	5.13	54	100.0	98.0	22.24	105	100.0	99.2	16.32

* Age and length data determined by length frequency analysis.

Table 13. Age and Length Data from Angler-Caught Chinook Salmon, Montana Creek, 1979*.

	Female Length (cm				Male Length (cm)				Total Combined Sexes			
Age	n	%	$\bar{x}$	$\pm$ SD	n	%	$\bar{x}$	$\pm$ SD	n	%	$\bar{x}$	$\pm$ SD
1.2					5	26.3	68.0	4.46	5	14.7	68.0	4.46
1.3	3	20.0	91.0	5.20	6	31.6	86.8	4.57	9	26.5	88.2	4.93
1.4	12	80.0	103.4	4.48	8	42.1	109.7	6.31	20	58.8	105.9	6.02
Total	15	100.0	100.9	6.79	19	100.0	91.5	18.27	34	100.0	95.7	14.97

* Age and length data determined by length frequency analysis.

larger number of Age 1.2 and Age 1.3 chinook salmon than did carcass recoveries on both streams. Both methods have biases and the actual age composition of the populations are expected to be somewhere in between. Carcass recoveries tend to overestimate Age 1.4 chinook salmon because the larger fish are easier to see and recover, and many of the small fish are males which normally enter the streams earlier and die off earlier. This problem could be somewhat alleviated by conducting carcass recoveries throughout the spawning period. However, this is not practical, due to the time and effort involved. More angler-caught fish represent Age 1.2 and Age 1.3 fish because the earlier fish are males, many of which are small, and the fishery closes before the main run enters the system. Anglers are also able to land smaller fish much easier than the larger ones.

Figure 3 graphically shows the differences in age classes of carcass recoveries and angler-caught chinook salmon on Willow and Montana Creeks. The dominance of Age 1.4 chinook salmon is clearly shown in this graph as is the higher frequency of Age 1.2 and Age 1.3 chinook salmon in the sport catch.

The age composition of the chinook salmon sport harvest in five streams is shown in Table 14. The age composition of the catch in Willow Creek, Little Susitna River and Montana Creek was very similar with 60% to 70% being Age 1.4 and 18% to 26% Age 1.3. The remainder of the catch in these three streams was Age 1.2 males. Age composition of the catch in Chunilna and Caswell Creeks were dramatically different from each other and from the other three streams. A total of only 38.2% and 28.6% of the catch in Chunilna Creek and Caswell Creek, respectively, consisted of Age 1.4 chinook salmon. In Chunilna Creek 41.4% of the catch was Age 1.3 and in Caswell Creek 50.0% of the catch was Age 1.2.

Male:female sex ratios were 1.3:1.0 in Chunilna Creek, Little Susitna River and Montana Creek. The sex ratio in Caswell Creek was 4.6:1.0 which, coupled with the high percentage of Age 1.2 fish, indicates a fishery supported by small male chinook salmon. It has previously been noted that chinook salmon do not enter Caswell Creek so the catch is made up of fish from various other tributaries. The Willow Creek sex ratio was 2.0 males to 1.0 females. The males were very large fish with 70.0% of them being Age 1.4. Figure 4 graphically depicts the differences in age composition of the chinook salmon harvest in each stream.

The average length of all angler-caught chinook salmon was 88.1 cm (mid-eye to fork of tail) or 97.8 cm (tip of snout to fork of tail). The conversion factor to convert mid-eye to fork length to tip of snout to fork length is 1.11. The average weight was 26.6 lbs.

Coho Salmon Studies

Foot surveys were conducted in escapement index areas on four streams to estimate spawning coho salmon populations. Although overcast skies prevailed, counting conditions on these small streams were favorable.

A summary of coho salmon escapement counts in index areas is presented in Table 15. Coho salmon escapements were good in 1979. During the years 1971-1974, coho salmon levels were low, partially attributed to extremely

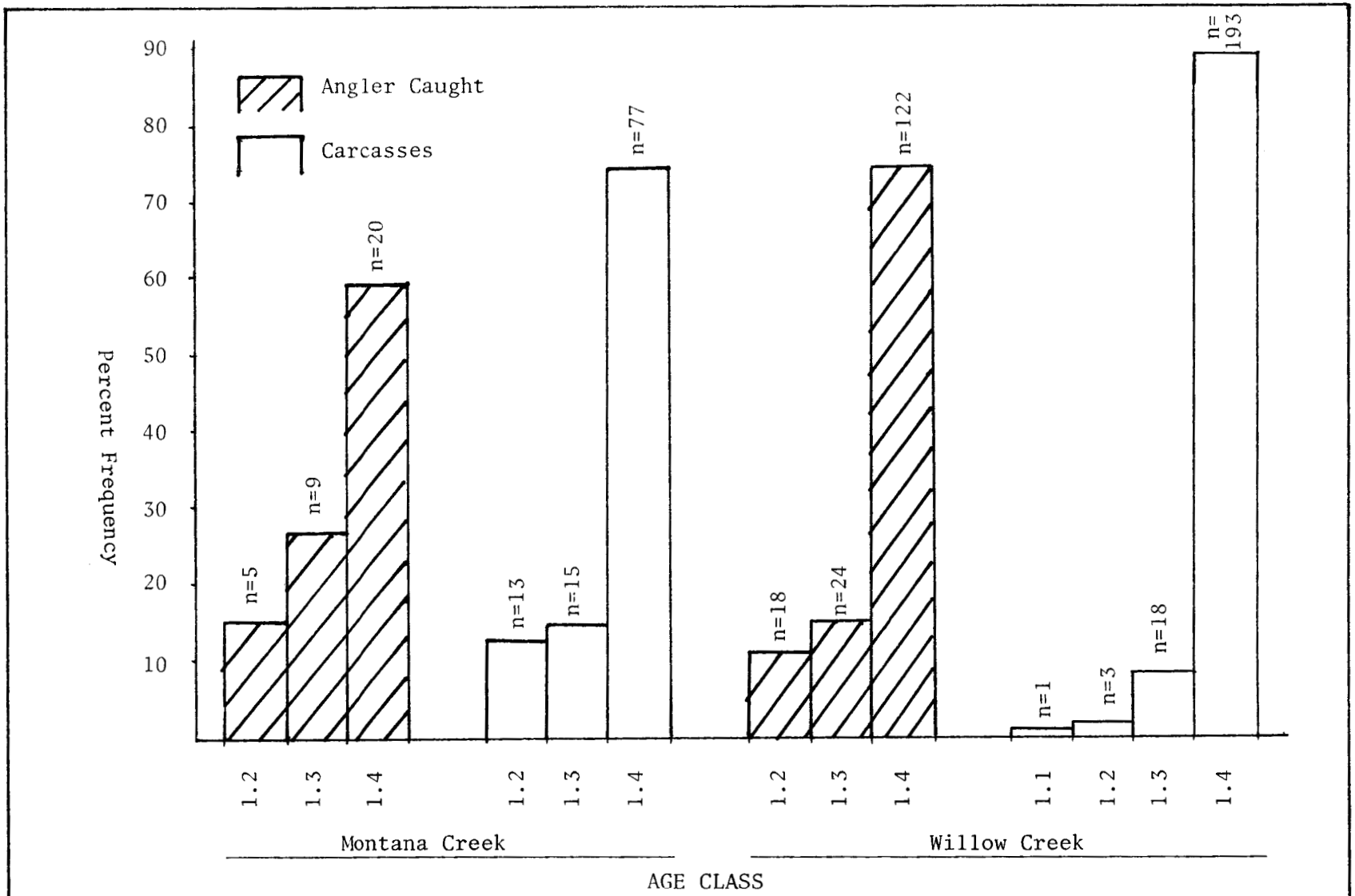

Figure 3. Comparison of Chinook Salmon Age Composition as Determined by Length Frequency Analysis of Angler Caught and Carcass Recoveries on Montana and Willow Creeks, 1979.

Table 14. Age Composition as Defined by Scale Analysis of 1979 Chinook Salmon Sport Harvest, 1979.

Age	Willow Creek		Little Susitna River		Chunilna Creek		Caswell Creek		Montana Creek		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
1.2	17	11.2	30	12.9	26	17.1	28	50.0	5	14.3	106	16.9
1.3	28	18.4	48	20.7	63	41.4	12	21.4	9	25.7	160	25.5
1.4	105	69.1	150	64.7	58	38.2	16	28.6	21	60.0	250	55.8
2.3			1	0.4							1	0.2
1.5	2	1.3	2	0.9	4	2.6					8	1.3
2.4			1	0.4	1	0.7					2	0.4
Total	152		232		152		56		35		627	

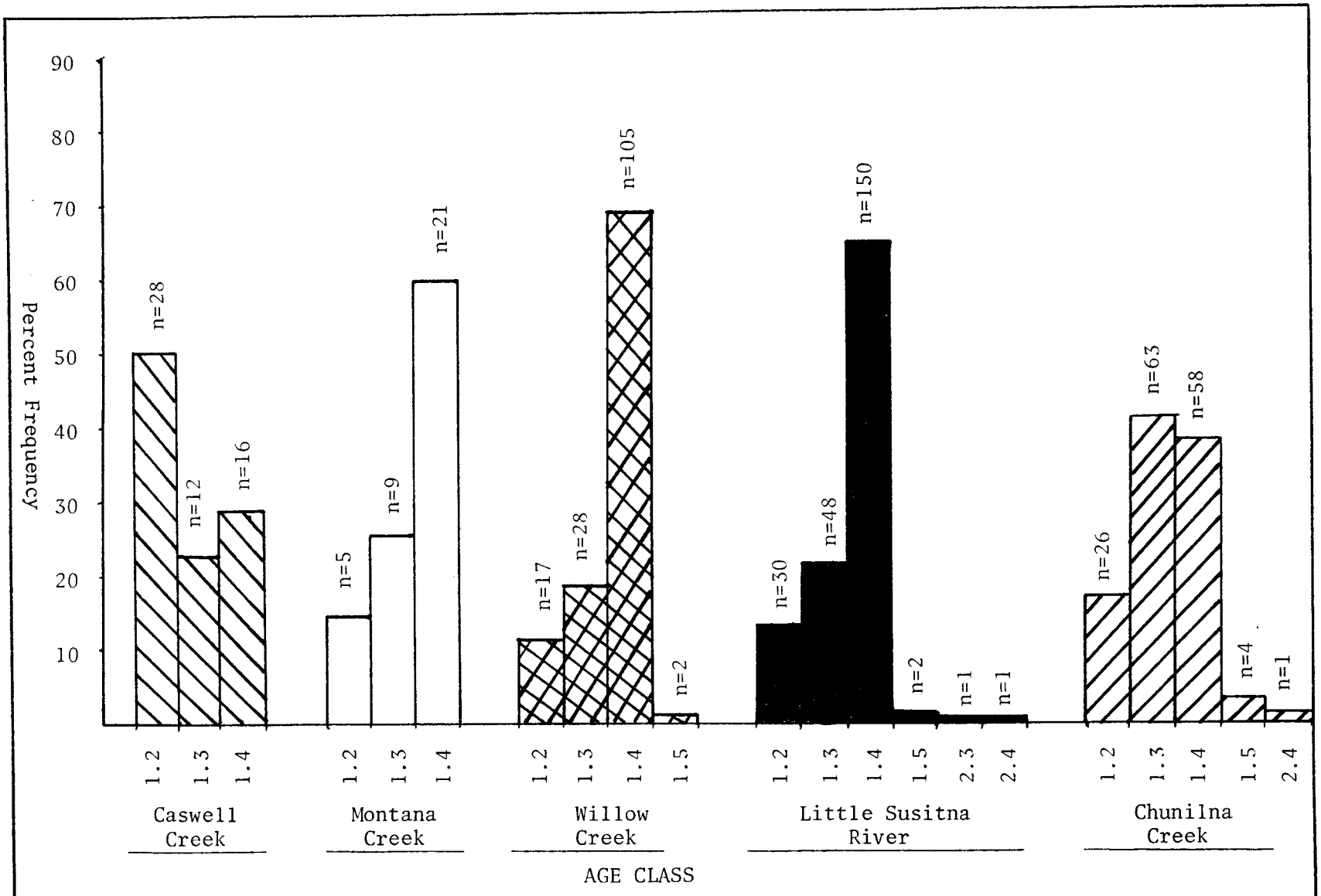

Figure 4 . Age Composition as Determined by Scale Analysis of 1979 Chinook Salmon Sport Harvest.

Table 15. Number of Coho Salmon in Escapement Index Areas (foot counts), Upper Cook Inlet, 1970-1979.

Stream	1970	1971	1972	1973	1974	1975	1976	1977*	1978	1979
Wasilla (a)	101	104	19	28	30	49	151		74	61
Wasilla (b)	94					159	162		76	187
Cottonwood	5	29	21	10	2	73	100	25	100	64
Birch	206	138	69	106	49	92	27	96	103	120
Question				59	3	111	126	87	45	384
Rabideux						67	91		88	
Total	406	271	109	203	84	551	657	208	486	816

* High water conditions made several index areas uncountable.

Table 16. Adult Coho Salmon Escapement Counts, Fish Creek, 1969-1979.

Year	Dates of Operation	Weir Counts
1969	July 31 - September 2	4,253
1970	July 19 - August 8*	1,048
1971	July 8 - August 7*	583
1972	July 2 - September 10	716
1973	July 1 - September 6	210
1974	July 8 - September 6	1,154
1975	July 3 - September 11	1,601
1976	July 5 - September 11	764
1977	July 6 - August 15*	930
1978	July 7 - September 30	3,121
1979	July 8 - August 30	2,511

* Weir was not operated long enough to enumerate the entire coho escapement.

dry summers that occurred from 1968-1970. In 1975, coho salmon escapement levels on all surveyed streams increased substantially and have remained about the same since that time. The 1979 returns were from the 1975 parent escapement and they were, in all cases, about equal to or substantially above the 1975 levels. Wasilla Creek had a total of 248 coho salmon in the index areas--this is the second highest recorded. A total of 384 salmon was enumerated in Question Creek which is three times the highest previous count.

A weir was operated in 1979 on Fish Creek by the Fisheries Rehabilitation and Enhancement Division. A weir has been on this stream since 1969, and has been operated by both Commercial and Sport Fish Division personnel in past years. The 1979 coho salmon escapement was the third highest recorded since 1969 (Table 16). The 2,511 coho salmon counted through the weir in 1979 are primarily offspring from the 1975 escapement of 1,601 coho salmon.

Physical and chemical data were collected during the past year from numerous lakes and streams. Data include periodic stream flows on selected anadromous fish streams and dissolved oxygen levels in numerous lakes throughout the Matanuska Valley. These data are available in the Alaska Department of Fish and Game files in the Palmer area office.

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