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D

INVENTORY AND CATALOGING

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Volume 22

Study G-I-B

STATE OF ALASKA

Jay S. Hammond, Governor

Annual Performance Report for

INVENTORY AND CATALOGING OF THE SPORT FISH AND SPORT FISH WATERS IN SOUTHWESTERN ALASKA

by

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and
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Volume 22 Study No. G-I-B

RESEARCH PROJECT SEGMENT

State: ALASKA Name: Sport Fish Investigations of Alaska

Project No.: F-9-13

Study No.: G-I Study Title: INVENTORY AND CATALOGING

Job No.: G-I-B Job Title: Inventory and Cataloging of the Sport Fish and Sport Fish Waters in Southwestern Alaska

Cooperators: Frank Van Hulle and John B. Murray

Period Covered: July 1, 1980 to June 30, 1981

ABSTRACT

Catalog and inventory studies determined 10 of 12 waters on north Shuyak Island contained natural populations of Dolly Varden, *Salvelinus malma* (Walbaum), and coho salmon, *Oncorhynchus kisutch* (Walbaum). Four of these waters also contained rainbow trout, *Salmo gairdneri* Richardson, and sockeye salmon, *Oncorhynchus nerka* (Walbaum); and two lakes were found barren of fish. Five Afognak Island lakes were investigated and determined unsuitable for rearing rainbow trout brood stock. Follow-up surveys of Afognak River and Big Kitoi Lake rainbow trout were conducted. The Kitoi rainbow population estimate was 3,237 ± 289 fish and a summary of fish counted and fish age-growth data from both waters is presented.

Karluk Lagoon weir escapement from May 30 to September 11, 1980, was comprised of 902 steelhead kelts, *Salmo gairdneri* Richardson; 4,810 chinook salmon, *Oncorhynchus tshawytscha* (Walbaum); 729 coho salmon; 2,359,051 pink salmon, *Oncorhynchus gorbuscha* (Walbaum); 144,513 sockeye salmon; and 50 immigrant adult steelhead. Age-growth data for Karluk River steelhead and chinook salmon and a summary of the weir count are presented.

Approximately 93,259 chinook salmon fingerlings ($\bar{x}$ wt. = 0.69 g) were stocked in Lake Rose Tead on June 9, and adults should return in 1985 and 1986. Six Age 1.1 chinook salmon were caught during June and August, and two were observed. Angler-caught fish averaged 645.3 mm.

Mark and multiple recapture population estimates indicated Age I rainbow trout (Swanson River strain, wt. = 1,516/kg) stocked in six Kodiak-Afognak Island lakes demonstrated survival rates of 10.4 to 37.1 percent. Age 0 rainbow trout (Swanson River strain, wt. = 1,516/kg) stocked in Abercrombie

Lake had a 55.8 percent survival rate after 6 weeks residency. Coho salmon (856/kg) stocked in Pony Lake had a 37.1 percent survival rate at Age I, while coho salmon (733/kg) stocked in Southern Lake had a 50.1 percent survival rate at Age 0. Rainbow trout and coho salmon approached a catchable size (131.8-200.8 mm) at Age I and are expected to enter the sport fishery at Age II. Insufficient numbers of Arctic grayling, Thymallus arcticus (Pallas), Dolly Varden and large rainbow trout were captured to compute population estimates; however, a summary of age-growth data for all fish is presented.

Salmon escapement counts indicated a minimum of 327,055 pink salmon; 19,100 chum salmon, Oncorhynchus keta (Walbaum), 38,898 sockeye salmon; and 7,714 coho salmon spawned in 18 northeast Kodiak Island streams during 1980.

BACKGROUND

The primary goal of the Sport Fish Division projects in Region IV is to optimize the survival and growth of resident and stocked game fish and to maintain the natural runs of anadromous fish.

Region IV is the Kodiak-Afognak Island group and the Alaska Peninsula, south of a line from Cape Douglas to Port Heiden, including the Aleutian Islands. The Kodiak Island complex (Figure 1) is approximately 200 km long by 120 km wide, and the Alaska Peninsula section is 1,600 km long extending 800 km into the Bering Sea. The area is mountainous with numerous bays, lakes and streams, and contains both anadromous and resident fish. Much of the area has not been surveyed and the total number of fish producing waters is unknown. Kodiak Island has over 1,609 km of coastline, over 1,000 lakes 4 ha or larger in size, and 229 known anadromous fish streams.

A fish stocking program for Kodiak area lakes was initiated in 1953 and has continued to the present. However, in order to develop more successful programs, numerous lakes have since been chemically rehabilitated and various fish species have been stocked at differential rates. Different sizes of fish have been tested, and various habitat conditions have been studied to optimize growth and survival.

The physical and biological condition of lakes on northeast Kodiak Island has been examined in some detail and the results of these observations are shown in the annual Federal Aid in Fish Restoration Reports 1953-1980. Priority for research, stocking and general survey work has been centered on the areas of intensive sport fishing effort and on areas where specific data are required to evaluate anticipated land use programs or development activities. Past stream research has centered on waters with steelhead, rainbow trout, coho salmon and chinook salmon; however, increases in fishing effort indicate these studies should be intensified. This report presents specific stream temperature, stream flow and related data which will form the basis for identifying programs to determine carrying capacity and areas of critical habitat for salmon, Dolly Varden and trout.

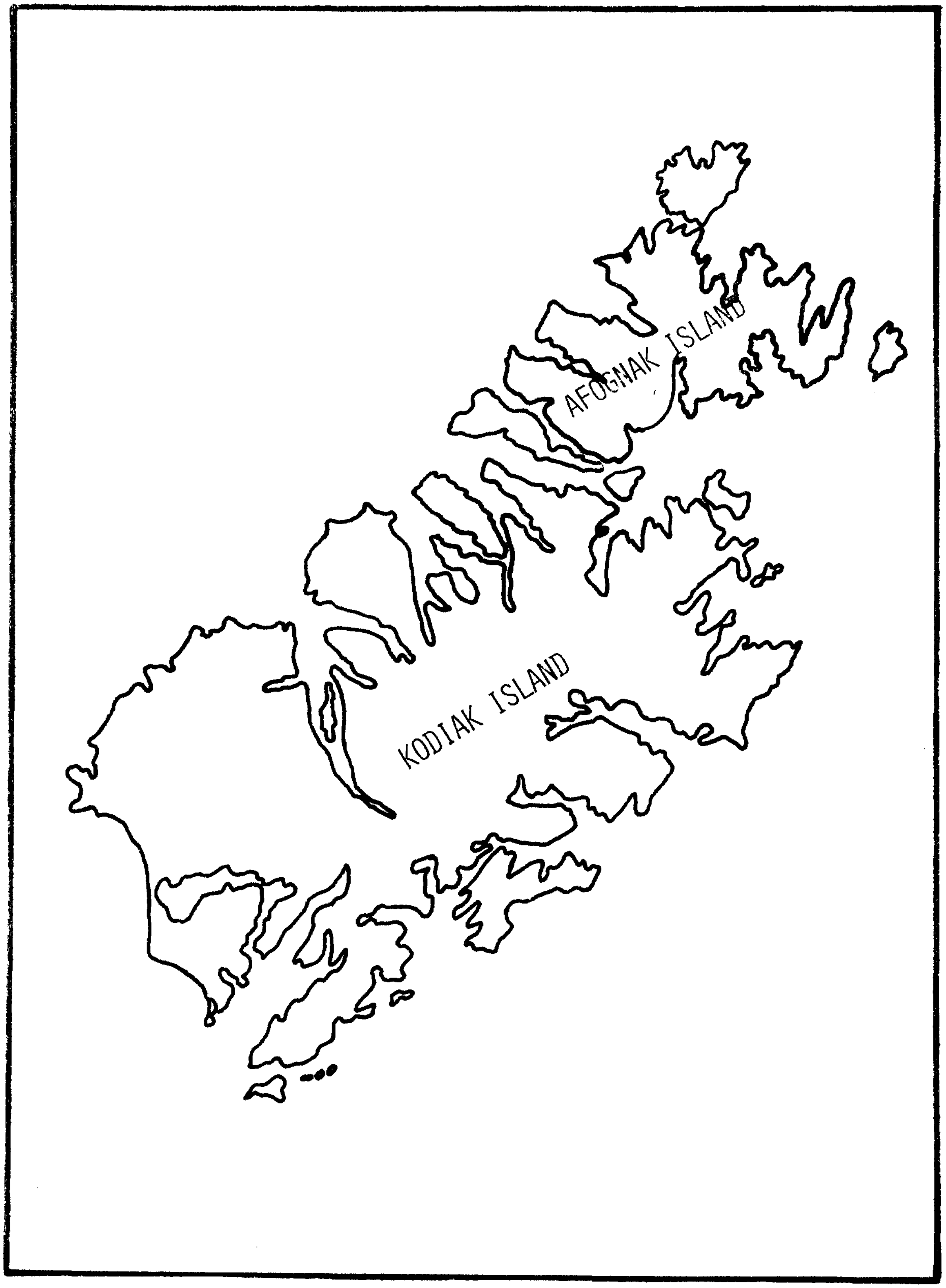


Figure 1. Map of the Kodiak-Afognak Island Group. Scale 1: 1,250,000

The Federal Aid in Fish Restoration Reports for the Kodiak area from 1953 to the present depict specific data concerning the size, age and growth of coho salmon, Dolly Varden, chinook salmon, sockeye salmon, rainbow trout and steelhead from the Kodiak area. Additional data concerning harvest rates and spawning escapement are presented.

These data form the foundation for most management decisions concerning sport fish regulations and recommendations pertaining to land use activities which may affect respective Kodiak area fisheries.

Table 1 presents respective Kodiak area species.

RECOMMENDATIONS

1. Creel census on Buskin and Pasagshak Rivers should be conducted in 1981 to determine angler effort and harvest of Dolly Varden and salmon.

2. The producing waters on Afognak and Shuyak Islands, that remain as public waters following total implementation of the Alaska Native Claims Settlement Act, should be surveyed.

3. Survival, growth and quality of fishing produced by various species and races of fish stocked in Kodiak and Afognak Island lakes should be evaluated.

4. A study should be developed to determine the Dolly Varden population sizes in Kodiak roadside streams and the optimum allowable sport harvest.

OBJECTIVES

1. To determine the physical, chemical and biological characteristics of existing and potential sport fishing streams and lakes in the Kodiak area.

2. To establish magnitude, distribution, timing, yearly fluctuations and angler harvest of sport fish populations on Kodiak Island, Afognak Island and areas of concern to sport fisheries management on the Alaska Peninsula.

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

TECHNIQUES USED

Standard techniques described by Van Hulle and Murray (1980), were used in conducting lake surveys, gill net sampling, age analysis, determination of fish size, escapements, harvest estimates and in collecting stream flows and temperatures.

Table 1. List of Common Names, Scientific Names and Abbreviations Used in this Report.

Common Name	Scientific Name and Author	Abbreviation
Arctic grayling	*Thymallus arcticus* (Pallas)	GR
Chinook salmon	*Oncorhynchus tshawytscha* (Walbaum)	KS
Chum salmon	*Oncorhynchus keta* (Walbaum)	CS
Coho salmon	*Oncorhynchus kisutch* (Walbaum)	SS
Dolly Varden	*Salvelinus malma* (Walbaum)	DV
Pink salmon	*Oncorhynchus gorbuscha* (Walbaum)	PS
Rainbow trout	*Salmo gairdneri* Richardson	RT
Sockeye salmon	*Oncorhynchus nerka* (Walbaum)	RS
Steelhead trout	*Salmo gairdneri* Richardson	SH
Threespine stickleback	*Gasterosteus aculeatus* Linnaeus	TS
Sculpin	*Cottus* sp.	SC

Fish population estimates in all lakes studied were made by the Regier and Robson (1967) mark and multiple recapture estimator. Fish were captured for sampling and marking by fyke nets of the following design: length = 3.7 m; diameter - 1 m; and two wings = 1.2 m x 7.6 m. Two square aluminum frames and five aluminum hoops supported the entrance and body of the fyke net. The wings, body and internal throats were constructed of 9.5 mm square mesh knotless nylon.

All fish captured by the fyke trap were anesthetized, sampled for age growth data, marked (top caudal clip) and released in the center of the lake for dispersion.

One June 9, 93,259 chinook salmon (0.69 grams per fish) were introduced into Lake Rose Tead.

Lake and Stream Surveys

Afognak Island:

Ruth Lake, Midarm Lake, Upper and Lower Jennifer Lakes and Little Kitoi Lake on east Afognak Island were investigated July 28 through July 30 to determine their suitability for a rainbow trout hatchery brood program. The surveys were not extensive, however, and we found no suitable spawning areas and rainbow trout were not captured or observed (Table 2). These waters were not suitable for this program.

Rainbow trout populations in Big Kitoi Lake and Afognak River were identified as potential stocks for a pilot egg-take in 1979 (Van Hulle and Murray, 1980). These waters were subsequently resampled to gain a broader data base and further define the population parameters. Five fyke traps set in Big Kitoi Lake August 5 through August 13 for 576 fyke trap hours, captured 347 rainbow trout and 130 Dolly Varden. The population estimate presented in Table 3 indicated a population size of 3,237 ± 829 rainbow trout and 1,567 ± 425 Dolly Varden. Fifty-two Age I, 157 Age II, 95 Age III, 34 Age IV and 9 Age V rainbow trout were captured with respective mean lengths of 94.1 mm, 152.8 mm, 216.6 mm, 270.5 mm and 327.4 mm. Approximately 40 hours of hook and line sampling at Afognak River on June 4 and June 25-27 captured 425 rainbow trout or 6.1 fish per hour. The sample contained 39 Age I, 63 Age II, 35 Age III, 34 Age IV and 34 Age V trout, with respective mean lengths of 11.3 mm, 173.6 mm, 197.4 mm, 239.5 mm and 283.0 mm. Twenty trout had regenerate or unreadable scales.

Data collected for the past 2 years indicate Kitoi Lake and Afognak River have sizeable rainbow trout populations, however, for the following reasons Kitoi Lake appears to have greater potential for an experimental rainbow trout egg-take:

1. Kitoi Lake does not have an active sport fishery.

2. The lake is located within a 15-minute hike from the Kitoi Bay Fish Hatchery.

Table 2. Summary of Morphometric and Fish Sampling Data for Five Afognak Island Lakes Surveyed July 28-July 30, 1980.

Lake Name and Location	Surface Area (ha)	Volume (m^3)	Average Depth (m)	Maximum Depth (m)	Inlets Suitable for Spawning: Number	Inlets Suitable for Spawning: Flow (cms)	Fish: Species Observed	Fish: Number* Captured
Little Kitoi T23S, R19W Sec. 10	38.6	4.174×10^7	10.8	26.8	1	0.18	TS DV RS SS	TST-226 DV - 48 RS - 5 SS - 93
Ruth T23S, R19W Sec. 12	19.2	1.245×10^7	6.2	17.1	None	Two Bog Seeps Observed	None	NS
Midarm T23S, R19W Sec. 12	5.2	0.340×10^7	6.6	12.2	None	One Bog Seep Observed	TS	NS
Upper Jennifer T23S, R19W Sec. 12	40.7	4.348×10^7	10.7	26.5	None	Three Bog Seeps Observed	DV TS	NS
Lower Jennifer T23S, R19W Sec. 13	17.9	1.811×10^7	10.1	26.2	None	Two Bog Seeps Observed	DV TS	NS

* Little Kitoi Lake fish were captured via variable mesh gill nets (25.0 hrs) and minnow traps (42.5 hrs).

DV = Dolly Varden
RS = Sockeye Salmon
SS = Coho Salmon
TS = Threespine Stickleback
NS = Not Sampled as inlets were not suitable for spawning

Table 3. Sampling Summary of 10 Kodiak-Afognak Island Lakes, 1980.

Water Name & Location	Date Sampled	Species	Number	Age	Length (mm) $\bar{x}$	Length (mm) $\pm$S.D.	Weight (g) $\bar{x}$	Weight (g) $\pm$S.D.	Population Estimate Number	Population Estimate $\pm$S.E.	Percent Survival	Date Stocked	Number Stocked	Per kg	Per ha
Abercrombie	10-15*	RT(S)	139	0	31.4	7.5	6.6	1.8	2,061	61	55.8	3-25-80	3,695	1,004	433
T27S, R19W	thru	RT(S)	341	I	200.8	20.2	92.9	29.0	628	19	33.0	9-13-79	1,900	1,516	247
Sec. 15	10-20	RT(AE)	4	III	334.0	...	452.0	...	NE	...	NE	6-21-77	2,391	1,097	316
	10-15*	Gr	4	I	132.8	...	23.0	...	NE	...	NE	Natural Reproduction			
	thru	Gr	3	III	254.3	...	146.8	...	NE	...	NE	6-21-77	10,000	fry	1,322
	10-20	Gr	1	IV	318.0	...	342.0	...	NE	...	NE	6-25-76	25,000	fry	3,304
Bull Lake	8-26*														
T31S, R20W	thru	RT(S)	113	I	182.8	27.4	78.7	30.3	156	12	15.6	9-13-79	1,000	1,516	250
Sec. 35	8-29														
Lilly Pond	8-13*														
T28S, R20W	thru	RT(S)	193	I	169.8	17.0	60.0	16.5	779	29	37.1	9-13-79	2,100	1,516	656
Sec. 27	8-22														
Long Lake	9-2*	RT(S)	221	I	131.8	22.4	24.0	10.2	370	28	10.4	9-13-79	3,550	1,516	243
T27S, R19W	thru	RT(S)	23	II	246.3	20.9	165.9	41.8	NE	...	NE	8-24-73	5,200	976	357
Sec. 34	9-6	RT(AE)	15	III	287.3	15.0	276.9	49.1	NE	...	NE	6-21-77	2,689	1,097	184
		RT(O)	6	IV	358.3	33.7	437.3	30.1	NE	...	NE	8-05-76	2,700	2,436	186
	9-2	Gr	75	III	230.9	12.1	128.6	17.9	NE	...	NE	6-21-77	10,000	fry	686
	thru	Gr	6	IV	266.7	9.6	178.0	19.3	NE	...	NE	6-25-76	25,000	fry	1,714
	9-6														
	9-2														
	thru	DV	191	NA	138.5	34.0	69.8	35.0	Pop. est. for all		NE	Natural Reproduction			
	9-6								age classes equal						
									494 $\pm$ 68						

Table 3. (Continued) Sampling Summary of 10 Kodiak-Afognak Island Lakes, 1980.

Water Name & Location	Date Sampled	Species	Number	Age	Length (mm) $\bar{x}$	±S.D.	Weight (g) $\bar{x}$	±S.D.	Population Estimate Number	±S.E.	Percent Survival	Date Stocked	Number Stocked	Per kg	Per ha
Lupine Lake	11-4*	RT(T)	13	0	116.3	8.7	16.7	4.6	NE	...	NE	7-19-80	1,600	1,102	500
T31S, R20W	thru	RT(S)	3	I	198.7	20.4	83.7	23.2	NE	...	NE	9-13-79	800	1,516	250
Sec. 35	11-6														
Pony Lake	10-22*	SS	286	I	152.1	7.3	37.0	7.2	594***	(Age I, II, &	37.1	6-6-79	1,600	856	276
T19S, R19W	thru	SS	72	II	179.8	12.5	57.2	8.3	123	III pop. est.	7.7	6-2-78	1,600	852	276
Sec. 36	10-28	SS	18	III	212.6	13.3	86.1	19.9	31	= 748 ± 44)	1.9	6-21-77	1,595	1,227	275
Southern Lake	9-22*	SS	210	0	105.0	10.5	13.0	3.6	1,754	119	50.1	5-28-80	3,500	733	494
T28S, R19W	thru	SS	91	II	220.5	14.0	112.2	24.0	374***	(Age II & III	12.5	6-02-78	3,000	852	423
Sec. 14	10-3	SS	25	III	254.9	14.9	179.8	39.4	103	pop. est. = 477 ± 829)	3.4	6-21-77	3,008	1,227	423
Delphin Bay	9-16	RT(S)	397	I	174.2	27.0	66.3	30.9	1,150	43	31.1	9-19-79	3,695	1,516	366
Lake #13566	thru														
T21S, R19W	9-19	DV	61	II	161.6	29.6	52.3	27.9	NE	...	NE	Natural Reproduction			
Sec. 30		DV	15	III	243.6	24.2	157.2	43.3	NE	...	NE	"	"		
		DV	5	IV	302.0	11.7	305.4	37.3	NE	...	NE	"	"		
Big Kitoi Lake	8-5*	DV	130	NA	142.6	42.1	...	...	1,567	425	NE	Natural Reproduction			
T23S, R19W	thru														
Sec. 16	8-13	RT	52	I	94.1	10.3	...	...	(Pop. est. for all		NE	"	"		
		RT	157	II	152.8	19.3	...	...	age classes equal		NE	"	"		
		RT	95	III	216.6	18.4	...	...	3,237 ± 829)		NE	"	"		
		RT	34	IV	270.5	13.2	...	...			NE	"	"		
		RT	9	V	327.4	28.5	...	...			NE	"	"		

Table 3. (Continued) Sampling Summary of 10 Kodiak-Afognak Island Lakes, 1980.

Water Name & Location	Date Sampled	Species	Number	Age	Length (mm) $\bar{x}$	Length (mm) ±S.D.	Weight (g) $\bar{x}$	Weight (g) ±S.D.	Population Estimate Number	Population Estimate ±S.E.	Percent Survival	Date Stocked	Number Stocked	Per kg	Per ha
Afognak River	6-4 & **	RT	39	I	113.3	10.7	...	...	NE for all		NE for all	Natural	Reproduction		
T24S, R22W	6-25	RT	63	II	173.6	18.3	...	...	age classes		all classes	"	"		
Sec. 8	thru	RT	55	III	197.4	16.7	...	...				"	"		
	6-27	RT	34	IV	239.5	14.9	...	...				"	"		
		RT	34	V	283.0	15.5	...	...				"	"		
		RT	20	NA	...	...	...	...				"	"		

* Fish captured via fyke trap.
** Fish captured via hook and line.
*** Population estimate based on a percentage of each age class in the sample.

RT = Rainbow Trout
Gr = Arctic Grayling
DV = Dolly Varden
SS = Coho Salmon
S = Swanson River Stock
AE = Alaska-Ennis Stock
O = Green River Oregon Stock
T = Talarik Creek Stock
NE = No Estimate
NA = No Age of Regenerate Scales

3. Using a strain of trout native to the hatcherie's water supply will reduce the disease and pathogen risk factors.

Kodiak Island:

Abercrombie Lake. Abercrombie Lake has been stocked annually with rainbow trout and periodically with Arctic grayling since it was chemically rehabilitated in 1972. Five fyke nets set for 360 trap hours from October 15-20, 1980 captured 1,315 Age 0, 501 Age I (Swanson River strain), four Age III (Alaska Ennis strain) rainbow trout and 8 Arctic grayling. The population estimate for Age 0 and Age I rainbow trout (Table 3) was 2,061 ± 61 and 628 ± 19 fish with respective survival rates of 55.8% and 33.0%. Grayling and Age III rainbow trout were not recaptured. A sample of 139 Age 0 rainbow trout averaged 81.4 mm and 6.6 g, while 341 Age I trout average 200.8 mm and 92.9 g. The lake is situated in a State Park and supports a fishery which probably harvested a portion of these fish. The grayling sampled contained 4 Age I, 3 Age II, and 1 Age IV fish with respective mean lengths of 132.8 mm, 254.3 mm, and 318.0 mm.

Bull Lake. Bull Lake was stocked with 1,000 rainbow trout (Swanson River strain, wt. = 1,516/kg) September 13, 1979. It contained only a small population of rainbow trout which were stocked in July 1977. Five fyke nets set in the lake August 26-29, 1980 for 321 trap hours captured 113 Age I rainbow trout with a mean size of 182.8 mm, and 78.7 grams. The population estimate as presented in Table 3 was 156 ± 12 fish with an estimated survival rate of 15.6%. The actual survival may have been higher. The lake has a small outlet over impassable falls to saltwater and fish may have migrated from the lake.

Lilly Pond. Lilly Pond was stocked with 2,100 rainbow trout (Swanson River strain, wt. = 1,516/kg) on September 13, 1979. It was rehabilitated in 1974 and contained a small population of rainbow trout which were stocked in 1976. Five fyke traps set in the lake August 18-22, 1980 for 420 trap hours captured 557 Age I rainbow trout with a mean size of 169.8 mm and 60.0 g. The population estimate as presented in Table 3 was 779 ± 29 fish with an estimated survival rate of 37.1%. This pond is land-locked, and probably did not receive significant angling effort on Age I trout. The survival rate is considered excellent for the size of fish and stocking techniques used.

Long Lake. Long Lake has been stocked annually with rainbow trout and periodically with Arctic grayling since it was chemically rehabilitated in 1973. Five fyke nets set in the lake from September 2-6, 1980 for 480 trap hours, captured 221 Age I and 44 Age II or older rainbow trout, 83 Arctic grayling, 191 Dolly Varden and numerous threespine stickleback. Population estimates for the above fishes, as presented in Table 3, were 370 ± 28 Age I rainbow trout with an estimated survival rate of 10.4% and 494 ± 68 Dolly Varden (all age classes). Insufficient numbers of grayling and Age II or older rainbow trout were captured or recaptured to compute population sizes. The 75 Age III grayling sampled averaged 230.9 mm and 128.6 g. The conspicuous absence of Age II grayling probably resulted from threespine stickleback reinhabiting the lake and devouring the 1978 sac fry plants.

Consequently, grayling will probably be eliminated from these waters by stickleback predation in the next 3 or 4 years. The 191 Dolly Varden captured had a mean length of 188.5 mm and a range of 82.0-305.0 mm. The 221 Age I rainbow trout (Swanson River strain) averaged 131.8 mm and 24.0 g, while 23 Age II, 15 Age III and 6 Age IV rainbow trout had respective mean lengths of 246.3 mm, 287.3 mm and 358.3 mm.

Long Lake and Abercrombie Lake are similar in size, geographic area and management history. They were both rehabilitated in 1973 and restocked with trout and grayling. The major differences in these lakes are that Abercrombie probably receives more fishing effort and has not become re-infested with stickleback. It is very significant that survival of Swanson trout to Age I was a minimum of 33.0% in Abercrombie Lake as opposed to 10.4% in Long Lake. There could be other factors, however, the presence of stickleback in Long Lake appears to be a significant factor in reduced survival for the stocked Swanson River trout.

Lupine Lake. Lupine Lake was stocked with 800 Swanson River rainbow trout (1,516/kg) on September 13, 1979. It may have contained a small population of rainbow trout (Ennis, Montana strain) that were stocked in July 1977. Three fyke nets set in the lake November 4-6, 1980 for 240 trap hours captured three Age I ($\bar{x}$ ln = 198.7 mm, $\bar{x}$ wt = 83.7 g) and 13 Age 0 ($\bar{x}$ = 116.3, $\bar{x}$ wt = 16.7 g) rainbow trout and no other fish. The population size and survival rate were undetermined as insufficient numbers of fish were captured or recaptured. However, it is obvious that few fish were in the lake. This is a 3.0 hectare pond with a maximum depth of 2.1 meters and a small outlet flows to the salt water. Fishing mortality, competition and stocking methods were probably not the reason for the apparent stocking failure. The nature of the trout or lake conditions may have caused these fish to migrate to salt water. Also the cold November water temperature (0-2° surface) may not have been conducive to fyke-trapping the trout actually in the lake.

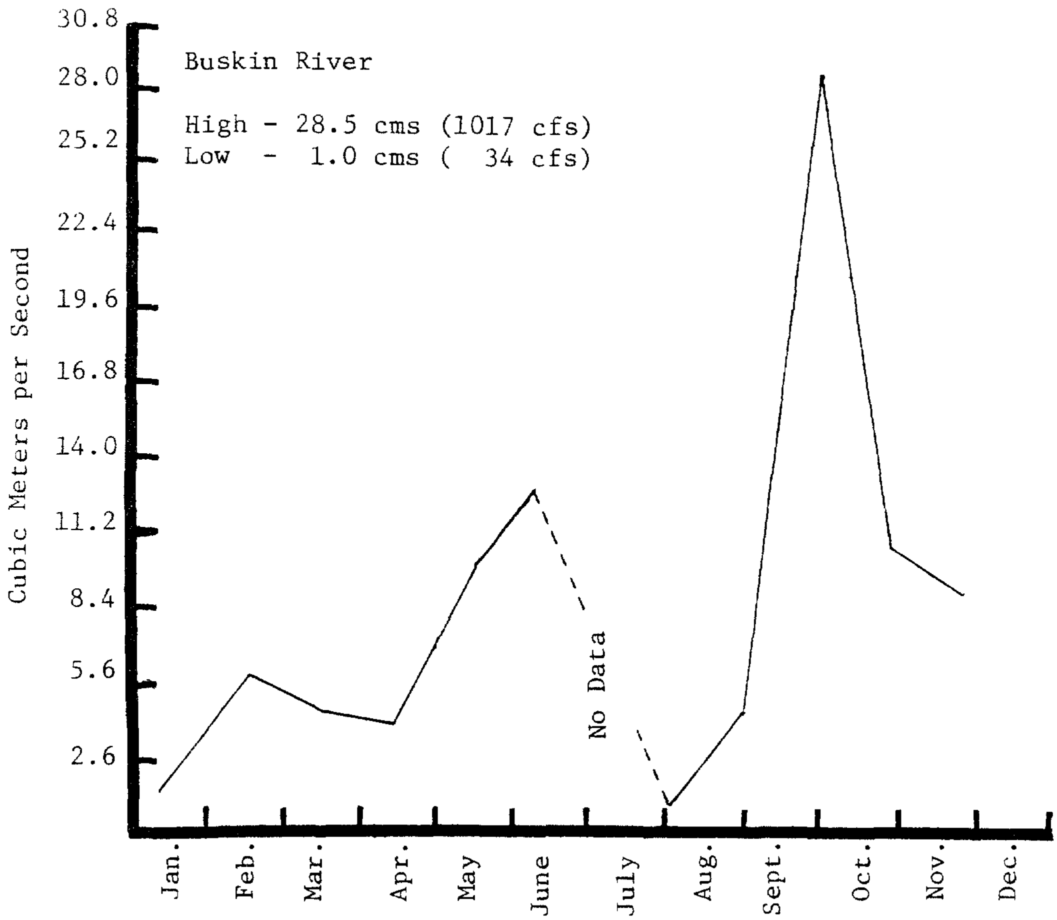
Pony Lake. Pony Lake has been stocked annually with coho salmon since 1970. The lake has never been rehabilitated and it contains a large population of threespine stickleback. Fyke net trapping during October 22-28, 1980 captured 440 landlocked coho in 362 trap hours. A total of 286 Age I, 72 Age II and 18 Age III fish were sampled with respective mean lengths of 152.1 mm, 179.8 mm and 212.6 mm. The population estimate for all age classes as presented in Table 3 indicated 748 ± 44 coho salmon were in the lake. The population size by age class (based on the age composition of Age I = 79.5%, Age II = 16.4%, Age III = 4.1%) was 594 Age I, 123 Age II and 31 Age III coho salmon. The respective survival rates were calculated at 37.1%, 7.7%, and 1.9%.

Southern Lake. Southern Lake has been stocked annually with coho salmon since 1971, except in 1979. The lake has never been rehabilitated and it contains a large population of threespine stickleback. Fyke net trapping during September 22-October 3, 1980, captured 868 landlocked coho in 480 trap hours. The 210 Age 0, 91 Age II and 25 Age III fish sampled had respective mean lengths of 105.0 mm, 220.5 mm and 254.9 mm. The population estimates for two size classes of fish identified in the field (Table 3) were 1,754 ± 119 Age 0 coho salmon (small fish F 150 mm), and 477 ± 105 Age II and Age III coho salmon (large fish ≥ 150). The latter population estimate broken down by a percentage of each age class sampled (Age II 78.4%, Age III - 21.6%) yielded 374 Age II and 103 Age III landlocked coho salmon. Survival rates for these age groups of fish were 50.1%, 12.5% and 3.4% respectively.

Southern and Pony Lakes have similar physical properties, water quality and stocking histories (Van Hulle and Murray, 1971-1979); however, respective stocking rates since 1975 have been 423-494 and 275-276 coho per hectare. A comparison of Age II coho shows Southern Lake fish are 18.5% longer (41 mm) and had a 4.8% better survival rate than Pony Lake fish. Also, the Age 0 Southern Lake coho had an excellent survival rate of 50.1%. These data suggest it may be more desirable to stock coho on an alternative year basis when working with landlocked lakes containing large populations of threespine stickleback.

Delphin Bay Lake #13566. Delphin Bay Lake was initially surveyed in 1974 and determined to be an excellent experimental lake for stocking rainbow trout (Van Hulle and Murray, 1975). It was chemically rehabilitated (0.5 ppm Pronox Fish) in September 1978 and stocked with 3,695 Swanson River rainbow trout at 1,516/kg on September 19, 1979. A gabion fish barrier installed on the lake outlet in October 1978 washed out and was replaced in June 1980. Fish immigration may have occurred while the barrier was inoperable; however, char were captured in the lake after rehabilitation and prior to the washout (pers. comm., 1979, Ralph Browning, USFS, Kodiak, Alaska) thus indicating an incomplete fish kill. Dolly Varden were also observed throughout the system during a September 16-19, 1980 survey while threespine stickleback were seen only in the outlet below a 1-meter falls. Fyke net traps fished for 312 hours captured 81 Dolly Varden, 650 rainbow trout and no threespine stickleback. The Dolly Varden population size was not determined; however, 61 Age II, 15 Age III and 5 Age IV char were captured with respective mean lengths of 161.6 mm, 243.6 mm and 302.0 mm. The trout population estimate as presented in Table 3 was 1,150 ± 43 fish ($\bar{x}$ ln. = 174.2 mm, $\bar{x}$ wt = 66.3 g) with a minimum estimated survival rate of 31.1%. Actual survival may have been higher, as stocked trout can migrate from this lake to the outlet. Delphin Bay Lake #13566 was the first water ever chemically rehabilitated on Afognak Island and subsequently stocked with rainbow trout. At Age I these fish had sufficient growth and survival rates to provide an excellent sport fishery. Since Lake #13566 is remote and exploitation is light, this information may be used as base line data for stocking similar Afognak Island lakes.

Roadside Stream Flows and Temperatures. Stream flows and water temperatures were collected during 1980 from five roadside streams to determine relative fluctuations in the stream discharge and the annual thermal units produced by each stream. Monthly flow readings for American River, Buskin River, Olds River, Roslyn Creek and Salonie Creek (Figures 2 and 3) indicate the highest flow occured in Buskin River (28.5 cms) and the lowest in Roslyn River (0.2 cms). Generally speaking, flows were high in June and September and lower during August and winter months. These findings are similar to those of 1978 and 1979 (Van Hulle and Murray, 1979 and 1980),



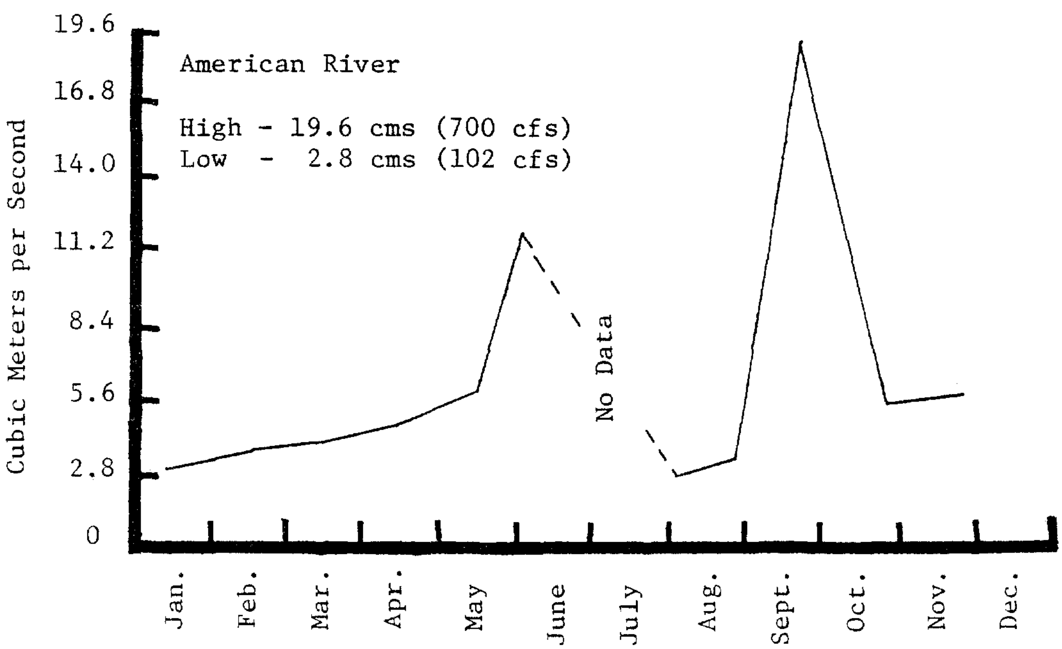


Figure 2. Flow Readings for American River and Buskin River January, 1980 through December, 1980.

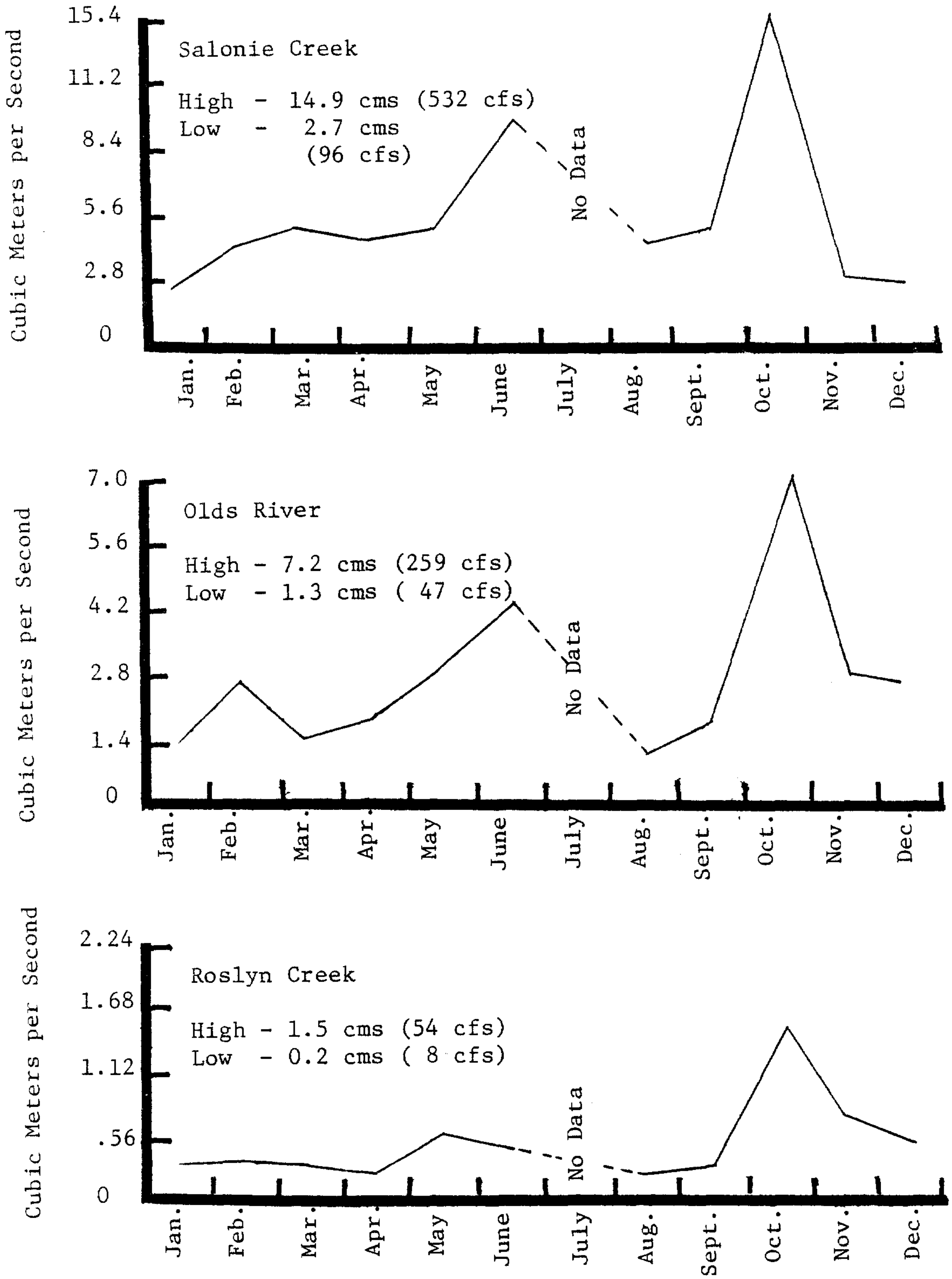


Figure 3. Flow Readings for Roslyn Creek, Olds River and Salonie Creek January, 1980 through December, 1980.

suggesting an annual winter and mid-summer low flow period with freshets occurring in the spring and fall. A summary of daily water temperatures for the above waters as presented in Table 4 shows the highest number of temperature units occurred in Buskin River (2,084.0°C) and the lowest in Salonie Creek (1,444.5°C). All streams reached a daily low of 0.0°C during January and/or February while only Buskin River reached a high of 16.5°C in August.

The above physical data provide vital information regarding the temperature and flow regimes under which fishes of the specific waters live. It will be helpful in establishing minimum flows and useful to correlate with annual fish production once stream surveys and specific fish survival information are completed and analyzed.

Shuyak Island:

Figure 4 shows the total length of Shuyak Island coastline inventoried for fish producing streams in 1975 (Van Hulle and Murray, 1976) and from July 8-13, 1980. Table 5 shows the fish sampling results of the 1980 surveys and Table 6 presents minimum estimate of the adult fish produced annually by these Shuyak Island streams. Field notes and more detailed descriptions of these waters are available in the Kodiak lake and stream file.

These surveys indicate that there are at least 10 streams on North Shuyak Island producing a minimum of 6,700-11,200 sockeye and coho salmon, 21,000 or more steelhead/rainbow trout and over 30,000 Dolly Varden char. None of the systems surveyed contained chinook, pink or chum salmon.

Development and Enhancement of Anadromous Fish Populations:

Lake Rose Tead. Chinook salmon have been stocked annually in Lake Rose Tead, the head waters of Pasagshak River, since 1976 (Murray and Vav Hulle, 1977-1980). Five returning adults from these plants were observed in 1979 (Van Hulle and Murray, 1980), and the largest predicted return (based on fry smolting at Age 1.0) should occur in 1981 (Table 7). A streamside creel census will be conducted at this time to assess the number of sport caught chinook salmon.

A cursory creel census conducted on Pasagshak River June 22 through September 7, 1980 indicated 146 completed anglers fished 283 hours and retained 45 pink salmon, 32 Dolly Varden, 2 chum salmon, 17 coho salmon and 1 chinook salmon. Sport anglers brought in six chinook salmon and two additional chinooks were observed below the river bridge for a total of eight chinooks known to have returned in 1980.

The five sport caught Pasagshak chinook salmon were analyzed for age-growth, and were Age 1.1 with a mean length and weight (n=3) of 645.3 mm and 5.5 kg. Chinook salmon fry (n=93,259) stocked in Lake Rose Tead on June 9, 1980, averaged 0.69 g per fish or 1,449 fish/kg. Approximately 120 hours of minnow trapping in the lake shoals and inlets July 25, captured numerous Dolly Varden, threespine stickleback, juvenile coho salmon and no chinook salmon. Consequently, relative growth rates of the 1980 experimental chinook plant were undetermined.

Table 4. Temperature Data for Five Kodiak Streams as Determined by Ryan Recording Thermographs January 1, 1980 through December 31, 1980.

Temp °C	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Stream: American River													
TU*	77.5	77.0	107.5	109.0	127.7	180.0	172.5	167.5	...	...	86.5	58.0	***
High	4.0	4.5	6.0	5.5	7.0	9.0	9.0	10.0	...	...	3.5	3.0	***
Low	0.5	0.0	2.0	2.0	2.5	3.0	3.5	4.0	...	...	2.0	1.5	***
Mean	2.0	2.7	3.5	3.5	4.1	6.0	5.7	5.8	...	...	2.9	1.9	...
Stream: Buskin River													
TU*	17.0	22.0	69.0**	110.0	133.0	254.0	393.0	390.0	341.5	212.0	101.0	41.5	2,084.0
High	1.0	1.0	...	4.0	5.5	10.5	15.5	16.5	13.0	9.0	5.0	2.0	16.5
Low	0.0	0.0	...	2.0	3.5	7.0	10.0	12.2	9.0	5.5	1.5	1.0	0.0
Mean	0.3	0.8	2.2	3.7	4.3	8.5	12.7	12.6	10.6	6.8	3.4	1.3	...
Stream: Olds River													
TU	55.0	42.5	83.0	78.5	139.5	191.0	298.5	289.5	228.0	173.0	131.0**	98.5	1,808.0
High	4.0	4.0	5.5	6.5	10.0	11.5	15.0	15.0	9.5	7.5	...	4.0	15.0
Low	0.0	0.0	0.5	1.5	3.0	4.0	6.0	6.0	5.5	3.0	...	1.0	0.0
Mean	1.8	1.5	2.7	2.6	4.5	6.4	9.6	9.3	7.6	5.4	4.4	3.2	...
Stream: Roslyn Creek													
TU	20.0	42.0**	70.5	105.0	155.5	216.5	301.5	291.0	226.0	170.5**	103.5	54.0	1,756.0
High	1.0	...	6.5	6.5	10.0	13.0	15.0	15.0	10.5	...	5.0	4.5	15.0
Low	0.0	...	0.5	2.5	4.0	4.0	5.5	5.5	4.5	...	1.0	0.5	0.0
Mean	0.6	1.5	2.4	3.5	5.0	7.0	9.7	9.4	7.3	5.5	3.3	1.7	...
Stream: Salonie Creek													
TU	55.5	83.5	112.5	114.0	122.0	134.5	160.0	172.5	163.5	148.0	117.5	62.0	1,444.5
High	3.0	4.5	7.5	7.5	6.5	7.5	8.5	9.5	8.5	6.0	5.0	2.5	9.5
Low	0.0	0.0	1.0	1.0	3.0	3.5	3.0	4.0	4.0	4.0	3.0	1.5	0.0
Mean	1.8	2.9	3.6	3.8	3.9	4.5	5.2	5.6	5.5	4.8	4.0	2.0	...

* TU = Temperature Units

** Thermograph inoperable ∴ $\bar{x}$ temp. and TU are based on an average of data from the preceding and following month.

*** Data not available - thermograph inoperable for two months.

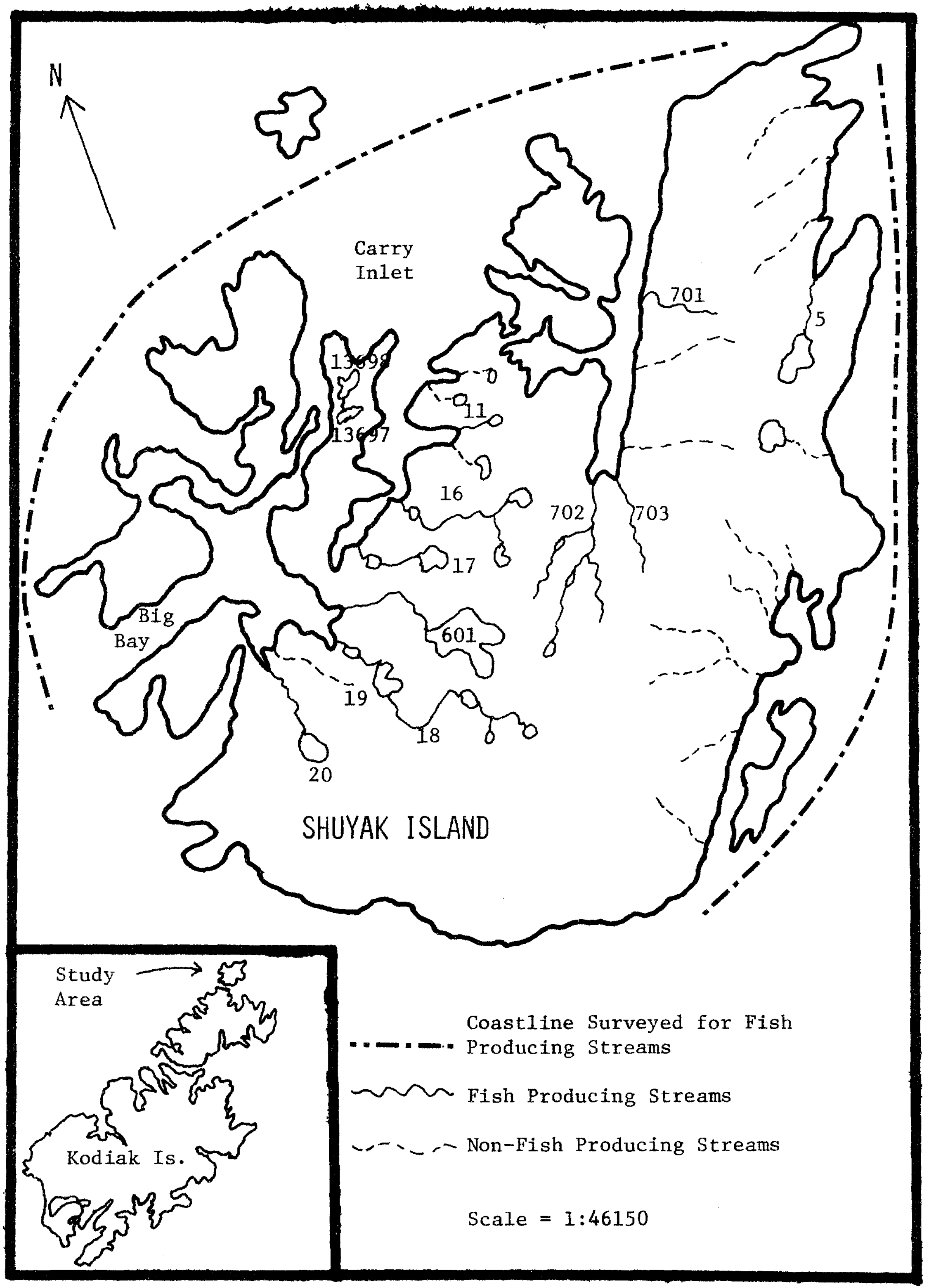


Figure 4. Location of Lakes Surveyed on Shuyak Island, 1980.

Table 5. Summary of Fish Sampling Data for Shuyak Island Lakes, 1980.

Water, Map* Reference & Location	Survey Date	Sur Water°C	Trap Hours	Net Hours	Fish** Species	Number Fish Captured	Length (mm) $\bar{x}$	Length (mm) Range
Carry Inlet, 17 T19S, R20W, Sec. 2	7/08	15°	30.0	29.5	DV	11	228	112-282
					TS	29		
					SS	80	101	60-75mm
					RS	6	407	360-405
					RT	3	203	109-303
Skiff Passage Lake Numbers 13698 & 13697 T18S, R20W, Sec. 26	7/09	16°	0.0	45.0	NO FISH			
Big Bay, 601 T19S, R20W, Sec. 10	7/11	16°	54.0	23.0	DV	30	215	94-301
					SS	16	94	60-123
					RS	6	551	499-585
					RT	10	139	80-211
Big Bay, 18 T19S, R20W, Sec. 10	7/13	15°	3.0	0.0	DV	3	...	65-100
					SS	16	...	55-90
					Sculpin	1	...	...
Big Bay, 20 T19S, R20W, Sec. 9	7/13	15°	4.0	0.0	DV	16	...	30-150
					SS	20	...	60-125
					Sculpin	2	...	...

* See Figure

DV = Dolly Varden
TS = Threespine Stickleback
RS = Sockeye Salmon
SS = Coho Salmon
RT = Rainbow Trout
SC = Sculpin

Table 6. An Estimate of the Number of Adult Fish Produced Annually by Surveyed Shuyak Island Stream-Lakes.

Area	Stream I.D.	Species			
		Coho	Sockeye	RT-SH	Dolly Varden
Shangin Bay	702	100-500	100-200	500+	5,000
	703	100	0	0	1,000
	701	100	0	0	500-1,000
Carry Inlet	11	100-300	0	0	1,000-2,000
	16	100-500	0	0	1,000-2,000
	17	500-1,000	1,000+	500+	5,000+
Big Bay	601	1,000-3,000	1,000	1,000-1,500	10,000
	18	1,000	0	0	5,000+
	20	1,000-1,500	0	0	1,000
	5	500	100-500	100+	1,000
Total		4,500-8,500	2,200-2,700	2,100-2,600	30,000-32,000

Table 7. Lake Rose Tead Chinook Salmon Plants and Year of Expected Return, Kodiak Island.

		Year of Expected Return	
Year Stocked	Number of Salmon Stocked	Three Ocean Salmon	Four Ocean Salmon
1976	22,500 fry	1980	1981
1977	133,109 fry	1981	1982
1978	14,261 smolt	1981	1984
1979	65,562 fry	1983	1984
1980	93,259 fry	1984	1985

Approximately 158,542 chinook salmon eggs were taken from 30 Chignik River females and fertilized with three males on September 2, 1980. These eggs are incubating in the Kitoi Bay Hatchery and will be stocked in Pasagshak as fry in June 1981.

Sport Fish Harvest Estimates

Creel censuses conducted at weir camps on southeast Kodiak Island and Afognak Island (Table 8) indicated fishing effort and harvest were low in relation to magnitude of available fish (Table 9). Fishing quality in all waters was considered excellent, and anglers usually released more fish than they retained. Karluk Lagoon received the most fishing pressure with a minimum of 382 anglers fishing 8,172 hours for an estimated harvest of 23 steelhead, three rainbow trout, 29 Dolly Varden, 270 coho salmon, 164 chinook salmon and 225 sockeye salmon. Total harvest for Karluk River was not determined as Karluk Portage was not included in the census.

Assessment and Inventory of Anadromous Fish Populations

Fish escapement estimates through the Karluk Lagoon weir between May 30 and September 11, 1980 were comprised of 4,810 chinook salmon, 902 steelhead kelts, 729 coho salmon, 50 inmigrant steelhead, 2,359,051 pink salmon and 144,513 sockeye salmon. Table 10 presents weekly counts of the former three species, while Table 11 and 12 display age-growth and sex composition of angler-caught chinook salmon and steelhead trout. Age-growth and sex composition of 31 inmigrant steelhead caught at Karluk Portage are presented in Table 13.

Age 1.3, 1.4 and 1.5 chinook salmon comprised 81.3% of the 80 fish sampled, while Age 1.2, 2.2, 2.3 and 2.4 comprised the remaining 18.7%. The dominant 1.4 age class contained 13 males and 27 females with respective mean lengths of 864.0 mm and 885.1 mm.

Steelhead kelts (n=12) sampled at Karluk Lagoon weir during June and July contained five age classes with only one repeat spawner, eight initial spawners and three unageable fish. The dominant 2.1S age class (n=4, 33.3%) contained one male (ln = 568.0 mm) and three females ($\bar{x}$ ln - 548.3 mm) while Age 2.2S contained two males ($\bar{x}$ ln = 722.5 mm). The male repeat spawner (Age 2.1S1S) spent 1 year plus (15 or 16 months) at sea spawning a second time.

Steelhead (n=31) sampled at Karluk Portage from October 10 through October 14 contained six age classes with five repeat spawners, 23 initial spawners and three unageable fish. The dominant Age class 2.2 (61.3%) contained 11 females and six males that respectively averaged 697.1 mm and 726.2 mm in length. Two additional Age 2.2 fish were captured but not sexed. The Age 2.1S1 male was one of 284 steelhead tagged in June 1979. It had grown 173 mm in length (532 mm to 705 mm) during 16 months residency at sea. One other tagged steelhead (#594) was reported captured by a native subsistence fisherman, however, age-growth data were not collected.

Table 8. Creel Census Estimates from Weir Camps at Afognak River, Ayakulik River, Olga Creek and Karluk Lagoon, 1980.

Area	Date	Number Anglers	Total		Steelhead*		Rainbow Trout		Dolly Varden		Coho		Chinook		Sockeye		Pink	
			Days	Hours	Rel.	Ret.	Rel.	Ret.	Rel.	Ret.	Rel.	Ret.	Rel.	Ret.	Rel.	Ret.	Rel.	Ret.
Afognak River	May 31-Aug. 3	22	66	252	0	1	45	130	46	52	0	0	0	0	37	63	5	13
Ayakulik River	June 1-July 4	20	52	244	95	1	0	0	0	0	0	0	146	4	94	15	0	0
Olga Creek	June 1-Sept. 6	14	14	46	0	0	31	38	49	5	0	13	0	0	0	1	0	0
Karluk River Lagoon	June 4-Sept. 21	204	627	3,200	33	19	3	3	12	29	0	0	131	156	54	66	0	0
Karluk Lodge	June 1-Oct. 9	178	586	4,972	154	4	0	0	0	0	4,739	270	148	38	811	159	0	0

Rel. = Released
Ret. = Retained

* Kelt steelhead (52) were caught between June 6 and July 4.

Table 9. Fish Escapement Counts Through Weirs on Kodiak and Afognak Islands, 1980.

River	Sockeye Salmon	Chinook Salmon	Pink Salmon	Chum Salmon	Coho* Salmon	Steelhead* Trout
Afognak	93,861	...	8,215	...	402	...
Upper Station	110,119	...	1,755	...	2,200	24
Ayakulik	363,229	974	857,627	46	511	29
Dog Salmon	405,525	66	6	28	...	...
Karluk Lagoon	144,513	4,810	2,359,051	262	729	50**

* Total coho and steelhead escapements were not counted as all weirs were pulled in August or early September.

** An additional 902 steelhead kelts moved down through the weir.

Table 10. Summary of Chinook, Coho and Steelhead Enumerated through Karluk Lagoon Weir, 1980.

Period	Chinook		SH Kelts				Up SH		Coho	
	No.	%	No.	%	Mortalities****	%	No.	%	No.	%
May 30 - June 5	691*	14.4	19	2.1	9	14.5	...	...	...	...
June 6 - 12	1,296**	26.9	14	1.6	5	8.1	...	...	...	...
June 13 - 19	1,171	24.4	13	1.4	6	9.7	...	...	...	...
June 20 - 26	708	14.7	50	5.6	14	22.6	...	...	...	...
June 27 - July 3	514	10.7	427	47.3	8	12.9	...	...	...	...
July 4 - 10	208	4.3	352	39.0	16	25.8	...	...	...	...
July 11 - 17	72	1.5	9	1.0	0	...	...	...	...	...
July 18 - 24	114	2.4	12	1.3	2	3.2	...	...	...	...
July 25 - 31	22	0.5	1	0.1	0	...	...	...	...	...
August 1 - 7	6	0.1	3	0.3	2	3.2	3	6.0	...	...
August 8 - 14	2	...	1	0.1	0	...	1	2.0	4	0.5
August 15 - 21	2	...	0	...	0	...	13	26.0	64	8.8
August 22 - 28	3	0.1	1	0.1	0	...	10	20.0	46	6.3
August 29 - Sept. 4	1	...	...	...	0	...	22	44.0	438	60.1
Sept. 5 - 11***	...	...	...	...	0	...	1	2.0	177	24.3
Total	4,810	100.0	902	99.9	62	100.0	50	100.0	729	100.0

* Weir not fish tight 5/28 to 6/04 - counts estimated.
** Weir not fish tight 6/06 to 6/07 - counts estimated.
*** Weir pulled on September 11.
**** Mortalities = Spawned-out, dead steelhead washed up on weir.

Table 11. Age, Sex and Composition of Karluk River Chinook Salmon, 1980.

Age Class	Males				Females					
			Length (mm)				Length (mm)			
	n	%	x	±S.D.	n	%	x	±S.D.	Total	%
1.2	3	7.5	621.7	36.2	2	5.0	655.0	49.5	5	6.2
1.3	15	37.5	753.1	82.5	...	...	...	...	15	18.8
1.4	13	32.5	864.0	57.2	27	67.5	885.1	75.9	40	50.0
1.5	4	10.0	940.3	25.7	6	15.0	919.7	40.4	10	12.5
2.2	...	...	...	...	1	2.5	558	0.0	1	1.2
2.3	2	5.0	688.5	176.1	2	5.0	761.5	161.9	4	5.0
2.4	3	7.5	839.0	52.4	2	5.0	824.0	161.2	5	6.2
Total	40	100.0			40	100.0			80	99.9

Table 12. Age, Sex and Size Composition of Karluk River Steelhead and Rainbow Trout, June and July, 1980.

		Males				Females				Total	
				Length (mm)				Length (mm)			
Age	Brood* Year	n	Percent	$\bar{x}$	$\pm$S.D.	n	Percent	$\bar{x}$	$\pm$S.D.	n	Percent
2.1S	1975	1	33.3	560	0.0	3	33.3	548.3	27.5	4	33.3
2.1S1S	1973	1	33.3	750	0.0	0	...	...	...	1	8.3
2.2S	1974	0	...	...	...	2	22.2	722.5	10.6	2	16.7
3.1S	1974	0	...	...	...	1	11.1	570	0.0	1	3.3
3.2S	1973	0	...	...	...	1	11.1	700	0.0	1	8.3
Regenerate ...		1	33.3	...	...	2	22.2	...	...	3	25.0
Total		3	99.9			9	99.9			12	99.9

* Brood Year = Year adults returned to spawn.

Table 13. Age, Sex and Size Composition of Karluk River Steelhead, October, 1980.

		Males				Females				Unknown				Total	
				Length (mm)				Length (mm)				Length (mm)			
Age	Brood* Year	n	%	$\bar{x}$	$\pm$S.D.	n	%	$\bar{x}$	$\pm$S.D.	n	%	$\bar{x}$	$\pm$S.D.	n	%
2.1	1976	0	...	...	...	0	...	...	...	2	40.0	546.0	18.4	2	6.4
2.1S	1975	3	23.1	628.3	16.1	0	...	...	...	0	...	...	...	3	9.7
2.1S1	1974	1	7.7	705.0	...	0	...	...	...	0	...	...	...	1	3.2
2.1SS	1974	1	7.7	760.0	0.0	0	...	...	...	0	...	...	...	1	3.2
2.2	1975	6	46.2	726.2	91.6	11	84.6	697.1	41.0	2	40.0	736.5	71.4	19	61.3
3.2	1974	1	7.7	610.0	0.0	0	...	...	...	1	20.0	826.0	0.0	2	6.4
Regenerate...		1	7.7	695.0	0.0	2	15.4	660.5	36.1	0	...	...	...	3	9.7
Total		13	100.1			13	100.0			5	100.0			31	99.9

* Brood Year = Year adults returned to spawn.

Northeast Kodiak Island Salmon Escapement

Peak salmon escapement estimates for Northeast Kodiak Island as presented in Table 14 indicated 327,055 pink salmon, 19,100 chum salmon, 38,898 sockeye salmon and 7,714 coho salmon spawned in 18 roadside streams. These peak counts were similar to previous escapements and considered sufficient to sustain the traditional sport harvest.

Table 14. Peak Salmon Escapement Estimates, N.E. Kodiak Island, 1980.

System	Chum Salmon		Coho Salmon		Pink Salmon		Sockeye Salmon	
	Date	Escpmt.***	Date	Escpmt.*	Date	Escpmt.	Date	Escpmt.
American	September 1	4,000	October 30	903	August 23	47,000	NA	...
Buskin	NC	...	October 27	1,021	August 20	95,000	August 15	3,814**
Chiniak	NC	...	November 3	32	August 20	5,500	NA	...
Hurst	NC	...	October 31	218	August 8	10,000	NA	...
Kalsin	NC	...	November 6****	240	July 13	75	NA	...
Monashka	NC	...	October 20	72	August 25	3,800	NA	...
Myrtle	NC	...	November 9	12	August 20	450	NA	...
Olds	August 23	8,500	October 28	780	August 8	67,700	NA	...
Panamaroff	NC	...	November 5	74	NC	...	NA	...
Pasagshak	NC	...	October 20-November 20	2,664	NC	...	August 19	3,484**
Pillar	NC	...	October 20	68	August 25	30	NA	...
Roslyn	NC	...	November 7	628	August 23	52,000	NA	...
Russian	August 20	4,000	October 30	30	August 20	8,000	NA	...
Salonie	August 20	1,400	October 30	741	August 20	3,000	NA	...
Saltery	August 8	1,200	November 7	212*****	Aug. 8	31,000	August 3	31,600***
Sargent	NC	...	October 30	18	August 20	2,800	NA	...
Twin	NC	...	November 18	1	August 23	350	NA	...
#410	NC	...	NC	...	August 23	350	NA	...
TOTAL		19,100		7,714		327,055		38,898

* Foot Survey
** Boat Survey
*** Aerial Survey
**** Includes 107 SS observed in Kalsin Pond
***** Outlet only
NC = No Count
NA = Not applicable

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Volume 22 Study G-I-C

STATE OF ALASKA

Jay S. Hammond, Governor

Annual Performance Report for

INVENTORY AND CATALOGING OF KENAI PENINSULA, AND COOK INLET DRAINAGES AND FISH STOCKS

by

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ALASKA DEPARTMENT OF FISH AND GAME
Ronald O. Skoog, Commissioner

SPORT FISH DIVISION
Rupert E. Andrews, Director

Volume 22 Study No. G-I

RESEARCH PROJECT SEGMENT

State: ALASKA

Name: Sport Fish Investigations of Alaska

Project: F-9-13

Study No.: G-I

Study Title: INVENTORY AND CATALOGING

Job No.: G-I-C

Job Title: Inventory and Cataloging of Kenai Peninsula, and Cook Inlet Drainages and Fish Stocks

Cooperator: Stephen L. Hammarstrom

Period Covered: July 1, 1980 to June 30, 1981.

ABSTRACT

Relative growth and survival rates, determined by fall gill-netting, are presented for rainbow trout, *Salmo gairdneri* Richardson, coho salmon, *Oncorhynchus kisutch* (Walbaum) and Dolly Varden, *Salvelinus malma* (Walbaum), captured in managed area lakes. Pertinent historical data regarding stocking, size, time, densities and catch rates are examined for various stocked lakes.

Creel census activities on 64.4 kilometers (40 miles) of the Kenai River resulted in an estimated harvest of 47,592 fish in 103,460 man-days of effort. Harvest estimates for coho salmon, sockeye salmon, *Oncorhynchus nerka* (Walbaum), pink salmon, *Oncorhynchus gorbuscha* (Walbaum), rainbow trout, and Dolly Varden are presented. Angler effort during June and July was directed primarily toward chinook salmon, *Oncorhynchus tshawytscha* (Walbaum), although other species are harvested incidentally. After August, effort was directed toward coho salmon.

It was estimated that anglers fished a total of 15,157 man-days on Anchor River during the period July 1November 15, 1980. The harvest was estimated to include: 6,904 Dolly Varden; 2,645 coho salmon; 309 pink salmon; 847 steelhead; 12 rainbow trout; and 57 fish of other species.

Life history data were obtained for juvenile coho and chinook salmon captured in an "inclined-plane" downstream migrant trap. The peak of the coho salmon smolt migration appears to have occurred prior to the first week in June with the peak size of smolts in the 95-99 millimeter length interval. Peak numbers of chinook salmon smolts were captured during the week of July 20, and most of the smolts ranged from 80 to 90 millimeters in length.

BACKGROUND

A map showing the location of the study area is presented in Figures 1 and 2, and a list of species of fish is presented in Table 1.

Stocked Lake Evaluation

Since statehood, an ongoing program to provide angling opportunities in easily accessable lake waters has utilized artificially reared or transplanted fish. Survey data have been analyzed with regard to: need for additional angling opportunity; potential of a given water to sustain desired species; status, condition and composition of existing populations; and requirements for rehabilitation or enhancement.

Historically, rainbow trout and coho salmon have been the predominant species used for stocking. Sockeye salmon and Arctic grayling have also been used when these species were available.

During the last few years, the state has been attempting to establish its own native brood stock of rainbow trout. Fish from the Swanson River were selected after testing against two other stocks. There have been difficulties with the program and, as a result, rainbow trout have not been available for stocking, and coho salmon have been substituted in a number of lakes. Only one lake was stocked with rainbow trout in 1978, none in 1979 and two in 1980.

Stocked populations are sampled each fall and the data obtained are used to determine relative survival, growth rates and future stocking densities. In addition, data gathered are forwarded to researchers in the Matanuska Valley where work evaluating native Alaskan rainbow trout brood stock is being conducted.

Skilak Lake Rainbow Trout

Since 1976, mild winter conditions have prevailed on the Kenai Peninsula. The Kenai River, at both its inlet to and outlet from Skilak Lake, has attracted more and more anglers in search of large rainbow trout. Fish up to 8.2 kg (18 lbs) have been reported. As this fishery became more popular, the public became more concerned that the population was being overharvested. The Department of Fish and Game conducted a creel census in 1979 (Wallis and Hammarstrom, 1980) and determined that neither harvest nor effort warranted additional census activities.

The Board of Fisheries decided to restrict this fishery by making the Kenai River, from its confluence with Moose River upstream to Kenai Lake, a single hook artificial lure area from January 1 through May 31.

An attempt was made in 1980 to capture and tag rainbow trout at the outlet of Skilak Lake, but insufficient numbers were collected to conduct a statistically valid population estimate.

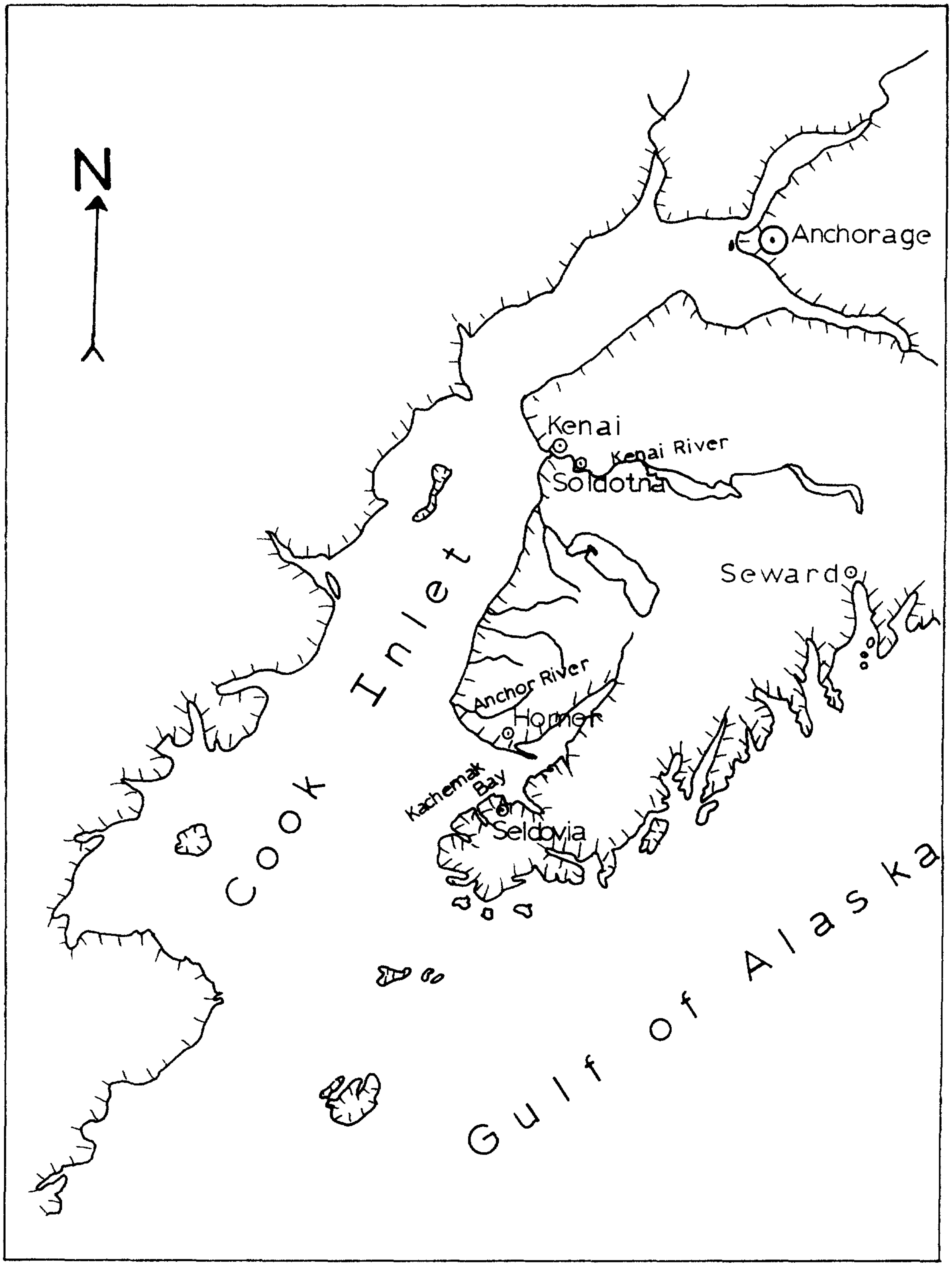

Fig. 1. Vicinity Map Showing Location of the Study Area.

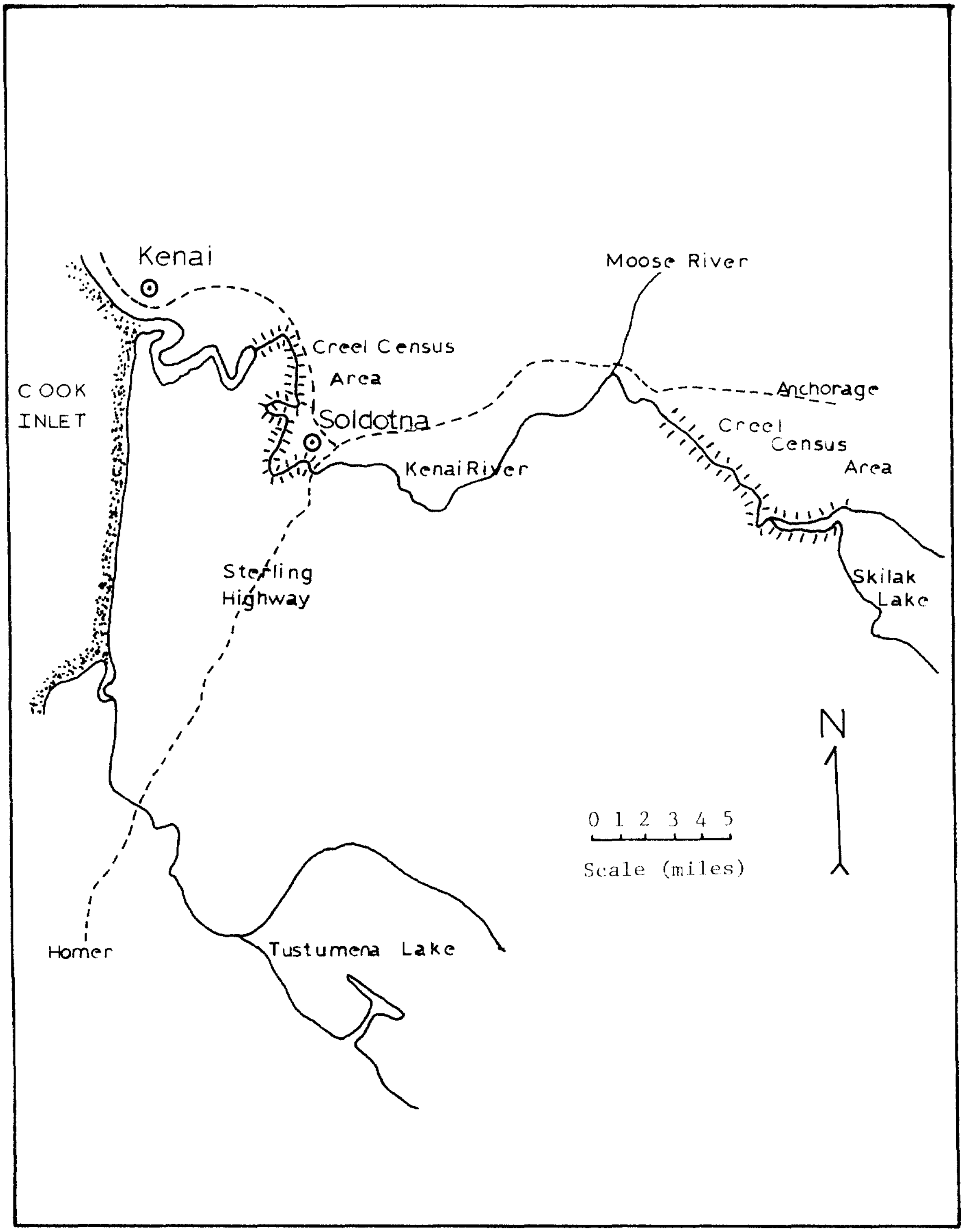

Fig. 2. Map Depicting Creel Census Areas on the Kenai River.

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

Common Name	Scientific Name & Author	Abbreviation
Pink salmon	*Oncorhynchus gorbuscha* (Walbaum)	PS
Chinook salmon	*Oncorhynchus tshawytscha* (Walbaum)	KS
Chum salmon	*Oncorhynchus keta* (Walbaum)	CS
Coho salmon	*Oncorhynchus kisutch* (Walbaum)	SS
Sockeye salmon	*Oncorhynchus nerka* (Walbaum)	RS
Dolly Varden	*Salvelinus malma* (Walbaum)	DV
Lake trout	*Salvelinus namaycush* (Walbaum)	LT
Rainbow trout	*Salmo gairdneri* Richardson	RT
Steelhead trout	*Salmo gairdneri* Richardson	SH
Arctic grayling	*Thymallus arcticus* (Pallas)	GR
Threespine stickleback	*Gasterosteus aculeatus* Linnaeus	TST

Kenai River Creel Census

The creel census on the Kenai River was initiated in 1974. Initially, the target species was chinook salmon; however, information gathered that first year demonstrated that anglers shifted their emphasis from chinook salmon to coho salmon after the chinook salmon season closes (July 31).

The fishing techniques also change from those primarily of a drift fishery to those of a stationary bait or casting fishery. Although most anglers still use boats, they usually run to a favorite spot, anchor and either fish roe or toss various lures. Fishing continues through September unless poor weather or high water levels prevail.

The coho salmon run into the Kenai River is comprised of early and late segments. The early run enters the stream in late July, peaks in early August and is present until late August. The late run usually enters in late August and is present until freeze-up, with peak fishing occurring in mid-September.

Prior to 1978, both runs were harvested commercially, primarily by the set net fishery occurring on the eastern shores of Cook Inlet (statistical areas 244-20, 30, 40). A decision by the Board of Fisheries in 1978 set the commercial closing date in this portion of Cook Inlet at August 15.

In 1978, legislation was passed giving subsistence priority use of the fishery resources. Prior to 1978, a small subsistence fishery had taken place along the east side of Cook Inlet. The fishery grew to nearly 600 household permits in 1980 and, as a result, the Board of Fisheries is currently considering a screening process that would allow the growth of the fishery to be controlled.

Anchor River Creel Census

Anchor River has long been recognized as one of the most popular sport fishing streams on the Kenai Peninsula. The river supports good populations of Dolly Varden, chinook and coho salmon. It also has the largest steelhead trout population of the five Kenai Peninsula streams which produce this species.

Observations indicated a great increase in angler effort and harvest on the river and, in 1978 and 1979, a creel census of the summer-fall sport fishery was undertaken to obtain data on harvest and population levels of Dolly Varden, coho salmon and steelhead trout.

Anchor River Life History Studies

During the course of an ongoing life history study of steelhead in Anchor River, juvenile salmonids were captured in various locations in the watershed. Fish of all species were captured, thereby providing an opportunity to obtain basic life history data for other species in addition to steelhead. These data will provide a better understanding of the stocks of fish and ultimately lead to better management techniques.

RECOMMENDATIONS

1. Adult Arctic grayling should be transported from Bench Lake to Seldovia Lake in an attempt to establish a self-sustaining population.

2. Added emphasis should be placed upon defining population characteristics of Dolly Varden in the Anchor River.

OBJECTIVES

1. To determine the environmental characteristics of the existing recreational fishery waters of the job area and to obtain estimates of existing and/or potential angler use of sport fish harvest.

2. To evaluate application of fishery restoration measures and availability of sport fish egg sources.

3. To assist as required in the investigation of public access status to the area's fishing waters and to make specific recommendations for segregation of public fishing access sites.

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

5. To provide recommendations for the management of sport fish resources in these waters and direct the course of future studies.

TECHNIQUES USED

Stocked Lake Evaluation and Lake Survey

The techniques for evaluating the stocked lakes were the same as those described by the Lake and Stream Manual, ADF&G (1971), Engel (1973) and Hammarstrom (1974).

Arctic grayling were captured using rod and reel in Crescent Lake and held in a floating line box until they could be transported by float plane. During transport, fish were carried in water filled plastic garbage cans supplied with oxygen for a distance of 180 km (108 mi.) to Seldovia Lake.

Kenai River Creel Census

The creel census employed on the Kenai River was based on the techniques described by Neuhold and Lu (1957) and described in detail by Hammarstrom (1977).

Effort estimates were based on two randomly selected instantaneous angler counts per day. Every weekend/holiday and 3 of 5 weekdays were sampled. Because of changing daylight hours, the fishing day ranged from 20 hours to 12 hours as follows: June and July, 20 hours; August, 16 hours; September, 12 hours. During two interview periods, the following information was collected: hours fished; catch by number and species; and specific biological data from chinook salmon, coho salmon and large rainbow trout.

As mentioned previously, the Kenai River coho salmon run is comprised of two distinct segments, early run fish and late run fish. Certain Alaska Board of Fisheries' policies pertain to these run segments; therefore, effort and harvest were calculated separately for early run and late run fish in upstream and downstream sections of the river. Previous unpublished data have shown the uncensused section of the river accounts for 9.1% as much as the two census areas; therefore, estimates from the upstream and downstream section were expanded by that factor to arrive at a total estimate of effort and harvest. Timing of the run was determined by changes in angler catch rates and size of fish captured.

Anchor River Creel Census

The Anchor River creel census was conducted during the period of July 1 through November 15, 1980. Methods employed were described in detail by Wallis and Hammarstrom (1979).

Coho salmon were captured with a beach seine and tagged with serially numbered Floy tags. Tags were recovered during the creel census of the fall sport fishery and by voluntary angler returns. The number of tag recoveries were inadequate to permit a population estimate.

Biological data (fork length, sex and scales) were collected from samples of coho salmon and Dolly Varden.

Anchor River Life History Studies

Juvenile chinook and coho salmon were captured in an "inclined-plane" downstream migrant trap. Fish were measured and scales were removed, and mounted on gummed cards and pressed on acetate sheets. Scales were read with a microfiche viewer and selected scales were photographed with a viewer-printer.

FINDINGS

Stocked Lake Evaluation

Fourteen stocked lakes in the area were sampled with variable mesh gill nets. Eight of these lakes had been previously chemically treated with emulsified rotenone to eliminate competing species, usually threespine stickleback. One lake, Jerome Lake, was rehabilitated again in 1980. This lake had remained stickleback-free, but an illegal fish stocking allowed Dolly Varden to become established. Only three of the eight lakes are currently free of stickleback.

Because of the nonavailability of either rainbow trout or coho salmon, only two lakes were stocked in 1980, Carter and Vagt Lakes. Both lakes are remote. Carter Lake is relatively high, elevation 435 m (1,486 ft), and naturally free of stickleback. Vagt Lake was rehabilitated with rotenone in 1975 and has remained free of stickleback. Neither of these lakes were sampled in 1980, but previous plants of rainbow trout have been termed successful based on reports from anglers who have regularly taken relatively large fish over 508 mm (20 inches).

Final evaluation of an experimental plant of rainbow trout from two different origins was accomplished on North Joseph Lake. In 1977, fish originating from the Swanson River on the Kenai Peninsula and Alaska Ennis, were stocked in a lake which seemed to best represent the majority of lakes on the Kenai Peninsula. The lake was not rehabilitated and thus contained stickleback, but it was not utilized by anglers to any extent. In an effort to keep the angler harvest to a minimum, no publicity regarding the program was released. Fish from each origin were marked with different ventral fin clips.

The lake was first sampled in 1978 with gill nets. Apparent survival was 3.75 times higher for the Swanson fish than the Alaska Ennis group, although the apparent growth rate was less for the Swanson group. Swanson fish increased from an average of 3.6 g at stocking to 100 g at time of sampling. Alaska Ennis fish increased from 4.4 g to 418 g during the same period. Catch per net hour was 0.090 for the Alaska Ennis fish and 0.674 for the Swanson fish.

In 1979, no fish with the Alaska Ennis mark were captured, while the catch rate for the Swanson group had dropped to 0.423 fish per net hour. The average weight of the sample had increased to 236 g per fish.

In 1980, no fish with the Alaska Ennis mark were captured. The 1980 catch rate for the Swanson group dropped to 0.140 fish per net hour, but the average weight increased to 685 g. Although the sample size is small (only three fish were captured) the size is in keeping with that found by other researchers in the Matanuska Valley who are evaluating the difference between strains of rainbow trout. Swanson River fish demonstrated slower growth rates but greater survival which, after 2 years, ultimately means more fish in the creel.

Pertinent historical data for the Kenai area lakes sampled with gill nets in 1980 are presented in Tables 2 and 3.

Kenai River Creel Census

The creel census on the Kenai River commenced June 1 and was continuous through September 30. Until July 31, the principal species harvested was chinook salmon. Other species harvested, Dolly Varden, rainbow trout, sockeye salmon, coho salmon and pink salmon, were taken incidental to chinook salmon. Data regarding chinook salmon and the associated fishery are presented in the G-II-L Report of Progress, Hammarstrom (1981).

Table 2. Summary of Recent Stocking History of Kenai Peninsula Area Lakes Sampled with Gill Nets in 1980.

Lake	Stocked	Species	Origin	Fish/ kg(lb)	Fish/Hectare (/acre)	Total Stocked
Arc	6/15/78	SS	Seward, Ak.	652(295)	630(255)	4,000
Cabin	5/24/77	RB	Ennis, Mt. Ak.	297(135)	303(122)	7,000
	7/24/79	SS	Seward, Ak.	267(121)	650(263)	15,000
Centennial	6/08/79	SS	Seward, Ak.	785(357)	610(244)	6,100
Engineer	6/08/79	SS	Seward, Ak.	785(357)	370(150)	34,250
Johnson	7/16/75	RB	Ennis, Mt.	255(116)	494(200)	17,000
	7/24/79	SS	Seward, Ak.	267(121)	580(235)	20,000
Longmare	8/16/78	SS	Seward, Ak.	323(147)	283(115)	19,698
Joseph	10/04/77	RB	Swanson River	350(159)	447(181)	4,000
Portage	7/24/79	SS	Seward, Ak.	267(121)	449(182)	5,000
Rainbow	7/03/74	RB	Winthrop, Wa.	728(331)	1,254(508)	7,600
Scout	6/15/78	SS	Seward, Ak.	652(285)	494(200)	19,000
Sport	9/15/78	RB	Tallarik Cr., Ak.	319(145)	293(119)	8,550
Sunken Island	6/06/77	RB	Tustumena Lk., Ak.	8,435(3,834)	3,971(1,608)	225,055
	6/08/79	SS	Seward, Ak.	785(357)	534(216)	30,250
Tirmore	7/16/75	RB	Ennis Mt.	365(165)	494(200)	10,400
Upper Jean	6/10/77	RS	Tustumena Lk., Ak.	9,198(4,181)	4,027(1,630)	75,000
	6/08/79	SS	Seward, Ak.	785(357)	486(197)	9,060

Table 3. Summary of Stocked Kenai Peninsula Lakes Sampled with Gill Nets in 1980.

Lake	Date Sampled	Species	Number in Sample	Catch per Hour	Length in mm Range	Length in mm Mean	S.D.*	Weight in Grams Range	Weight in Grams Mean	Year Planted
Arc	9/23	SS	31	1.38	213-243	227	9.8	100-154	122	1978
Cabin	10/07	RB	1	0.04		453			1,166	1977
		SS	152	6.57	165-262	181	18.4	45-236	59	1979
Centennial	9/22	SS	3	0.13	164-180	170	9.0	45- 54	50	1979
Engineer	10/08	SS	45	3.94	204-270	241	12.4	100-227	150	1979
		DV	3	0.06	170-400	308	121.5	32-835	445	Unknown
Johnson	9/22	RB	1	0.02		516			2,141	1975
		SS	92	7.92	162-380	205	45.3	54-694	209	1979
Longmare	10/14	SS	7	0.27	223-261	241	12.4	118-195	145	1978
North Joseph	9/24	RB	3	0.14	371-414	391	21.7	635-744	685	1977
Portage	9/24	SS	52	2.21	150-183	171	8.1	45- 64	54	1979
Rainbow	9/19	RB	2	0.09	554-609	582	38.9	3,266-3,969	3,742	1974
Scout	9/18	SS	7	0.32	246-263	259	6.2	154-200	181	1978
Sport	10/08	RB	30	0.61	195-443	334	64.1	100-1,252	522	1978
Sunken Island	9/18	RB	10	0.47	210-330	278	42.1	82-431	259	1977
		SS	81	3.77	167-245	206	26.7	54-154	100	1979
Tirmore	10/07	RB	2	0.09	623-664	644	29.0	4,309-4,536	4,423	1975
Upper Jean	9/19	SS	10	0.47	175-270	210	30.3	64-245	118	1979

* S.D. - Standard Deviation

When the chinook salmon season closes July 31, emphasis shifts to coho salmon. Anglers that had drift fished the day before would set an anchor in a quiet area along the bank and either fish with bait, usually salmon roe, or cast for coho or pink salmon.

Early run coho are available from late July through late August. In 1980, the first coho salmon was reported July 23 and a few were reported each day until August 1 when catch rates began rising steadily in the downstream section (Beaver Creek to the Soldotna Bridge). The early run peaked in this section about August 14 and was considered present until August 31 (Figure 3). The upstream section also displayed similar timing; the early run began to show increased harvest rates the first week of August, peaked about August 20 and was considered present until August 31 (Figure 4).

The late run became available in both sections about September 1. Because of the strong return of both runs, the date is somewhat artificial. Undoubtedly there is an overlap between the two runs but, during years when both runs are strong, the timing between the end of the early run and beginning of the late run was considered available until September 30 when the census terminated.

Fish are taken into October, however, cold temperatures, inclement weather and reduced flow in the Kenai River reduces the effort to a point which makes it unjustifiable to continue the creel census. For those anglers who do venture out, fishing can be quite good but the total harvest is felt to be insignificant after September 30.

The early and late runs are normally separated by a sharp decline in the catch per hour followed by a rapid increase indicating the building of the late run. This increase is usually accompanied by a higher proportion of larger fish, again indicative of late run fish. Early run fish averaged 3.5 kg (7.7 lbs) while late run fish averaged 4.4 kg (9.7 lbs). A length-weight relationship is presented in Figure 5.

In 1980 both early and late runs were considered very strong in relation to what has been observed annually since 1975. Total harvest was estimated at 25,255 coho salmon; 15,796 from the early run and 9,459 from the late run. Effort was estimated at 32,835 man-days; 22,095 and 10,740 from the early and late runs, respectively (Table 4).

The 1980 early run harvest was 140% greater than the 1975-1979 mean and displayed a 79.6% increase over the 1979 harvest. The late run harvest was 66.2% greater than the 1976-1979 mean and 66.4% greater than last year's harvest.

Effort during the early run was 44.3% above the mean and 40.7% greater than 1979. Corresponding figures for the late run are 21.2% below the mean and 15.1% less than 1979 figures. Total effort was 13.5% greater than the historical mean, and 1980 figures was 17.2% larger than 1979 data. It is felt the excellent fishing, especially during the late run, was due in part to a curtailment of commercial set net fishing after August 15.

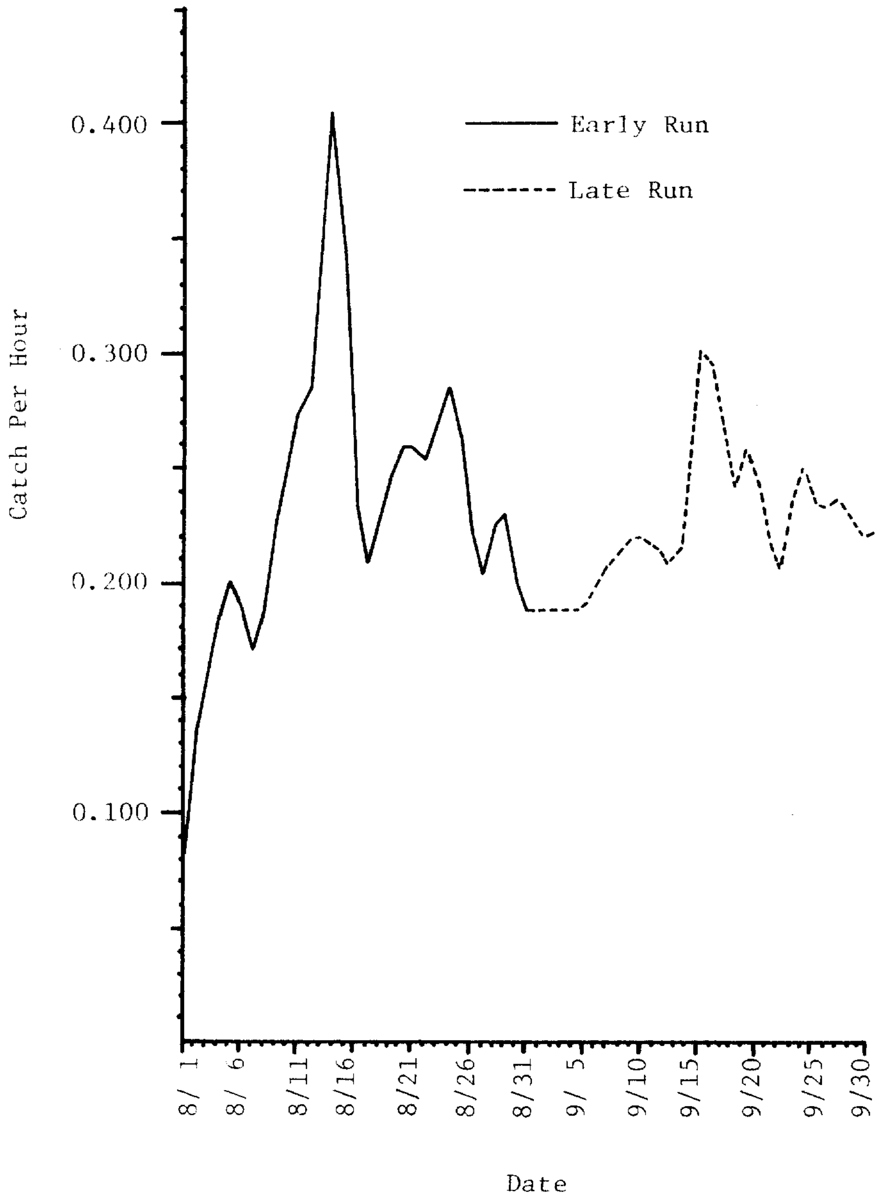

Fig. 3. Catch Per Hour by Date of Coho Salmon in the Downstream Section (Beaver Creek to Soldotna Bridge) of the Kenai River, 1980. (graph smoothed $\frac{a+2b+c}{4}$).

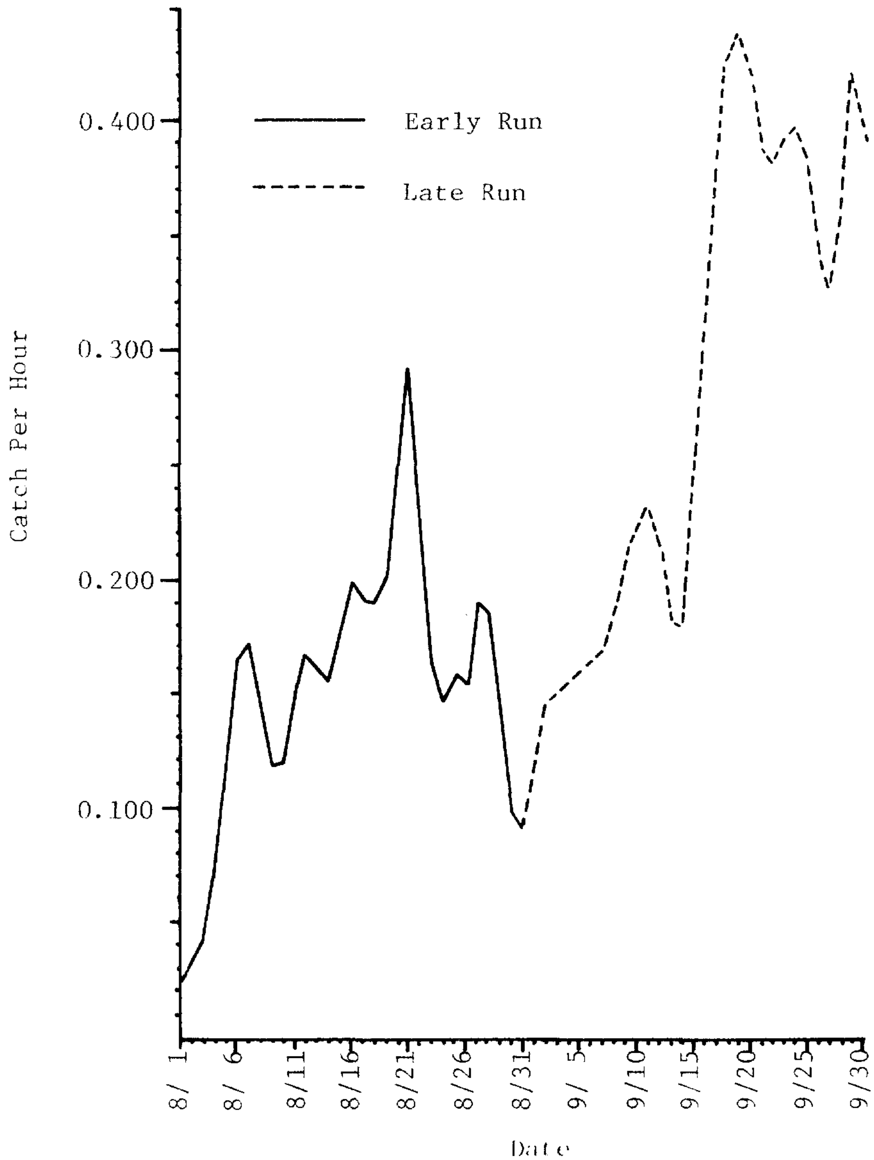

Fig. 4. Catch Per Hour by Date of Coho Salmon in the Upstream Section (Naptowne Rapids to Skilak Lake) of the Kenai River, 1980 (graph smoothed by $\frac{a+2b+c}{4}$).

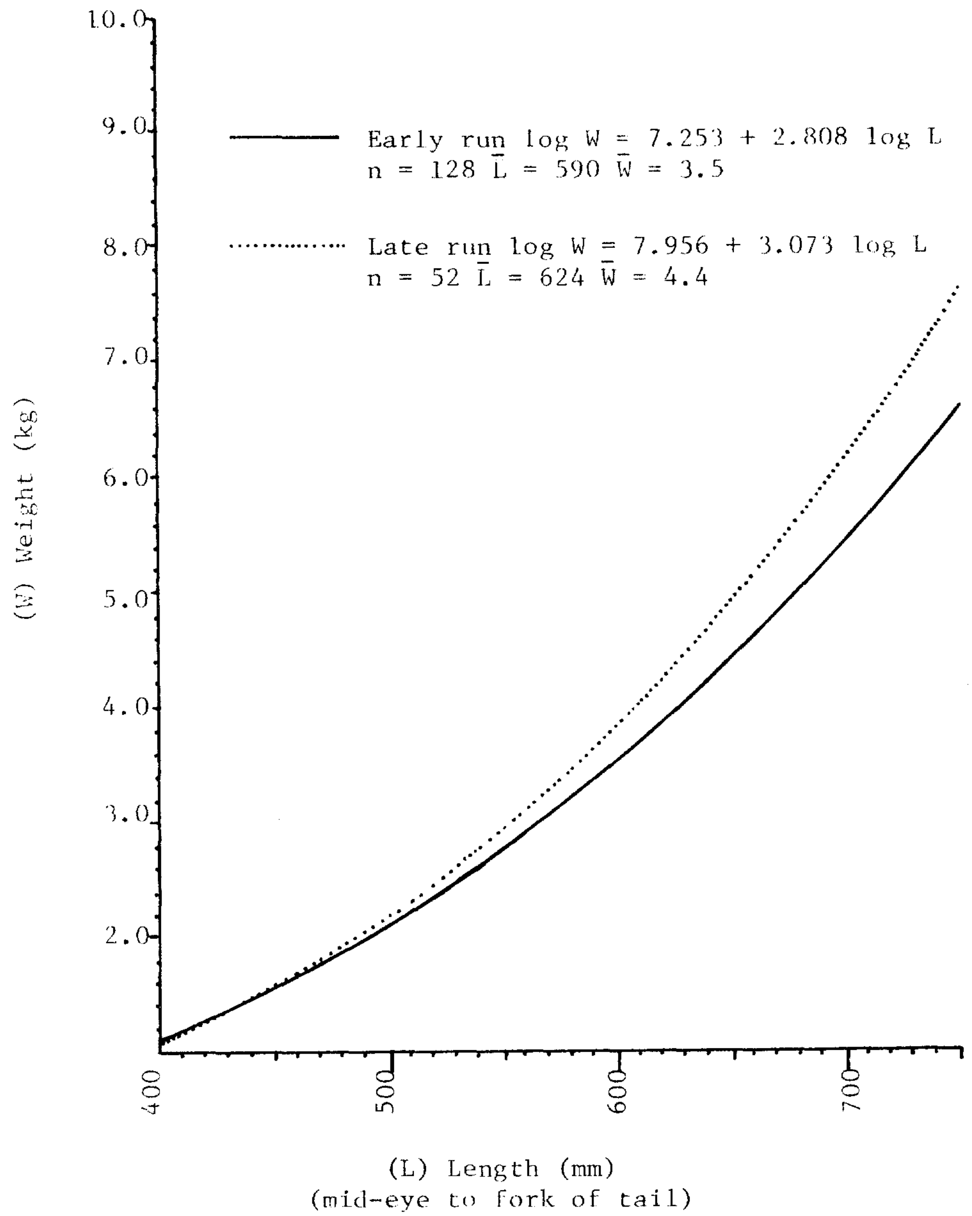

Fig. 5. Length-Weight Relationship for Coho Salmon Captured in the Recreational Fishery in the Kenai River, 1980.

Table 4. Summary of Kenai River Coho Salmon Sport Harvest and Effort, 1975-1980.

Year	Early Run Harvest	Early Run Effort	Early Run C/H	Late Run Harvest	Late Run Effort	Late Run C/H	Total Harvest	Total Effort
1975	5,715	9,725	0.091	Not Censused			-	-
1976	6,365	18,620	0.085	7,445	17,430	0.122	13,810	36,050
1977	6,780	12,520	0.123	3,280	6,630*	0.105	10,060	19,150
1978	5,225	19,965	0.058	6,360	18,140	0.100	11,585	38,105
1979	8,795	15,700	0.101	5,685	12,325*	0.123	14,480	28,025
1975-79 Mean	6,576	15,306	0.091	5,693	13,632	0.113	12,269	28,938
1980	15,796	22,095	0.184	9,459	10,740	0.251	25,255	32,835

* Angling effort reduced due to chronic flooding conditions.

Most other species in the river are harvested incidentally while fishing for chinook and coho salmon. Pink salmon enter the system in late July and are available through August. Much of the harvest on this species occurs in the vicinity of the Warren Ames Bridge which is located approximately 6.4 km (4 miles) downstream from the creel census area of the Kenai River. The estimated harvest of pink salmon in the creel census area was 7,415, representing a 56.4% decline from the 1978 season. This decrease can be explained partially by the fact that coho salmon fishing was so good that even novice anglers were reporting good catches and the less popular pink salmon was not needed to fill the creel. Additionally, people who desired pink salmon moved to that area around the Warren Ames Bridge where the concentration of fish that had only recently migrated from salt water offered excellent fishing, even for novice anglers. The true harvest estimate for pink salmon from the Kenai River will probably be better estimated by the Statewide postal survey, results of which appear in a report by Mills (1981).

Data regarding other species are presented in Tables 5 and 6. It should be noted that the overall fishing on the Kenai River in 1980, as determined by catch per hour, was better in 1980 than in 1979; that June and July were not as good in 1980 while August and September were substantially better. The August catch per hour of 0.350 (2.9 hours per fish) and the September harvest rate of 0.268 (3.7 hours per fish) were the highest recorded since the creel census was initiated in 1974.

Total effort was reduced by 23,125 man-days (18.3%) while total harvest increased by 8,047 fish (20.3%). If the "even-year only" pink salmon are not considered, the harvest was increased by only 632 fish; but in light of the 23,125 less man-days, the 1980 fishery was highly successful.

Harvest and effort were both about the historical means (Table 7), but the catch rate showed the most dramatic increase. Historically, both runs have averaged about 0.100 fish per hour (10 man-hours to catch one fish). In 1980, however, the early run was estimated at 0.184 fish per hour (5.4 man-hours/fish), while the late run was estimated at 0.251 fish per hour (4.0 man-hours per fish).

Although escapement data are available only for sockeye salmon, 464,000 as determined by sonar counters operated by the Commercial Fish Division of the Department of Fish and Game, escapement values for all anadromous species were felt to be adequate.

The harvest of rainbow trout and Dolly Varden declined in 1980 from previous years. This may be a natural fluctuation or the first indication of excessive sport harvest. A creel census conducted near the outlet of Skilak Lake in the spring of 1979 indicated a small harvest of adult rainbow trout, many of which appeared involved in spawning activity. No census was conducted in 1980 but reports from anglers suggested that few fish were available in that area. The rainbow trout situation should be more clearly defined after another year of data, but, with the restrictive fishery (single hook artificial lure only area) protecting the spawning activities, it is doubtful severe damage could be done to the adult population while they are on the spawning grounds.

Table 5. Harvest and Effort as Determined by Creel Census by Month, by Species, for the Kenai River, 1980.

Month	Effort Man-Days	Chinook Salmon	Sockeye Salmon	Pink Salmon	Coho Salmon	Rainbow Trout	Dolly Varden	Total Harvest	Total Catch/hour
					Downstream Section				
June & July	44,980	3,896	-	-	-	-	-	3,896	.022
August	11,532	-	-	6,088	9,704	-	-	15,792	.391
September	5,077	-	-	-	4,091	-	-	4,091	.228
Total	61,589	3,896		6,088	13,795			23,779	.101
					Midstream Section				
June & July	10,913	883	245	-	33	190	311	1,662	.039
August	1,824	-	31	593	1,288	30	310	2,252	.353
September	888	-	-	20	781	2	28	831	.265
Total	13,625	883	276	613	2,102	222	649	4,745	.090
					Upstream Section				
June & July	14,732	775	1,238	-	165	957	1,571	4,706	.086
August	8,739	-	348	503	4,606	338	3,441	9,236	.296
September	4,775	-	-	211	4,587	24	304	5,126	.313
Total	28,246	775	1,586	714	9,358	1,319	5,316	19,068	.174
					Total				
June & July	70,625	5,554	1,483	-	198	1,147	1,882	10,264	.037
August	22,095	-	379	7,184	15,598	368	3,751	27,280	.350
September	10,740	-	-	231	9,459	26	332	10,048	.268
Total	103,460	5,554	1,862	7,415	25,255	1,541	5,965	47,592	.122

Table 6. Kenai River Historical Sport Harvest (excluding chinook salmon) and Effort Data for 1976-1978.

Year	Effort Man-days	Sockeye* Salmon	Coho Salmon	Pink Salmon	Rainbow Trout	Dolly Varden	Total Harvest
1976	80,506	719	13,808	21,443	1,797	4,957	42,724
1977	102,203	1,436	10,056	100	2,474	8,058	22,124
1978	118,307	2,180	11,585	17,011	3,118	11,695	45,589
1979	126,585	1,907	14,479	-	3,100	11,764	31,250
1980	103,460	1,862	25,255	7,415**	1,541	5,965	42,038
Mean	106,212	1,621	15,037	Not Applicable	2,406	8,488	38,404

* Sockeye salmon estimates reflect only the legal boat harvest and do not estimate the shore harvest that occurs outside the creel census area.

** Pink salmon estimates are only valid for the creel census area. A significant harvest occurs downstream from the creel census area.

Table 7. Estimated Sport Fishing Effort and Harvest from Anchor River, by Species and Weekly Intervals, July 1-November 15, 1980.

Week Ending	Total Effort Angler Hours	Estimated Harvest DV	SS	PS	SH	RT	Other
7/6	1,932	0	0	0	12	12	11
7/13	568	26	0	0	0	0	0
7/20	1,162	838	0	0	0	0	0
7/27	1,714	2,042	0	0	0	0	0
8/3	1,133	855	0	31	0	0	0
8/10	1,850	274	354	104	0	0	0
8/17	2,551	92	529	42	0	0	21
8/24	5,521	197	840	85	36	0	25
8/31	4,686	185	477	32	72	0	0
9/7	3,820	224	289	15	145	0	0
9/14	1,794	81	121	0	149	0	0
9/21	2,181	265	26	0	139	0	0
9/28	2,689	202	9	0	48	0	0
10/5	1,882	287	0	0	88	0	0
10/12	1,459	622	0	0	76	0	0
10/19	1,644	529	0	0	56	0	0
10/26	203	0	0	0	0	0	0
11/2	366	71	0	0	8	0	0
11/9	414	77	0	0	10	0	0
11/15	323	37	0	0	8	0	0
Total	37,892	6,904	2,645	309	847	12	57

Anchor River Creel Census

A creel census of the summer-fall fishery was started on July 1 and ended on November 15. A summary of estimated angler effort and harvest is presented in Table 7. A total of 3,634 anglers were interviewed, and completed anglers fished an average of 2.5 hours per day.

A summary of creel census data since 1954 from the summer-fall fishery in Anchor River is presented in Table 8. Angler effort in 1980 was reduced from that observed during the previous 3 years.

Dolly Varden first appeared in angler catches during the week ending July 13 and built to a peak during the week of July 27. A secondary peak harvest period during late August and early September was due to an increase in effort rather than increased abundance. A third peak harvest period occurred about mid-October and coincided with the Dolly Varden spawning period.

There were observable differences in the size of Dolly Varden harvested during early and late periods of the fishery, and these size differences are illustrated in Figure 6. During the early period, most of the fish are bright silver and obviously fresh from saltwater. At this time, there were many Dolly Varden caught but released due to their small size. Therefore, the length distribution shown in Figure 6 is representative of the early harvest, but not of the entire seasonal catch. In the late period, most of the fish caught were highly colored and sexually mature. Most of the fish caught after November 1 had spawned. During the late period, very few fish smaller than about 356 mm (14 inches) were caught, and the length distribution shown in Figure 6 is representative of both the catch and harvest since most fish were retained.

We have assumed that the smaller Dolly Varden which enter the river in July and August remain throughout the winter. However, we cannot explain why they do not enter the fishery during late fall. Observations during the spring fishery in 1979 and 1980 indicated most of the Dolly Varden taken were fish which had spawned the previous fall. Very few sub-adults were caught in the fishery.

The first coho salmon appeared in the census during the week of August 10 and the harvest increased to a peak during the week ending August 24. In 1980, the fishery for coho was centered in the intertidal area for a longer period and with greater intensity than in the previous 2 years.

One hundred fifteen coho salmon were tagged with Floy anchor tags, but only 10 tags were recovered and the data were not adequate to make a population estimate. The first coho salmon were tagged on August 27, which was after the peak harvest had occurred. In addition, the bulk of the harvest occurred downstream of the tagging sites.

Scales were collected from 173 coho salmon taken by anglers for age determination. The length frequency of the sample is listed in Table 9 by age classifications and sex. In the sample, 7.5% were Age 1.1, 85.5% were Age 2.1, and 6.9% were Age 3.1. The ratio of males to females was 1:0.63.

Table 8. Summary of Creel Census Data from Anchor River for Harvest of Dolly Varden, Coho and Steelhead Trout.

Year	Period Covered In Census	Effort Man-days	Dolly Varden Harvest	Dolly Varden Total Run	Coho Harvest	Coho Total Run	Steelhead Harvest	Steelhead Total Run
1954	5/29-10/23	3,000	4,000	11,500	395	1,700	247	511
1957	5/1-10/15	5,800	573	7,000	90	801	50	600
1960	5/7-10/2	5,300*	3,300	...	1,000	...	400	...
1968	7/6-10/19	3,045	4,352	...	1,149	...	102	...
1977	5/28-6/19	10,978	NC**	...	NC	...	NC	...
	Bal. of year	20,573	9,222		1,339		1,072	
	Total	31,573	9,222		1,339		1,072	
1978	5/27-6/19	23,748	NC		NC		NC	
	7/15-11/12	20,906	21,141	...	1,433	...	1,462	4,132
	Total	44,654						
1979	4/13-4/30	3,500	5,700	...	0	...	100	...
	5/26-6/18	17,715	NC		NC		NC	
	7/14-11/4	18,267	15,205	...	2,248	5,306	611	...
		39,482	20,905		2,248		711	
1980	5/24-6/16	10,109	NC	...	0	...	15	...
	7/1-11/15	15,157	6,904	...	2,645	...	847	2,388
	Total	25,266	6,904		2,645		862	

* Effort incomplete - covers period 5/7-7/14 only

** NC - not covered in census

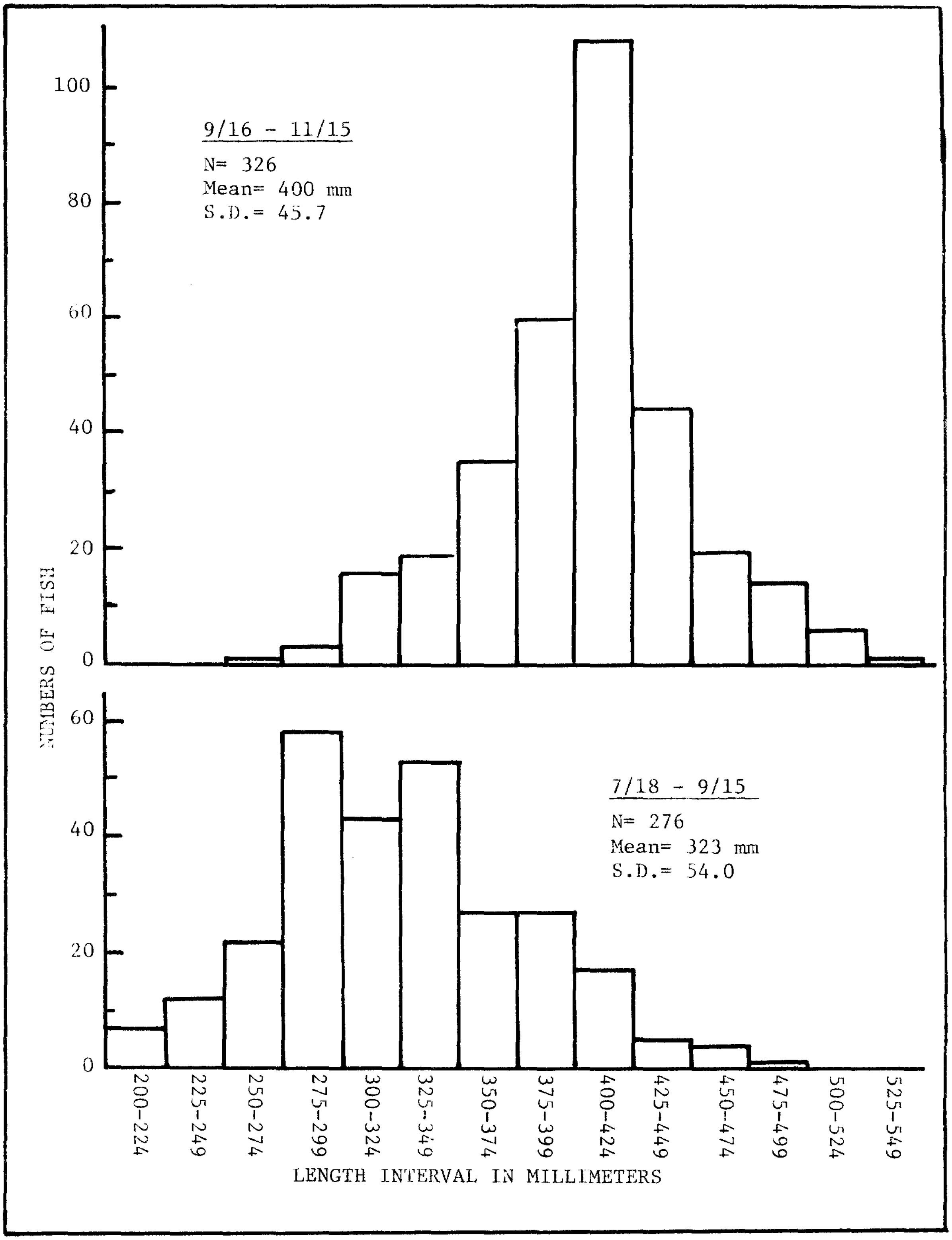

Figure 6. Length frequency of Dolly Varden harvested in the sport fishery in Anchor River during two time periods, 1980.

Table 9. Length Frequency of Coho Salmon from Anchor River, by Sex and Age Classification, 1980.

Age Classification	Females 1.1	Females 2.1	Females 3.1	Males 1.1	Males 2.1	Males 3.1
Length Interval (mm)						
525-549					3	
550-574		2			8	
575-599		6		2	1	
600-624	2	13	1	1	12	1
625-649	1	14		1	18	2
650-674	1	20	2	1	16	3
675-699		3			16	1
700-724	1	1		1	12	2
725-749				1	1	
750-774					2	
Number	5	59	3	7	89	9
Mean Length	639	634	640	639	649	661
S.D.	40.1	32.1	32.6	58.9	49.5	32.4

Anchor River Life History Studies

An "inclined-plane" downstream migrant trap was operated in Anchor River during the period of June 7 through September 10, 1980 as part of a steelhead life history study (Wallis and Balland, 1981). Coho salmon, chinook salmon and Dolly Varden juveniles were also captured in the trap and provide some information on time of migration and size at migration.

The sizes of juvenile coho salmon captured in the trap are listed in Table 10 by weekly periods. During the earliest period sizes, juveniles formed three modal groups at 35-44 mm, 60-69 mm and 95-99 mm. The smallest group consisted of young-of-the-year, the mid-sized group were Age I parr and the largest group consisted of both Age I and Age II fish which were designated smolts.

The maximum daily number of smolts captured was on June 7, the first day of operation, and numbers remained comparatively high until about June 20. Small numbers of smolts continued to enter the trap until late August. It is obvious the trap was not installed early enough to capture the earliest migrating smolts, and it appears that the peak smolt migration occurred during or before the first week in June.

The sizes of juvenile chinook salmon captured in the trap are listed in Table 11 by weekly period. Age of fish was determined by examination of scale samples, and the dashed line in Table 11 denotes the separation of young-of-the-year from Age I fish. There were shifts in modal lengths of fish with time, but it appears most smolts were in modal lengths from 80 to 90 mm.

Few smolts were caught during the first few days of operation. It appears that trap catches encompassed almost the entire smolt migration period. Catches were comparatively high throughout the period of June 15 through August 3, with the peak catch occurring the week ending July 20.

Kachemak Bay Feeder Chinook Salmon

Two additional tagged feeder chinook salmon were recovered in the Kachemak Bay sport fishery in 1980. One was from the Priest Rapids facility on the Columbia River in Washington, and the other from the Marion Forks Hatchery on the North Santiam River, Oregon (Table 12).

Table 10. Lengths of Juvenile Coho Captured in the Inclined Plane Downstream Migrant Trap in Anchor River, by Weekly Period, 1980.

Length Interval (mm)	Week Ending												
	6/8[1/]	6/15	6/22	6/29	7/6	7/13	7/20	7/27	8/3	8/10	8/17	8/24	8/31
30- 34	1	0	6	1	3	0	0	0	0	0	0	0	0
35- 39	9	8	6	4	2	0	0	0	0	0	0	0	0
40- 44	7	10	10	7	1	0	1	0	0	0	0	0	0
45- 49	1	5	9	13	8	1	1	2	0	0	0	0	0
50- 54	1	15	13	19	1	3	3	1	0	1	0	4	2
55- 59	9	31	40	39	16	5	10	7	1	2	1	4	2
60- 64	15	66	76	79	27	15	26	2	5	3	1	2	2
65- 69	6	67	81	89	36	20	71	7	6	11	4	2	3
70- 74	4	55	57	46	30	15	48	4	22	17	6	5	8
75- 79	2	25	42	39	35	6	31	2	11	17	20	9	4
80- 84	8	27	34	36	26	10	10	0	6	4	10	3	3
85- 89	17	32	35	28	28	17	3	0	3	0	5	1	0
90- 94	18	23	25	11	10	8	0	0	0	2	3	1	1
95- 99	18	31	44	5	10	4	2	0	0	1	3	0	0
100-104	19	25	25	6	0	0	1	0	0	1	0	0	0
105-109	14	9	17	7	1	0	0	0	0	1	0	0	0
110-114	3	3	17	4	1	0	0	0	0	0	0	0	1
115-119	0	3	10	2	0	0	0	0	0	0	0	0	0
120-124	5	0	4	1	0	0	0	0	0	0	0	0	0
125-129	0	2	3	1	1	0	0	0	0	0	0	0	0
130-134	0	0	1	0	0	0	0	0	0	0	0	0	0
135-139	0	0	0	0	0	0	0	0	0	0	0	0	0
140-144	0	0	0	0	0	0	0	0	0	0	0	0	0
145-149	1	0	0	0	0	0	0	0	0	0	0	0	0
Total	158	437	555	437	236	104	207	25	54	60	53	31	26

1/ Two days only

Table 11. Length of Juvenile Chinook Salmon Captured in the Inclined Plane Downstream Migrant Trap in Anchor River, by Weekly Period, 1980.

Length Interval (mm)	Week Ending												
	6/8 1/	6/15	6/22	6/29	7/6	7/13	7/20	7/27	8/3	8/10	8/17	8/24	8/31
40- 44	0	3	2	2	1	0	0	0	0	0	0	0	0
45- 49	0	0	1	3	0	0	0	0	0	0	0	0	0
50- 54	0	0	0	0	0	0	1	1	0	0	0	0	0
55- 59	0	8	6	6	1	1	10	0	0	0	0	0	0
60- 64	2	4	7	6	0	0	2	1	0	1	0	0	1
65- 69	2	9	10	13	2	2	2	1	0	2	1	0	1
70- 74	3	12	15	12	9	1	5	0	3	4	2	3	0
75- 79	2	2	4	11	31	9	17	3	9	2	4	4	2
80- 84	2	4	9	20	44	22	45	8	10	8	6	7	1
85- 89	0	14	16	18	33	29	77	14	37	14	4	4	1
90- 94	1	29	38	14	15	22	54	3	72	19	1	0	0
95- 99	1	14	25	7	4	7	18	0	43	6	0	0	0
100-104	0	14	17	3	0	1	2	0	13	4	3	0	0
105-109	0	7	13	3	1	0	1	0	0	2	0	0	0
110-114	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	13	120	163	118	141	94	234	31	187	62	21	18	6

Young-of-the-year

Age I

1/ Two days only

Table 12. Data for Tagged Chinook Salmon Caught in Kachemak Bay Sport Fishery 1977-1980.

Date Captured	Length/ Weight	Tag Code	Brood Year	Origin
1977	Size Unknown	2-3-2	1973	Puntledge River Hatchery, British Columbia; hatchery evaluation.
9/26/78	680 mm/5.9 kg	9-5-7	1975	South Santiam River, Oregon; hatchery experimental.
9/26/78	575 mm/3.7 kg	2-4-11	1975	Nitinat River, British Columbia; wild stock contribution.
9/26/78	570 mm/3.6 kg	2-1-10	1975	Atnarko River, British Columbia; wild stock contribution.
9/30/78	825 mm/6.8 kg	9-5-8	1975	South Santiam River, Oregon; planted in Willamette River at Oregon City.
10/19/78	Lgth Unknown 2.3 kg	63-16-6	1976	Skagit River, Washington; wild stock contribution.
3/5/79 1/	505 mm	4-16-16	1976	Crystal Lake Hatchery, Petersbury, Alaska.
5/6/79	Lgth Unknown 1.6 kg	9-16-30	1976	South Santiam River, Oregon; planted in Willamette River at Oregon City.
9/9/79	Lgth Unknown 6.8 kg	9-16-30	1976	South Santiam River, Oregon; planted in Willamette River at Oregon City.
10/6/79	760 mm/10 kg	9-5-8	1975	South Santiam River, Oregon; planted in Willamette River at Oregon City.
10/23/79	Lgth Weight Unknown	2-16-30	1976	Robertson Creek Hatchery, British Columbia.
6/7/80	Lgth Weight Unknown	63-16-62	1976	Priest Rapids, Columbia River, Washington.
9/-/80	Lgth Weight Unknown	7-12-32	1977	Marion Forks Hatchery, North Santiam River, Oregon.

1/ This individual was caught in an experimental shrimp trawl.

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Volume 22 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

David Watsjold

ALASKA DEPARTMENT OF FISH AND GAME
Ronald O. Skoog, Commissioner

SPORT FISH DIVISION
Rupert E. Andrews, Director

Volume 22 Study No. G-I

RESEARCH PROJECT SEGMENT

State:	ALASKA	Name:	Sport Fish Investigations of Alaska
Project No.:	F-9-13		
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

Cooperator: David Watsjold

Period Covered: July 1, 1980 to June 30, 1981.

ABSTRACT

Fall gill-netting was conducted to assess the effect of current stocking techniques on survival and growth of stocked coho salmon, Oncorhynchus kisutch (Walbaum), in Matanuska-Susitna Valley lakes. A reduction in stocking densities (ranging from 50-80 fish per acre) and an increase in stocking size from, 650 per pound to 140-254 per pound resulted in increased growth rates of Age 0+ coho salmon planted in early summer. Coho salmon stocked in September at 59 per pound exhibited high growth and survival rates during their first year of lake residency.

Coho salmon stocking guidelines cannot be established without further assessment of stocking size, density and time of stocking.

A creel census, conducted on five streams open to chinook salmon, Oncorhynchus tshawytscha (Walbaum), fishing, estimated a harvest of 1,420 chinook salmon in 7,229 man-days of effort. Catch rates averaged .041 chinook salmon per hour and ranged from .023 per hour on the Little Susitna River to .060 per hour on Caswell Creek. The average length of a man-day was 3.90 hours for bank anglers and 7.10 hours for boat anglers.

Examination of 637 chinook salmon scales revealed a change from predominately Age 1.3 and 1.4 to Age 1.2 fish in Montana, Willow and Chunilna Creeks. The change was generated by a strong showing of Age 1.2 chinook salmon, which returned from the 1976 parent year; the first year substantial increases in Susitna River chinook escapements were recorded.

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. Overlapping of length classes was encountered with Age 1.3 and 1.4 chinook salmon on all streams. Alternate age prediction methods are being investigated.

Coho salmon escapement counts, conducted in established index areas, revealed above average numbers in most streams. Record escapements were recorded on Fish and Cottonwood Creeks.

BACKGROUND

A coho salmon stocking program was initiated in 1960 to provide angling opportunities in waters lacking game fish populations. Presently, 12 Matanuska-Susitna Valley lakes are stocked yearly with approximately 200,000 coho salmon.

Seven of the stocked lakes were rehabilitated to remove threespine sticklebacks, which resulted in increased growth and survival rates for salmon. Four of the lakes have since been reinfested by threespine sticklebacks with a resultant reduction in coho salmon growth and survival.

Coho salmon population sampling is conducted each fall to evaluate survival, growth and stocking densities. During winter months, chemical parameters are monitored in lakes having a history of low dissolved oxygen. The results of these evaluations are used to determine future management procedures to maintain or improve the quantity and quality of coho salmon fishing.

Probable overharvest of Cook Inlet chinook salmon in the 1940's and 50's resulted in drastic declines in chinook salmon numbers in the 1960's. Attempts to restore Upper Cook Inlet chinook salmon populations, through intense management, were initiated in 1973 when these fish were protected by complete closures on both sport and commercial fisheries. Prior to 1973 a very limited sport and commercial fishery was allowed in some areas of Upper Cook Inlet.

Results of these management efforts first appeared in 1976 when large increases in chinook salmon numbers were noted in Susitna River spawning streams. High escapements were again observed in 1977 and 1978.

In 1979 the Alaska Board of Fisheries allowed a limited chinook salmon fishery on five streams in the Matanuska-Susitna Valleys. A punch card was required of each angler and a maximum catch quota established for each of the following streams: Willow, Montana and Chunilna Creeks (300 each), Little Susitna River (1,000), and Caswell Creek (200). The bag limit was one chinook salmon per day and five per season over 20 inches in length. In 1980 the bag limit was changed to two chinook salmon per day, but only one could exceed 28 inches in length. Stream harvest quotas remained the same.

Effective management of these chinook salmon populations requires creel census programs and various enumeration techniques to determine yearly harvest and escapement levels.

If current management procedures continue to enhance Susitna River chinook salmon populations a relaxation of existing stringent restrictions could occur.

Coho salmon runs during the early 1970's declined to very low levels in Matanuska-Susitna Valley streams. Environmental conditions combined with an intense Cook Inlet commercial fishery were probable causes of the decline. From 1968 to 1970 extremely low rainfall resulted in reduced stream flows, which are known to be deleterious to coho salmon. Since coho salmon run timing through the Cook Inlet commercial fishery coincides with that of all other species except chinook salmon, it is difficult to specifically manage coho salmon by manipulation of the mixed stock commercial fishery.

Management of Upper Cook Inlet coho salmon has primarily been conducted through regulation of sport fisheries. Various techniques that are used include: protection of spawning grounds; regulation of sport fishing methods and means; restriction to weekend-only fishing; and emergency closures when runs appear to be lagging.

Coho salmon populations are monitored on selected Matanuska-Susitna Valley streams. In 1975, coho salmon populations increased substantially and since then it appears that populations are slowly recovering from early 1970 declines.

Continued use of present management techniques is expected, but may be altered if successful enhancement of coho salmon populations is attained by the Fisheries Rehabilitation and Enhancement Development Division.

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

RECOMMENDATIONS

1. A creel census should be continued on those streams opened to chinook salmon fishing to determine angler effort and harvest.

2. Angler effort and harvest data on Little Susitna River coho salmon should be obtained since upgrading of the Burma Road in 1981 will greatly increase angling pressure.

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

4. Catalog and inventory of waters in the rapidly developing Point McKenzie area should be initiated to provide management guidelines for these waters.

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

Common Name	Scientific Name and Author	Abbreviation
Chinook salmon	*Oncorhynchus tshawytscha* (Walbaum)	KS
Coho salmon	*Oncorhynchus kisutch* (Walbaum)	SS
Rainbow trout	*Salmo gairdneri* Richardson	RT
Threespine Stickleback	*Gasterosteus aculeatus* Linnaeus	TST

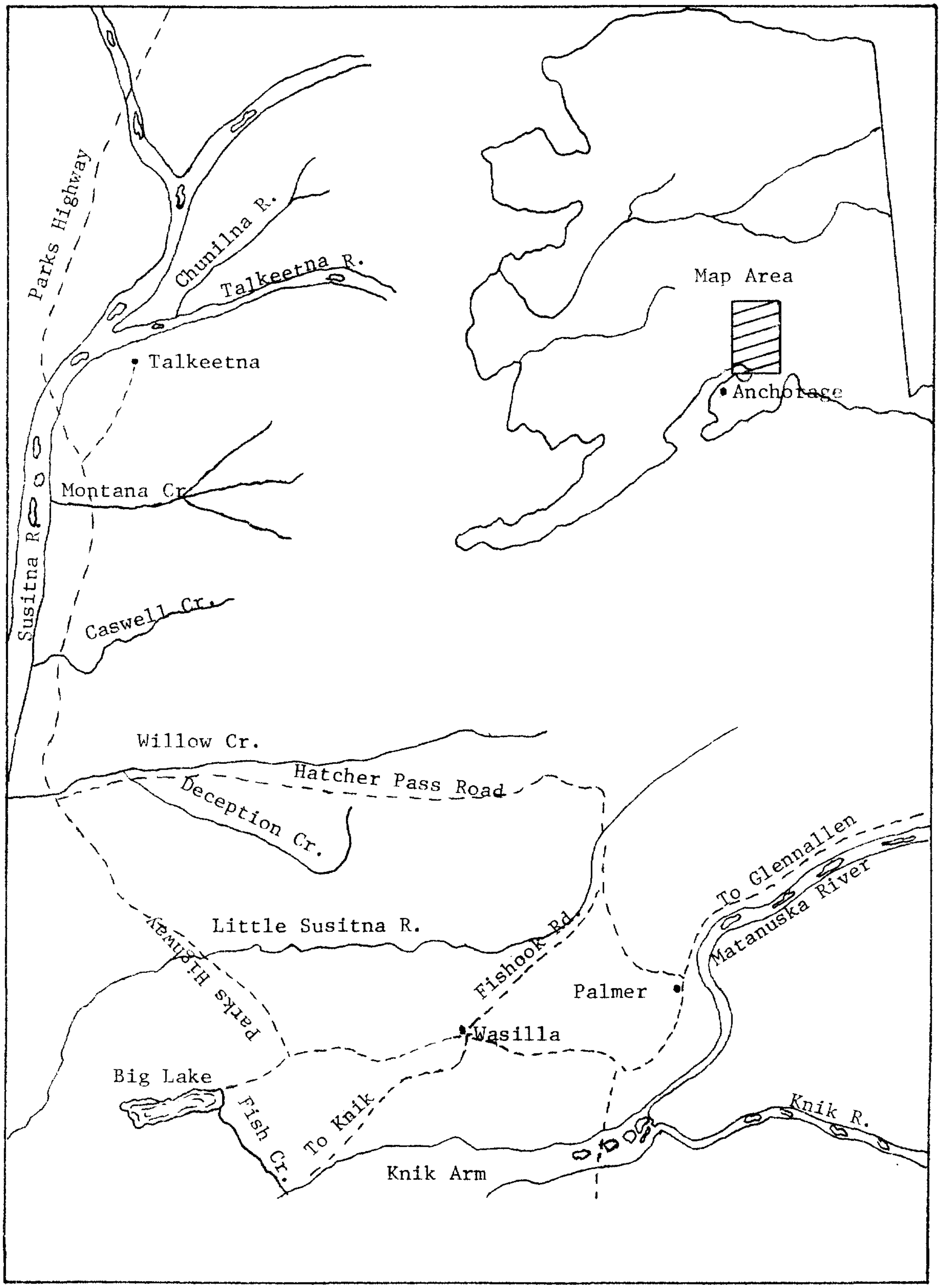

Figure 1. Study Area in Matanuska-Susitna Valleys.

OBJECTIVES

1. To determine levels of abundance of anadromous and resident fish stocks and to evaluate densities to determine optimum levels necessary for maintenance of these stocks.

2. To determine anadromous fish harvest levels and fishing effort on selected streams in the job area.

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

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

TECHNIQUES USED

Fish specimens were collected with monofilament gill nets 6 ft x 125 ft, having five mesh sizes ranging from 1/2 in to 2 in bar measure. All gill-netted fish were weighed to the nearest gram and fork lengths recorded to the nearest millimeter.

The creel census conducted during the chinook salmon fishery was statistically designed to estimate harvest and effort on five streams. On those streams opened on weekdays and weekends, the sampling day was divided in five 4-hour periods between the hours of 4:00 a.m. and 12:00 midnight. Two randomly selected periods were sampled each day on 4 weekdays while on each weekend day and holiday all five periods were sampled. On those streams open on weekends only the entire 24-hour period was sampled each day.

During sampling periods angler counts were conducted on those areas of the stream that received the greatest fishing intensity. Frequency of angler enumerations were dependent upon the length of the established count section on each stream.

The Little Susitna River census was conducted at two major access points. Catch and effort estimates were calculated separately for each access and then summed.

During sampling periods only completed anglers were interviewed. Information collected from anglers included: number of hours fished; number and species of fish caught; punch card numbers; and whether they were boat or bank anglers. Chinook salmon over 20 inches in length were weighed to the nearest pound and scales 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 0.5 cm. All lengths in this report are from tip of snout to fork of tail measurements.

The European method was used to denote anadromous salmon age groups. This method uses a decimal mark to separate the number of years spent in freshwater from the number of years spent in the sea.

Chinook salmon scales were mounted on gum paper and pressed onto plastic acetate. Scales were examined using a Bruning Model 200 microfiche reader. Coho salmon spawning populations were enumerated by foot surveys within established index areas.

FINDINGS

Lake Stocking Evaluations

In 1980 landlocked coho salmon were sampled with variable mesh gill nets in eight stocked lakes (Table 2). Gill net catches of Age 0+ and Age I+ coho salmon were high in most lakes. Catch rates of Age 0+ coho salmon ranged from 0.32 fish/hour in Finger Lake to 2.35 fish/hour in Memory Lake. Catch rates of Age I+ coho salmon ranged from 0.78 fish/hour in South Rolly Lake to 2.31 fish/hour in Echo Lake.

After 6 months residency in the lakes Age 0+ coho salmon averaged from 139 mm to 154 mm in length, which is much larger than the 110 mm size that has been recorded in past years. This greater than normal growth is attributed to a reduction in stocking densities and larger planted fish. In 1980 fewer coho salmon were available for stocking, but they averaged 140 to 254 fish/lb as compared to 500 to 650 fish/lb that were stocked in past years.

After 17 months residency in five lakes, Age I+ coho salmon averaged from 208 mm to 236 mm in length which is average for Matanuska-Susitna Valley lakes. Victor Lake Age I+ coho salmon, however, average 343 mm after 17 months residency. Watsjold (1980) noted that when coho were stocked in Victor Lake in 1979 the lake was almost barren after a severe winter kill. The coho salmon stocked in 1979 reached 172 mm in length after only 5 months and this growth rate continued, thus producing larger than normal Age I+ fish in 1980.

Surplus coho salmon were available for stocking in the fall of 1979. Echo and South Rolly Lakes were stocked in September at 200 per acre with coho averaging 59 fish/lb and 67 fish/lb, respectively. These were both the largest and latest coho ever planted in the Matanuska-Susitna Valleys.

A large rainbow trout population was present in Echo Lake during the fall of 1979. Gill-netting on November 1, 1979 resulted in Age 0+ coho salmon and Age I+ rainbow trout catch rates of 0.74 and 5.70 fish/hr, respectively. A total of 17 coho were captured at this time and averaged 110 mm in length, which was almost identical to the average length of Age 0+ coho that had been stocked 4 months earlier. Echo Lake was again sampled in October 1980 to evaluate these coho that were now Age I+. They had attained an average length of 296 mm after only 13 months in the lake, which was significantly larger than the Age I+ coho that had spent 17 months in other stocked lakes. The catch rate of 2.31 fish/hr was also much greater than recorded in the other sampled lakes.

Table 2. Gill Net Results and Stocking Histories of Managed Lakes, Matanuska-Susitna Valleys, 1980.

	Date		Age	Length (mm)				Catch/	Date	Total	Per	Per
Lake	Sampled	Species	Class	n	$\bar{x}$	$\pm$ SD	Range	Net Hr.	Stocked	Number	Lb.	Acre
Echo	10/24/80	SS	I+	56	296	16.228	243-327	2.31	9/19/79	4,606	59	200
Finger	10/29/80	SS	0+	7	139	10.792	127-156	0.32	5/7/80	44,177	140	120
			I+	40	236	19.269	189-288	1.80	5/21/79	73,030	670	200
Loon	10/28/80	SS	I+	44	216	12.764	181-238	1.91	5/21/79	10,800	670	100
Lucille	10/29/80	SS	I+	26	232	28.037	163-264	1.18	5/21/79	72,500	670	200
Memory	10/28/80	SS	0+	54	153	27.528	124-242	2.35	5/7/80	8,285	254	100
			II+	2	328	9.192	322-335	.09	7/11/78	12,500	277	150
Rocky	10/28/80	SS	I+	37	208	25.235	159-245	1.60	5/23/79	5,900	650	100
South Rolly	10/29/80	SS	I+	17	228	33.453	170-290	0.78	9/7/79	22,378	67	200
Victor	10/24/80	SS	0+	37	154	12.580	112-185	1.50	6/19/80	2,800	231	200
			I+	25	343	18.750	311-385	1.01	5/23/79	2,800	650	200

Previous higher density introductions in Echo Lake of smaller coho salmon in July and August produced smaller fish (195-241 mm) with catch rates ranging from 0.48 to 0.91 fish/hr. From these limited data, it appears that size and stocking densities may over-ride stocking time as a factor influencing growth and survival of coho salmon. Further investigation is necessary to substantiate these conjectures.

Evaluation of South Rolly Lake coho salmon is not possible due to limited background information and the stocked coho salmon may have been able to leave the lake because high water overflowed the outlet control structure.

Chinook Salmon Studies

Creel Census:

A chinook salmon fishery was scheduled from May 24 through July 6 on the Little Susitna River and Chunilna Creek, and on Caswell, Montana and Willow Creeks during four consecutive weekends commencing June 14.

Since it was apparent during the 1979 fishery that few fish were available at the beginning of these fisheries, the census schedule was shortened to coincide with chinook salmon run timing. The census on the Little Susitna River Burma Road access site was conducted from May 30 to July 6. The census on the Little Susitna River at the Parks Highway crossing and on Chunilna Creek was conducted from June 14 to July 6. On the weekend-only streams, the census was scheduled for the last 3 weekends on Willow and Montana Creeks and all 4 weekends on Caswell Creek.

Since the census covered only the period when chinook salmon were available to anglers, recorded angler effort is somewhat less than what occurred during the entire fishery.

Angler effort and catch estimates were derived from interviews with 3,097 completed anglers, which represented 42.8% of the total estimated effort. The best coverage occurred on Montana Creek where 64.6% of the total estimated number of anglers were interviewed, while the lowest number checked was on Caswell Creek (33.9%). Completed anglers caught 977 chinook salmon, which represents 68.8% of the total estimated catch. On weekend-fishing-only streams, which were censused 24 hours daily, 85% of the total estimated harvest was checked.

The total chinook salmon harvest for the five east side Susitna River streams was estimated at 1,420, and 7,229 man-days of effort were expended with a mean catch per hour of .041 (Table 3). Catch rates on the five streams ranged from .023 chinook salmon per hour in the Little Susitna River to .060 per hour on Caswell Creek.

The area catch quota of 2,100 chinook salmon was not attained. Individual stream quotas were reached on Willow, Montana and Caswell Creeks, however, prior to the end of the scheduled fishery. To remain within established catch quotas emergency orders were issued closing Willow and Montana Creeks on the last day of the scheduled fishery. Caswell Creek was closed the last 3 days of the scheduled season.

Table 3. Effort and Harvest Data of the Chinook Salmon Sport Fishery, Matanuska-Susitna Valleys, 1980.

Stream	Quota	Harvest	Sex Ratio Male Female	Effort Man-Days	Catch/Hour	Harvest Per Man-Day
Caswell Creek	200	255	5.3 : 1.0	1,038	.060	0.25
Chunilna Creek	300	161	1.8 : 1.0	801	.038	0.20
Little Susitna River	1,000	337	1.2 : 1.0	2,877	.023	0.12
Montana Creek	300	375	2.6 : 1.0	1,901	.050	0.20
Willow Creek	300	292	1.5 : 1.0	612	.059	0.48
Total	2,100	1,420	2.3 : 1.0	7,229	.041	0.20

Tables 4 and 5 show angling effort and catch by weekly period. Effort and catch started out slow on all streams and peaked the week of 6/23-6/29 when 35.6% of the seasonal effort was recorded and 37.8% of the seasonal catch was taken. The reduction in effort and catch the last week was the result of the stream closures. Had all the streams remained opened the last week of the fishery the highest effort and catch would have occurred during this time. The effects of the stream closures on effort and catch is graphically depicted in Figure 2.

On those streams opened throughout the week, 86.9% of the effort and 87.4% of the catch occurred from 12 noon to 12 midnight. On weekend fishing only streams periods of highest effort and catch varied considerably on each stream. On Caswell Creek, 50.3% of the catch occurred between midnight and 8:00 a.m. while 43.7% of the effort occurred from midnight to 4:00 a.m. and 8:00 p.m. to midnight. The catch on Montana Creek was distributed equally throughout the day but 63% of the effort was from 12 noon to 12 midnight. The highest catches (33.8%) and effort (30.1%) were recorded from 8:00 p.m. to 12 midnight on Willow 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 3.90 and 7.10 hours per day, respectively, on all streams combined.

Since three streams were closed prior to the scheduled season and the census schedules were shortened, very little comparison can be made between 1979 and 1980 census data. Although the catch per hour on all streams combined of .041 in 1980 was almost identical to the 1979 rate of .040, catch rates on individual streams were completely opposite on all but Willow Creek. Catch rates on Caswell and Montana Creeks in 1980 were two and three times, respectively, higher than those recorded in 1979. Conversely, 1980 catch rates on Chunilna Creek and Little Susitna River were only half of the 1979 rate.

The high catch rates on Willow, Montana and Caswell Creeks reflect the apparent strong runs that occurred in Susitna River tributaries. Low catch rates on Chunilna Creek and Little Susitna River do not necessarily indicate weak escapements in these streams. Chinook salmon did not show up at Chunilna Creek until the last week of the fishery, therefore, were available for only a short harvest period. Heavy rains in both drainages resulted in abnormally high and turbid stream flows throughout most of the fishery. Road conditions on the only access to the Lower Little Susitna River were severe and restricted to all-terrain vehicles. These conditions undoubtedly had a negative impact on catch rates and angler effort in both streams.

Escapement:

Chinook salmon escapements in Upper Cook Inlet streams were not determined in 1980 due to extremely high rainfall that persisted throughout the spawning period. The high rainfall resulted in the second wettest summer since recordings were initiated in 1916. Table 6 shows chinook salmon escapements in past years.

Table 4. Angling Effort by Weekly Period During the Chinook Salmon Fishery, Upper Cook Inlet, 1980.

Date	Chunilna Creek Man-Days	Chunilna Creek %	Little Susitna River Man-Days	Little Susitna River %	Willow Creek Man-Days	Willow Creek %	Caswell Creek Man-Days	Caswell Creek %	Montana Creek Man-Days	Montana Creek %	Total Man-Days	Total %
5/24-6/1	No Census		156	5.4	...	...	...	...	...	...	156	2.2
6/2-6/8	No Census		314	10.9	...	...	...	...	...	...	314	4.3
6/9-6/15	83	10.3	668	23.2	No Census		275	26.5	No Census		1,026	14.2
6/16-6/22	120	15.0	563	19.6	28	4.6	455	43.8	308	16.2	1,474	20.4
6/23-6/29	264	33.0	619	21.5	275	44.9	308	29.7	1,106	58.2	2,572	35.6
6/30-7/6	334	41.7	557	19.4	309	50.5	Closed	...	487	25.6	1,687	23.3
	801		2,877		612		1,038		1,901		7,229	

Table 5. Chinook Salmon Catch by Weekly Period, 1980.

Date	Chunilna Creek Catch	Chunilna Creek %	Little Susitna River Creek	Little Susitna River %	Willow Creek Catch	Willow Creek %	Caswell Creek Catch	Caswell Creek %	Montana Creek Catch	Montana Creek %	Total Catch	Total %
5/24-6/1	0	0	19	5.6	...	...	...	...	...	...	19	1.3
6/2-6/8	0	0	12	3.6	...	...	...	...	...	...	12	0.9
6/9-6/15*	0	0	62	18.4	6	2.1	31	12.2	10	2.7	109	7.7
6/16-6/22	0	0	58	17.2	40	13.7	120	47.0	57	15.2	275	19.4
6/23-6/29	48	29.8	72	21.4	139	47.6	104	40.8	174	46.4	537	37.8
6/30-7/6	113	70.2	114	33.8	107	36.6	...	...	134	35.7	468	32.9
	161		337		292		255		375		1,420	

* Although no census was conducted during this week on Willow and Montana Creeks, chinook salmon harvests were recorded from angler punch cards.

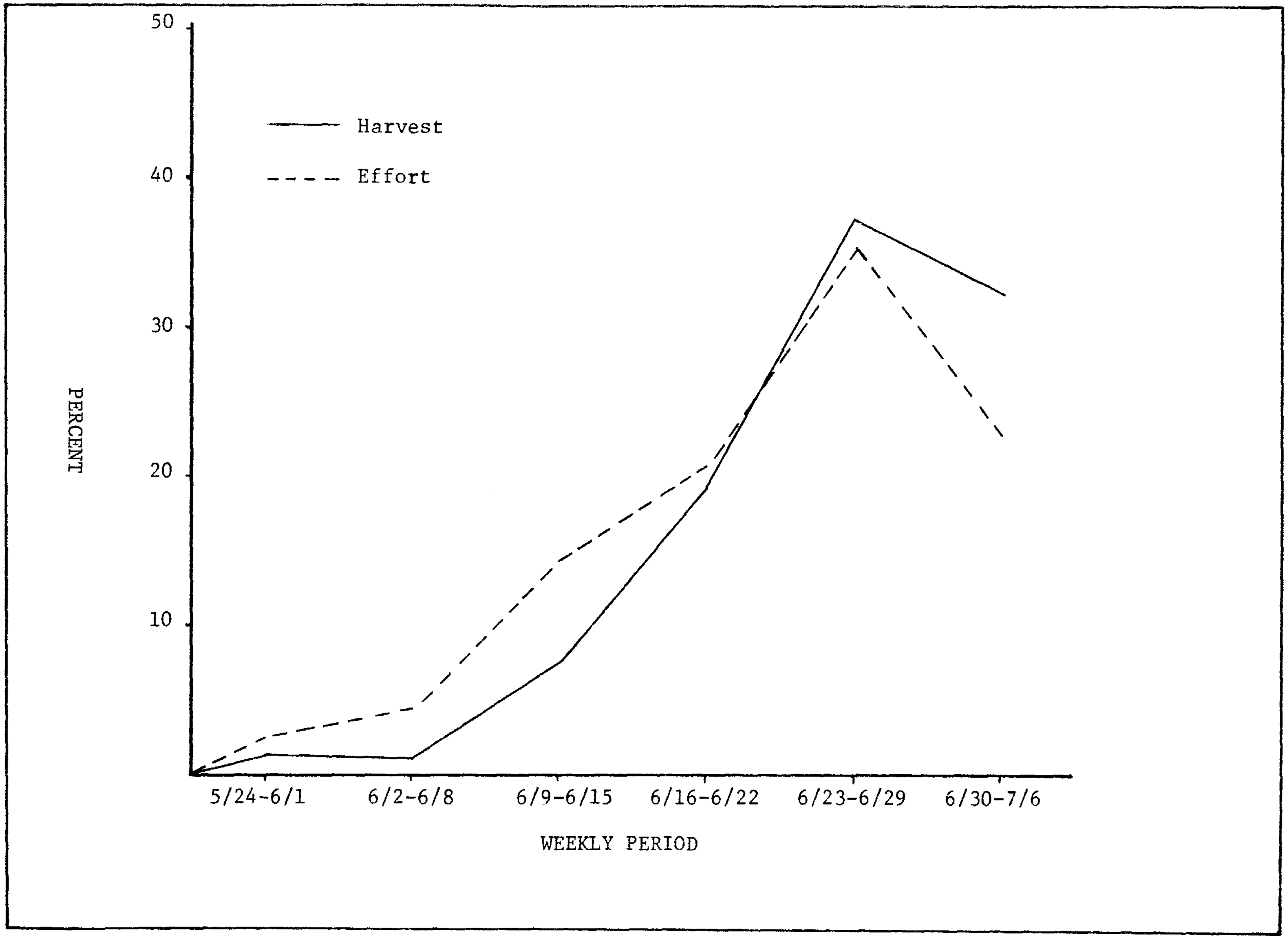

Figure 2. Chinook Salmon Harvest and Effort by Weekly Period, 1980.

Table 6. Chinook Salmon Escapement Counts and Population Estimates, East Side Susitna River Tributaries and Tributaries of the Chulitna and Talkeetna Rivers, 1973-1980.

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
1980**		

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

** High water cancelled all counts.

The 1980 chinook salmon escapements probably approximated the high escapements recorded during the 1976-1979 period. This assumption is based on comparisons between the 1979 and 1980 sport fish harvest and effort levels. Comparisons were made on Willow, Caswell and Montana Creeks where high water conditions did not adversely affect the fisheries as they did on Chunilna Creek and the Little Susitna River. The harvest on the three streams increased from 565 in 1979 to 922 in 1980, while the effort declined from 4,515 man-days in 1979 to 3,551 man-days in 1980. This increased harvest level would not have occurred if the 1980 run had been substantially below 1979 levels.

Population Structure:

Length measurements from chinook salmon carcasses supplied the necessary data for analysis of the age structure of spawning populations. Since no chinook salmon scales have been available for aging from east side Susitna River tributaries prior to 1979, length frequency classes developed from scale aged west side tributary chinook salmon have been used throughout the Susitna River.

A chinook salmon fishery in 1979 and 1980 on east side Susitna River tributaries has permitted collection of scales to determine the accuracy of assessing age soley by length frequency distribution. Although scale analysis is the most accurate method, it is very time consuming and costly when compared to recording lengths. The Little Susitna River is not a Susitna River tributary but was included in the analysis because it is an Upper Cook Inlet stream.

The length frequency classes that are used to determine age structure are as follows: 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 and saltwater. Minor error will exist because these additional age groups cannot be accounted for using the length frequency method.

Watsjold (1980) analyzed the scales collected during the 1979 chinook salmon fishery and assessed the accuracy of the length frequency classes. He grouped angler caught chinook salmon according to age soley on the basis of length frequency distribution and compared the results with age structure as determined by scale analysis. This same procedure was repeated for data collected during the 1980 chinook salmon fishery.

Table 7 shows the comparison of the two methods used in determining age composition of 1980 chinook salmon populations. It is apparent that the length frequency method is extremely accurate in predicting the occurrence of Age 1.2 chinook salmon, as there was only 1.4% difference between the two methods. In 1979 there was only 0.1% difference in this age group. As in 1979 the 1980 analysis showed some inconsistency in predicting frequency of Age 1.3 and Age 1.4 chinook salmon. The length frequency method predicted 2.5% fewer Age 1.3 and 3.9% more Age 1.4 chinook salmon than actually occurred. In 1979 this method predicted 5.6% fewer Age 1.3 and 7.5% more Age 1.4 chinook salmon. In 1980 the greatest disparity occurred on the Little Susitna River while the differences on the other four streams were very small. In 1979 Chunilna Creek had the largest error. In both these streams Age 1.3 chinooks were the dominant age group.

Table 7. Comparison of Scale Analysis and Length Frequency Distributions to Determine Chinook Salmon Age Composition, 1980.

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	31	29.5	27	25.7	9	10.0	9	10.0	32	43.2	31	41.9
1.3	17	16.2	17	16.2	28	31.1	42	46.7	15	20.3	18	24.3
1.4	57	54.3	54	51.4	53	58.9	37	41.1	27	36.5	24	32.4
1.5	...	...	5	4.8	...	...	2	2.2	...	...	...	...
2.2	...	...	2	1.9	...	...	...	...	...	...	1	1.4
Total	105		105		90		90		74		74	

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	78	46.1	78	46.1	88	44.2	84	42.2	238	37.4	229	36.0
1.3	38	22.5	39	23.1	51	25.6	49	24.6	149	23.4	165	25.9
1.4	53	31.4	49	29.0	60	30.2	61	30.7	250	39.2	225	35.3
1.5	...	...	...	...	...	...	2	1.0	...	...	9	1.4
2.2	...	...	3	1.8	...	...	3	1.5	...	...	9	1.4
Total	169		169		199		199		637		637	

From the 2 years of data, it appears that Age 1.3 chinook salmon are the source of the largest error when using the length frequency distribution method. In 1979 and 1980, 31% and 18.2%, respectively, of Age 1.3 chinook salmon fell into the 96 cm and over class while only 3.7% and 6.2%, respectively, of Age 1.4 chinook salmon were in the the 76-95 cm class. The length frequency method is most accurate when assessing predominately Age 1.4 chinook salmon populations.

It was noted during both years of scale analysis that those Age 1.3 chinook salmon exceeding 95 cm in length have atypical growth patterns. The pattern of widely spaced circuli indicates that these chinook salmon were exposed to favorable saltwater growing conditions that were not encountered by the majority of Age 1.3 fish.

Methods other than length frequency may more accurately predict age groups. These methods include the use of different length measurements, weights and sex. A statistical analysis of available data is being conducted to determine which factors or combination of factors will most accurately predict age groups. Since the analysis will take considerable time, the results will not be included in this report.

Analysis of the age structure of 1980 chinook salmon spawning populations by measurement of carcasses was not possible due to persistent high water conditions. The 1980 age stucture was determined from ageing of angler-caught chinook salmon.

Watsjold (1980) stated that data collected from either carcasses or angler-caught chinook salmon resulted in slightly biased age determinations. He stated that carcass recoveries reflect a higher percentage of Age 1.4 chinook salmon than were caught by anglers and the sport catch reflects a larger number of Age 1.2 and Age 1.3 fish than did carcass recoveries. Regardless of which method is used, they both reflect general age structures of spawning populations.

The age composition of the chinook salmon sport harvest in five streams is shown in Table 7. Age 1.2 chinook dominated the catch in Chunilna, Caswell and Montana Creeks with over 40% of the fish falling into this age group. The Little Susitna River was the only stream which did not have a significant number of Age 1.2 chinook salmon represented in the catch. The strong runs of Age 1.2 chinook salmon are from the 1976 parent escapement of 20,000, which was 125% higher than the previous high escapement of 8,900 recorded in 1973.

The abrupt change in chinook salmon age structure between 1979 and 1980 on Montana, Willow and Chunilna Creeks is graphically depicted in Figure 3 and 4. Past data have shown that 80% and 70% of the chinook salmon populations in Willow and Montana Creeks, respectively, were Age 1.4 fish. Although 1980 chinook salmon age structure has changed, it is expected that with favorable survival of succeeding years offspring there will be a return to the normal Age 1.4 dominance.

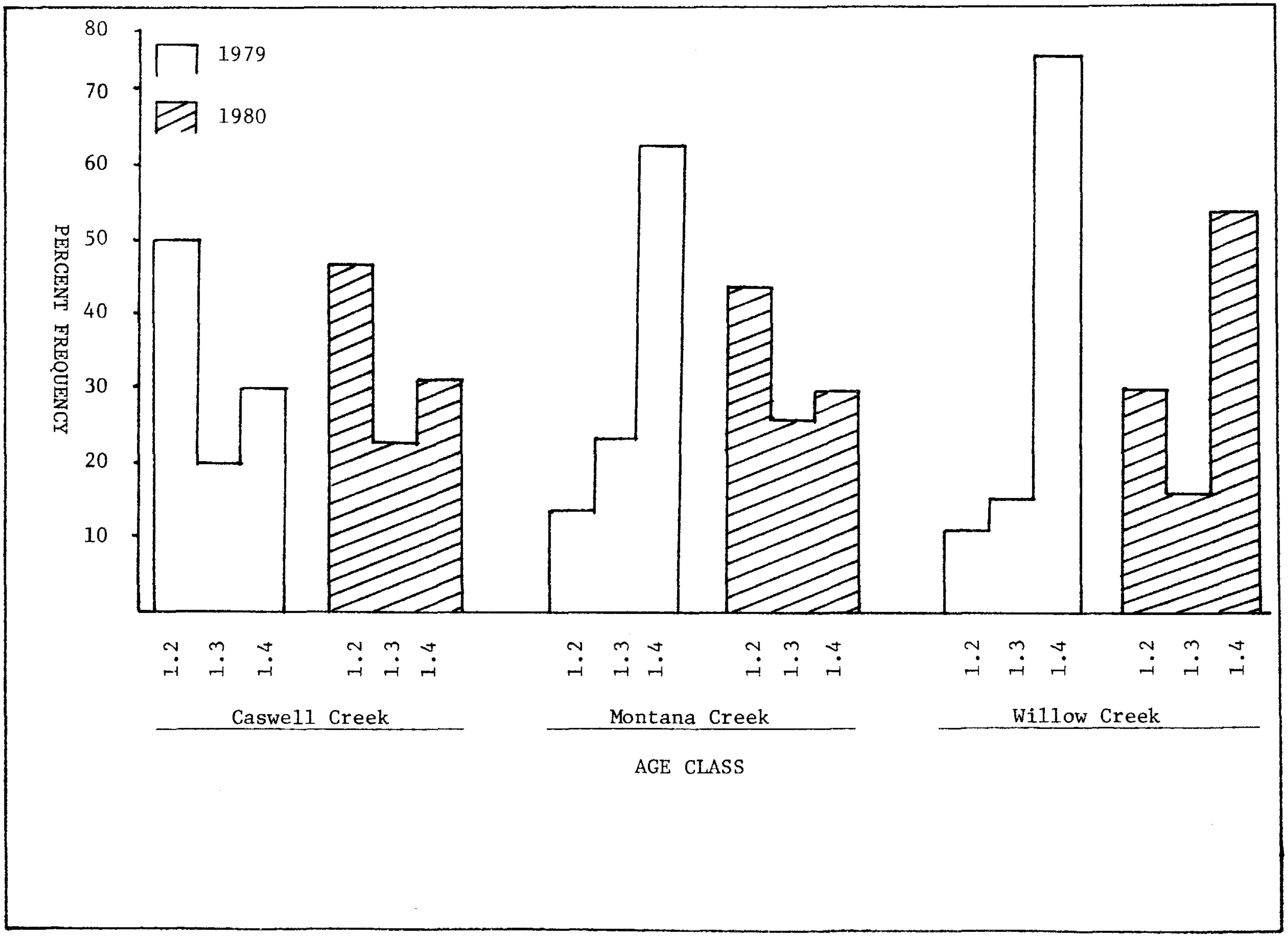

Figure 3. Comparison of Chinook Salmon Age Composition, as Determined by Length Frequency Analysis, of the 1979 and 1980 Sport Harvest.

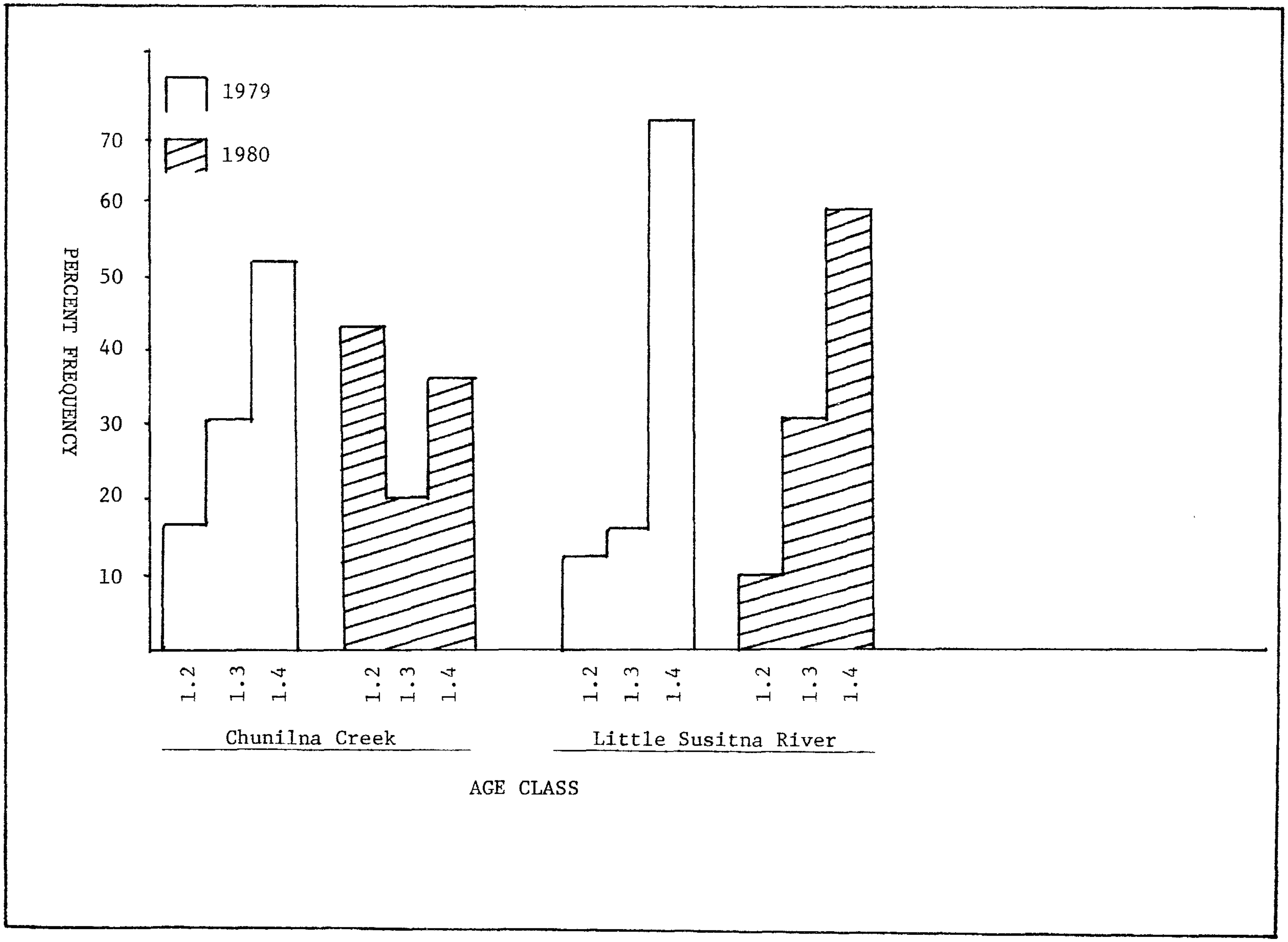

Figure 4. Comparison of Chinook Salmon Age Composition, as Determined by Length Frequency Analysis, of the 1979 and 1980 Sport Harvest.

The Little Susitna River did not experience a large influx of Age 1.2 chinook salmon in 1980. Due to glacial runoff, chinook salmon counts cannot be obtained on this stream, therefore, it was not known whether a large increase in chinook salmon number was experienced in 1976. The low number of Age 1.2 chinook salmon indicates that either there was not a large increase in 1976 escapement or there was poor survival of the off-spring. Subsequent years of data collected from angler-caught fish may indicate a population trend in the Little Susitna River.

Coho Salmon Studies

Coho salmon spawning populations were enumerated by foot surveys in escapement index areas. Heavy rains precluded surveys on Wasilla and Rabideaux Creeks and flooding conditions occurred on Wasilla Creek during the spawning migration. Waters flowed over streambanks, flooding roads and threatening homes. Coho salmon were observed downstream from several highway crossings; apparently unable to migrate upstream because of high water velocities present in the culverts. The effects of flooding on coho salmon populations in Wasilla Creek are unknown at this time. Counting conditions on the remaining streams were favorable since flows are regulated by lake systems, which absorb excess runoff thus reducing flooding conditions.

A summary of coho salmon escapement counts in index areas is presented in Table 8. An additional index area was included for Cottonwood Creek. Cottonwood (a) is the traditional counting area which covers the section from the outlet of Wasilla Lake to Edlund Road crossing. Cottonwood (b) has been counted for several years and includes stream sections connecting the lakes between Wasilla and Cornelius Lakes.

The 1980 coho salmon returns were from the 1976 parent escapement and were, in all cases, substantially above 1976 levels. Coho salmon escapement in Cottonwood Creek in 1980 was the highest recorded (870) since initiation of foot counts in 1968, and was 230% greater than the previous high count of 264 coho salmon in 1978. High counts were also recorded on Question Creek, which has 321 coho as compared to the previous high of 384 in 1979.

A record 8,832 coho salmon were counted through a weir operated on Fish Creek by the Fisheries Rehabilitation and Enhancement Development Division (Table 9). These coho are primarily offspring from the 1976 escapement of 765. This extreme increase is not attributable to an increase in smolt outmigration which is monitored each year by the Fisheries Rehabilitation and Enhancement Development Division. It was probably a combination of two factors: high smolt to adult survival rates; and the commercial fishery may have failed to intercept a portion of the run.

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 file in the Palmer office.

Table 8. Number of Coho Salmon in Escapement Index Areas (foot counts), Upper Cook Inlet, 1971-1980.

Stream	1971	1972	1973	1974	1975	1976	1977*	1978	1979	1980*
Wasilla (a)	104	19	28	30	49	151	...	74	61	...
Wasilla (b)	...	...	...	...	158	162	...	76	187	...
Cottonwood (a)	29	21	10	2	73	100	25	100	64	340
Cottonwood (b)	...	...	...	19	163	104	90	164	...	530
Birch	138	69	106	49	92	27	96	103	120	121
Question	...	...	59	3	111	126	87	45	384	321
Rabideaux	...	...	...	...	67	91	...	88	...	...
Total	271	109	203	103	713	761	298	650	816	1,312

* High water conditions made several index areas uncountable.

Table 9. Adult Coho Salmon Escapement Counts, Fish Creek, 1969-1980.

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	710
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	765
1977	July 6 - August 15*	930
1978	July 7 - September 30	3,121
1979	July 8 - August 30	2,511
1980	July 4 - September 1	8,832

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

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