

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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VOLUME 18  
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## RESEARCH PROJECT SEGMENT

State: Alaska Name: Sport Fish Investigations  
of Alaska  
Project No. : F-9-9  
Study No. : G-I Job 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

Period Covered: July 1, 1976 through June 30, 1977

## ABSTRACT

Recommendations were made to the U.S. Forest Service to modify 1977 and 1978 logging plans to minimize impacts on 4.0 kilometers of stream and 67.6 hectares of fish producing lakes. Otter Lake (T21S, R19W, Sec. 29) encompasses 56.7 hectares of the waters surveyed and was found to produce rainbow trout, Salmo gairdneri Richardson, Dolly Varden, Salvelinus malma (Walbaum), and coho salmon, Oncorhynchus kisutch (Walbaum).

Fifteen lakes and two streams in the Kodiak area were sampled to assess survival, growth trends and species composition of rainbow trout, coho salmon, chinook salmon, O. tshawytscha (Walbaum), Arctic grayling, Thymallus arcticus, (Pallas), and Dolly Varden.

A total of 6,897 and 1,779 chinook salmon passed through Karluk and Ayakulik Lagoon weirs respectively, and additional information on up-stream migrant salmon and steelhead timing into these rivers is reported. Spawned steelhead through Karluk weir totaled 1,427 fish with 36 mortalities recovered from the weir. The weir was a barrier to spawned steelhead and could reduce the incidence of repeat spawning.

Adult chinook (n=28) spawned above Frazer Lake fish pass and an undetermined number spawned below, representing the first return of naturally reproduced chinook to the system. Age and growth patterns are presented for chinook salmon, steelhead and rainbow trout from Frazer Lake.

Observations during mid-November indicated that age 0+.0 coho in Lake Rose Tead (n=37,  $\bar{x}$  =70 mm) were larger than in American (n=52,  $\bar{x}$ =58 mm) and Olds rivers (n=90,  $\bar{x}$ =55 mm). Coho stocked in Mission Lake June 23, 1976 at 1,235 per hectare (500 per acre), at 970/kg (440/lb) were in pre-smolt condition after three months lake residency (n=60,  $\bar{x}$ =93 mm).

Salmon escapement counts indicated approximately 273,700 pink salmon, O. gorbuscha (Walbaum), 17,600 chum salmon, O. keta (Walbaum), 25,546

sockeye salmon, O. nerka (Walbaum), and 3,164 coho salmon spawned in 18 northeast Kodiak Island streams.

Harvest data as determined through a series of postal questionnaires and creel censuses are presented for 1975 and 1976. The 1975 harvest estimates are included in this report because of delays in completing statistical analysis of the data during the 1975-1976 report period.

## BACKGROUND

The primary objective of 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 complex 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, containing 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 1,000 miles of coastline, over 1,000 lakes (4 hectares or larger in size), and 229 known anadromous fish streams.

The fish stocking program was initiated in 1953 and has continued to the present; however, in order to develop more successful programs, numerous lakes have 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 Report 1953-1976. 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 is required to evaluate anticipated land use programs or development activities.

Stream research has centered on waters with steelhead, rainbow trout, chinook salmon and on 19 northeast Kodiak Island streams.

The Federal Aid in Fish Restoration Report for the Kodiak area from 1953 to present depicts specific data concerning the size, age, and growth of coho, Dolly Varden, chinook, sockeye, 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 land use activities. They also determine,

in **part, the** direction of Kodiak research projects by indicating specific areas for which data are lacking or where more comprehensive data are required.

#### RECOMMENDATIONS

1. Continue creel census on Buskin and Pasagshak rivers as needed.
2. Continue the postal survey annually.
3. Survey and catalog the fish producing waters on Afognak Island that may be affected by logging.
4. Evaluate the **survival**, growth, and quality of fishing produced by various races and species of stocked fish.
5. **Determine** the optimum coho carrying capacity of major streams on northeastern Kodiak Island.
6. Evaluate the ability of Karluk Lagoon weir to allow passage of steelhead both upstream and downstream.
7. Enumerate spawning chinook salmon in the Frazer River to determine success of the chinook introduction.

#### 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 as described by Murray and Van Hulle (1976) were used in lake surveys, **gillnet** sampling, age analysis, and determination of fish size and escapements.

Sport fish harvest estimates for 1975 were determined by a modified Neuhold and Lu (1957) creel census on Buskin River and two postal surveys described by Murray and Van Hulle (1974). Biases observed between creel census and postal estimates for Buskin River were used to correct coho and Dolly Varden postal harvest estimates for northeast

Kodiak Island. Harvest estimates for five southwest Kodiak Island streams during 1976 were determined by blanket creel censuses.

## FINDINGS

### Results

#### Lake and Stream Surveys:

Timber cut units 90, 91, 40, and 41 on Afognak Island (Figure 1) contain 4.0 km of fish producing streams and encompass or border three lakes totaling 67.6 hectares. Sampling results for Otter Lake (T21S, R19W, Sec. 29, 140 ac.) are presented in Table 1.

Relative growth and survival rates of stocked and/or wild fish in 14 Kodiak lakes as determined by gillnetting and minnow trapping are presented in Table 2.

Table 3 presents age and growth data for Frazer Lake rainbow trout, Salmo gairdneri Richardson, captured in inlet and outlet areas from May 20 through July 16, 1976. Sampling was not extensive enough to determine exact population parameters; however, the data presented in Table 3 are probably representative of the resident spawning trout population.

#### Assessment and Inventory of Anadromous Fish Populations:

Steelhead (n=19) sampled below the Frazer River steepass May 23 and 24, 1976 were in spawning condition and ranged for 426 mm to 870 mm. Readable scale samples (n=100) indicated a two to three year freshwater and a one to two year marine residency which is similar to Karluk steelhead (Van Hulle and Murray, 1974).

Table 4 shows the weekly counts of chinook, Oncorhynchus tshawytscha (Walbaum), steelhead and coho, O. kisutch (Walbaum) through Karluk and Ayakulik Lagoon counting facilities. A total of 28 chinook were also passed through the Frazer Lake Fish pass from June 20 through August 21, 1976.

Table 5 shows age and size data for spawned Karluk steelhead and Table 6 presents age and size data for chinook samples from Kodiak waters.

Table 7 presents species composition, size and age data for fish sampled at Lake Rose Tead in 1976. Table 8 incorporates minnow trap sampling of Lake Rose Tead and American and Olds rivers.

Escapements surveys for 18 major streams on northeastern Kodiak Island, (Table 9) indicated 273,700 pink salmon, O. gorbuscha (Walbaum), 17,600 chum salmon, O. keta (Walbaum), 25,546 sockeye salmon, O. nerka (Walbaum), and 3,164 cohos spawned.

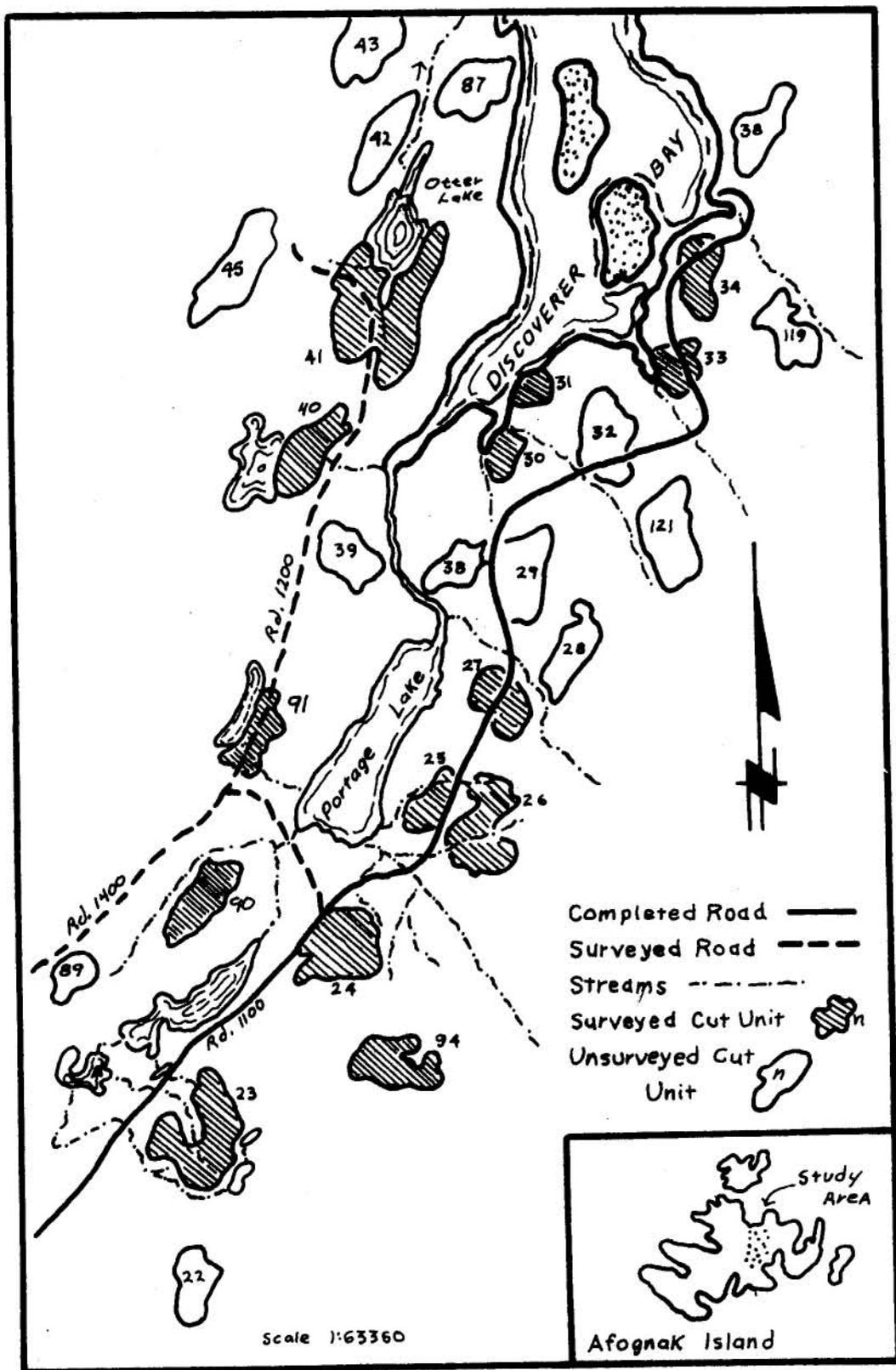


Figure 1. Location of Clear Cut Logging Units on Afognak Island.

Table 1. Population Characteristics of Otter Lake as Defined by 65.25 Hours of Variable-Mesh Gill Net Sampling on September 16 and 17, 1976,

Species	Number	Age	Length (mm)		Weight (gr)		Catch/ Net Hour
			Range	Mean	Range	Mean	
RT	4	III*	181-221	203	69-126	100.0	0.06
SS	46	1+.0**	103-127	109		15.2	0.70
	2	2+.0	160-349	255	45-312		0.03
	5	3+.0	166-333	286	47-354	271.0	0.08
	1	III		226		115.0	0.02
	22	2.1	452-798	622			0.34
	6	3.1	668-773	722			0.09
	6	3.0+	285-391	364			0.09
	7	Released Alive					0.11
DV***	7	III	119-120	119	13-17	15	0.11
	23	IV	142-200	182	25-62	53	0.35
	52	V	180-268	218	49-164	93	0.80
	<u>23</u>	VI-IX	183-471	323	55-1105	412	<u>0.35</u>
	204						3.13

\* Age of resident fish

\*\* Age of anadromous fish

\*\*\* DV age and size composition determined from a subsample of 25% of the total fish captured,

RT = Rainbow Trout

SS = Coho Salmon

DV = Dolly Varden

Table 2. Sampling Summary of Kodiak Island Management Lakes, 1976

Lake Name 6 Location	Sampling Data										History					
	Date Sampled	* Species	Number	Age	Length (mm)			Weight (g)			Catch/ Net Hr.	Date Stocked	Total Number	Per kg	Per ha	
					Range	$\bar{x}$ *	SD*	Range	$\bar{x}$	SD						
Abercrombie T27S, R19W Sec. 15	7/20	GR	5	III	210-235	221	11.1	99-131	119	15.0	0.62	6/16/73	55,000	Fry	7,267	
		RT	2	I	200-200	200	0.0	91-101	96	7.1	0.25	7/21/75	3,700	3,968	489	
		RT	2	II	264-265	264	0.7	205-224	214	13.4	0.25	6/20/74	3,700	3,194	489	
		RT	1	III	280			293			0.12	7/09/73	3,625	575	479	
Aurel T28S, R21W Sec. 36	9/07	GR	1	0	113			14			0.03	NR or migrant from				
		GR	9	I	228-256	241	11.5	130-194	152	21.2	0.26	"	"			
		RT	4	I	121-181	160	28.1	20-82	47	19.3	0.11	7/18/75	1,500	589	247	
		RT	2	II	227-294	260	47.4	148-341	244	136.5	0.06	6/20/74	3,000	3,194	494	
Bull T31S, R20W Sec. 35	9/06	RT(W)	32	I	180-232	207	15.1	71-149	107	18.4	0.94	7/18/75	1,500	3,984	373	
		RT(E)	21	I	203-260	231	17.1	100-222	146	37.1	0.62	7/18/75	1,500	589	373	
Caroline T28S, R21W Sec. 26	8/16	GR	1	I	205			98			0.05	6/26/75	10,000	Fry	3,744	
		RT	1	IV	552			1804			0.05	8/11/72	1,300	1,226	484	
Cascade T27S, R21W Sec. 12	9/08	GR	1	I	171			50			0.06	NR				
		GR	11	II	210-270	244	18.1	97-226	168	37.1	0.64	NR				
		GR	2	V	317-318	318	0.7	394-480	437	60.8	0.12	NR				
		RT	1	I	173			53				NR				
		RT	4	II	203-215	210	5.1	105-126	120	10.0	0.23	NR				
		RT	1	III	299			316			0.06	NR				
Dragonfly T28S, R24W Sec. 34	9/02	RT	12	I	192-242	212	15.2	81-165	110	25.4	0.71	7/18/75	1,600	589	519	

Table 2. continued. Sampling Summary of Kodiak Island Management Lakes, 1976

Lake Name & Location	Sampling Data										History				
	Date Sampled	Species	Number	Age	Length (mm)			Weight (gr)			Catch/ Net Hr.	Date Stocked	Total Number	Per kg	Per ha
					Range	$\bar{x}$ *	SD*	Range	$\bar{x}$	SD					
Genevieve T28S, R20W Sec. 10	7/16	RT	6	I(W)	106-121	111	5.9	14-24	18	3.4	0.11	7/21/75	7,800	3,984	410
		RT	13	II(W)	165-245	209	20.1	93-213	126	36.5	0.24	6/20/74	9,500	3,194	499
		RT	2	III(W)	205-240	222	24.7	120-196	158	53.7	0.04	6/20/73	10,200	586	536
		RS	13	I	109-158	130	17.3	15-50	29	12.6	0.24	NR			
		DV	9		158-236	193	26.7	46-120	87	38.8	0.17	NR			
Lilly Pond T28S, R20W Sec. 27	9/07	RT	17	II	194-278	218	23.6	95-264	128	44.8	1.26	6/20/74	2,000	3,194	628
Long T27S, R19W Sec. 34	9/09	GR	32	I	205-230	218	6.3	98-125	109	6.5	0.87	6/26/75	25,000	Fry	1,714
		RT	4	I	168-211	190	21.6	46-107	79	28.3	0.11	7/21/75	5,300	3,984	363
		RT	11	II	231-263	247	8.2	128-195	165	19.1	0.29	6/24/74	5,400	3,194	371
		DV	16	II	164-210	187	12.2	47-90	67	11.9	0.42	NR			
Lupine T21S, R20W Sec. 35	9/06	RT(W)	11	I	194-265	229	22.8	90-233	155	44.6	0.65	7/18/75	750	3,984	247
		RT(E)	3	I	256-282	271	13.3	202-300	245	50.1	0.18	7/18/75	750	589	247
Margaret T28S, R20W Sec. 11	7/21	RT(W)	2	I	104-104	104	0.0	14-17	16		0.07	7/17/75	800	3,984	250
		RT(E)	4	I	100-117	108	5.8	14-20	17		0.15	7/17/75	800	589	250
		RT(W)	1	II	190			84		0.0	0.04	6/21/74	800	3,194	250
8/09 *	RT(W)	12	I	94-150	115	21.3	12-41	21	10.8	NA**	7/17/75	800	3,984	250	
	RT(E)	8	I	100-124	111	9.1	12-21	17	3.2	NA**	7/17/75	800	589	250	
	RT(W)	5	II	159-209	182	19.0	60-124	82	24.9	NA**	6/21/74	800	3,194	250	
	RT(E)	2	II	181-210	196	20.5	76-118	94	30.4	NA**	6/21/74	800	331	250	
Mission T27S, R20W Sec. 33	10/1	SS	60	0	66-113	93	11.6				NA***	6/23/76	10,000	970	1,236

Table 2. Continued. Sampling Summary of Kodiak Island Management Lakes, 1976

Lake Name 6 Location	* Sampling Data										History				
	Date Sampled	Species	Number	Age	Length (mm)			Weight (gr)			Catch/ Net Hr.	Date Stocked	Total Number	Per kg	Per ha
					Range	$\bar{x}$	SD*	Range	SD <sub>w</sub>						
Snag	9/03	DV	1	UK	280			143		0.03	NR				
<b>T28S, R20W</b>		RT	3	II	305-321	315	9.0	<b>360-414</b>	397 31.9	0.09	6/24/74	1,610	331	796	
<b>Sec. 35</b>		RT	1	IV	335			462		0.03	8/11/72	1,500	1,226	741	
		SS	1	0	98			11		0.03	NR				
		SS	1	I	150			43		0.03	NR				
Summit	<b>10/7</b>	DV	<b>121</b>	UK	<b>115-489</b>	231	108.5	<b>15/1105</b>	194 230.5	1.69	NR				
<b>T30S, R20W</b>		RT	6	III	225-289	250	22.5	100-240	148 47.9	0.08	7/09/73	7,400	575	250	
<b>Sec. 31</b>		SS	4	II	190-200	196	5.3	71-83	76 5.2	0.06	NR				

- \* GR = Grayling  
 RT = Rainbow Trout  
 (W) = Winthrop, Washington Strain  
 (E) = **Ennis**, Montana Strain  
 RS = Sockeye **Salmon**  
 DV = Dolly Varden  
 SS = Coho Salmon  
 NR = Natural Reproduction  
 SD = Standard Deviation  
 $\bar{x}$  = Mean  
 UK = Unknown  
 \*\*\* = Caught by seine  
 \*\* = Caught by trap

Table 3. Age and Size **Composition** of Frazer Lake Rainbow Trout,  
 May 20-July 16, 1976.

Number	Age Class	Length (mm)		Percent
		Range	Mean	
2	III	208-244	266	8.3
7	IV	286-334	301	29.2
7	V	324-392	361	29.2
4	VI	386-426	415	16.7
2	VII	440-463	452	8.3
<u>2</u>	VIII	<u>454-500</u>	<u>477</u>	<u>8.3</u>
24		208-500	360	100.0

Table 4. Summary of Chinook, Coho and Steelhead Enumerated Through Karluk and Ayakulik Lagoon Weirs, 1976.

Weekly Period	Karluk Lagoon Weir					Red River Weir			
	Chinook		Down SH***		UP SH	Coho	Chinook		Coho
	No.	%	No.	Mortality	No.	No.	No.	%	No.
5/23-5/29	32	0.5					278	15.6**	
5/30-6/05	640	9.3					314	17.7**	
6/06-6/12	1,841	26.7					526	29.6	
6/13-6/19	1,417	20.5					220	12.4	
6/20-6/26	1,682	24.4	*				139	7.8	
6/27-7/03	592	8.6					134	7.5	
7/04-7/10	266	3.9	110				82	4.6	
7/11-7/17	144	2.1	640				34	1.9	
7/18-7/24	110	1.6	475	8			9	0.5	
7/25-7/31	26	0.4	189	9			26	1.5	
8/01-8/07	79	1.1	9	5			6	0.4	26
8/08-8/14	11	0.2	4	3		11	1	0.1	80
8/15-8/21	21	0.3		2		4	0		6
8/22-8/28	23	0.3		8	48	140	Weir Out --		
8/29-9/04	8	0.1		1	15	111			
9/05-9/11	4	0.1			48	833			
9/12-9/17	1	0.0			218	7,416			
			Weir Out						
	6,897	100.1	1,427	36	329	8,515	1,769	99.6	112

\* An estimated 1,000 spawned out steelhead holding above the Karluk Lagoon Weir.

\*\* Escapement extrapolated as weir was installed June 4.

\*\*\* SH = Steelhead

Table 5. Size and Age Composition of Karluk Steelhead Sampled at Karluk Lagoon Weir, Summer, 1976.

Sex	Age	No.*	%	Brood** Year	Length (mm)			Weight (g)		
					Range	$\bar{x}$	SD	Range	$\bar{x}$	SD
Males	2.1S	6	25	1971	555-790	692	96	1,362-3,087	2,050	820
	2.1SS	9	38	1970	694-815	731	38	1,816-3,587	2,285	726
	2.2S	4	17	1970	721-765	738	20		2,270	0
	3.1S	2	8	1970	775-798	787	16	2,497-3,178	2,838	482
	2.1SSS	2	8	1969	735-779	757	31	2,497-2,542	2,520	32
	3.1SS	<u>1</u>	<u>4</u>	1969		725	0		2,497	0
			24	100		555-815			1,362-3,587	
Females	2.1S	15	71	1971	505-721	599	67	726-1,816	1,235	361
	2.1SS	2	10	1970	657-745	701	62	1,589-2,270	1,930	482
	2.2S	<u>4</u>	<u>19</u>	1970	<u>663-793</u>	704	61	<u>1,271-2,542</u>	1,737	591
			21	100		505-793			726-2,542	

\* 36 of the fish sampled were weir mortalities (K=0.32) and 9 were captured with hook & line (K=0.42).  
 \*\* Year adults returned to stream.

Table 6. Age, Sex and Size Composition of Chinook Salmon Sampled on Kodiak Island, 1976.

Area	Sex	Age	No.	%	Length (mm)		Weight (kg) **	
					Range	Mean	Range	Mean
Karluk Lagoon	Male	1.1						
		1.2	14	11.8	580-690	634	2.5-3.2	2.8
		1.3	42	<b>35.3</b>	703-970	850	8.1-12.4	10.1
		1.4	28	23.5	912-1,085	989	11.3-15.6	13.2
			<b>3</b>	2.5				
	Female	1.3	12	10.1	760-1,000	853	7.7-13.4	9.4
		1.4	19	16.0	860-983	909	860-983	9.9
		*	1	0.8		835		10.1
Ayakulik Lagoon***	Male	1.1	6	26.0	360-474	418		
		1.2	<b>2</b>	8.7	545-556	551		
		1.3	4	17.4	775-990	883		
		1.4	4	17.4	860-1,030	944		
	Female	1.3	3	13.0	760-980	867		
		1.4	3	13.0	800-930	880		
			1	4.3		880		
Frazer Fish Pass	Male	1.3	6	46.2	771-871	809	8.3-11.3	9.3
			6	46.2	546-761	604	1.7-8.5	4.4
	Female	1.3	1	7.6		792		8.4

\* Could not be aged

\*\* For **unspawned** fish

\*\*\* All fish dressed



Table 7. Lake Rose Tead Fish Sampling Summary, 1976.

Date	Species*	Number	Age	Length (mm)		Weight (g)		Capture Method	
				$\bar{x}$	SD	$\bar{x}$	SD		
3/24	DV	2		444	33.2			Gill Net	
	H	1						" "	
5/03	DV	7		326	79.4			" "	
	Smt	26		143	71.3	53.2	24.2	" "	
	H	41		216.2		138.7	24.7	" "	
	MS	6						" "	
	F	2						" "	
5/11	DV	1						" "	
	H	117						" "	
	Smt	18						" "	
	MS	50						" "	
	SS	2	1+.0	116	7.7	40	2.8	" "	
6/1 & 6/3	DV	4		313	126.5				
	H	41							
	MS	34							
	SS	50	0+.0	36	1.6	[36.2gr/100]		Dip Net	
	SS	5	1+.0	148	10.4	36.5	8.3	Gill Net	
		56	2+.0	172	18.6	55.1	16.5	" "	
	RS	9	2+.0	121	8.4	18.6	3.2	" "	
	F	1						" "	
6/17	SS	100	0+.0	35	1.7	[38.0gr/100]		Dip Net	
	KS	170	0+.0	42	2.6	[70.0gr/100]		Dip Net	
6/30	DV	1		47				Seine	
	Stbk	1						"	
	Stbk	1						"	
	SS	245	0+.0	39	4.1			"	
		15	1+.0	66	8.1			"	
	KS	27	0+.0	44	1.9	[79.0gr/100]		"	
	RS	332	0+.0	35	3.3			"	
8/18	SS	92	0+.0	69	15.4			Trap	
	SS	13	1+.0	116	12.3			"	
9/19	SS	22	0+.0	79	17.0			Weight Influenced	
	SS	5	1+.0	122	18.7			by trap bait	"
11/17	SS	37	0+.0	70	16.9				

- DV - Dolly Varden
- H - Herring, Clupea harengus pallas, Valenciennes
- Smt - Surf Smelt, Hyposmesus pretiosus (Girard)
- MS - Marine Sculpin
- SS - Coho Salmon
- RS - Sockeye Salmon
- KS - Chinook Salmon
- Stbk - Threespine Stickleback
- F - Flounder, Platicthys stellatus (Pallas)

Table 8. Population Characteristics of Rearing Fish in Three Kodiak Area Waters as Defined by Minnow Traps, November, 1976.

Area & Date	Species	Age	No.	Length (mm) x̄	SD
American River November 18	SS	0+.0	52	58	8.7
	DV	0+.0	138	67	7.9
		1+.0	20	99	7.8
		2+.0	43	122	12.6
	Stb		9		
Olds River November 23	SS	0+.0	90	55	7.1
		1+.0	2	91&114	
	DV	0+.0	187	58	5.1
	Fld		1		
	Stb		2		
	Sculp		2		
Lake Rose Tead August 18	SS	0+.0	92	69	15.4
	SS	0+.0	22	79	17.0
		1+.0	5	122	18.7
	November 17	SS	0+.0	37	70

SS = Coho Salmon

DV = Dolly Varden

Stb = Ninespine Stickleback, Pungitus pungitus (Linnaeus)

Fld = Flounder

Sculp = Yellow Irish Lord Sculpin

Table 9. Salmon Escapement Estimates, N.E. Kodiak Island, 1976.

System	Chum Salmon		Coho Salmon		Pink Salmon		Sockeye Salmon	
	Date	Escpmt.	Date	Escpmt.	Date	Escpmt.	Date	Escpmt.
American		NC	10-26	146*	8-24	33,000***		NA
Buskin		NA	10-27	851*	8-09	52,000***	8-20	3,046***
Chiniak		NC	11-02	44*	8-24	SO***		NA
Hurst		NC		NC	8-10	61,000***		NA
Kalsin		NC	10-26	67*	8-24	2,500***		NA
Monashka		NA	11-02	17*	8-03	1,500***		NA
Myrtle		NA		NC	8-24	3,500***		NA
Olds		NC	10-28	104*	8-24	32,000***		NA
Pasagshak		NA	10-26	1,505*		NC	9-03	4,500***
Pillar		NA	10-25	13*	9-09	5,490*		NA
Red Cloud		NC		NA	9-06	2,000*		NA
Roslyn	8-24	10,500***	10-29	131*	8-24	31,500***		NA
Russian	8-23	75***	10-29	4*	8-23	2,100***		NA
Salonie	8-23	25***	11-01	273*		1,300***		NA
Saltery	8-23	7,000		NC	8-10	38,000***	8-23	18,000***
Sargent		NC	10-29	9*	8-22	610*		NA
Twin		NA		NC	8-24	150***		NA
#410		<u>NA</u>		<u>NA</u>	9-03	<u>7,000***</u>		<u>NA</u>
TOTAL		17,600		3,164		273,700		25,546

\* Foot Survey

\*\* Boat Survey

\*\*\* Aerial Survey

NC = No Count

NA = Not Applicable

## Development and Enhancement of Anadromous Fish Populations:

Mission Lake, stocked on June 23, 1976 at 1,235 coho **per** hectare (500 per acre) at **970/kg** (440 per pound) produced 60 coho ( $\bar{x}=93$  mm) in 30 trap hours on October 1, 1976. All fish captured were in presmolt condition, indicating they would migrate to saltwater at age 1.0 in 1977.

Chinook salmon (**n=22,500**) stocked in Lake Rose on June 17 average 42 mm long and 0.7 grams (**n=170**). A June 30 sample (**n=27**) averaged 44 mm and 0.79 grams indicating satisfactory growth and acclimation to the lake. Observations (using scuba gear) on July 9 indicated that all chinook had dispersed from the stocking site. Monthly trapping through November failed to recapture any of the stocked chinook.

### Sport Fish Harvest Estimates (1975) :

Buskin River creel census indicated 10,222 Dolly Varden, Salvelinus malma (Walbaum), 428 pink salmon, 1,036 coho, 4 chum and 17 sockeye salmon were harvested during 16,976 angler hours (9,506 angler trips). Most of the Dolly Varden (88.1%) and all sockeye salmon were caught during the spring fishery (January 1-July 15). All chum salmon, coho salmon and 1,215 Dolly Varden (11.9%) were caught during the summer-fall fishery (July 16-October 20). Anglers who purchased their fishing license in Kodiak caught 77.2% of the spring Dolly Varden, 48.0% of the fall Dolly Varden and 78.6% of the coho during 6,659 angler trips.

Postal surveys indicated a harvest (by anglers who purchased their license in Kodiak) of 17,990 Dolly Varden, 3,674 pink salmon, 2,270 coho salmon, 146 chum salmon and 191 sockeye salmon from Buskin River. Total fishing effort for the entire season was 12,784 angler trips.

A comparison of the two estimates for Buskin River (Kodiak licensed anglers only) as presented in Table 10 indicated the postal surveys over reported harvest of fish by the following factors: Dolly Varden - 2.4; pink salmon - 10.0; **chum** salmon - 36.5; sockeye salmon - 11.2; coho salmon - 2.8.

A total of 15,550 Dolly Varden and 4,480 coho salmon (postal survey estimates adjusted by Buskin biases) were harvested from northeastern Kodiak Island streams (Table 11). The bias between harvest estimates for pink salmon (10.0) and chum salmon (36.5) was too great to make reasonable harvest adjustments.

Angler trips and sport fish harvest estimates for Kodiak Island waters as reported by the fall postal survey are presented in Table 12. A total of 59,936 fish were harvested (excluding halibut) with 48% of the catch composed of Dolly Varden. Buskin River received approximately 39% of the **fishing** effort and produced 40% of the fish harvested for the entire Kodiak area. Buskin River, American River, Saltery River, and saltwater beach areas produced 76% of the pink salmon harvest with each system contributing from 17% to 21% of the catch. American River, Pasagshak River and other streams produced the highest catches of chum

Table 10. Buskin River Sport Fish Harvest Estimates as Determined by a Creel Census and Two Postal Surveys, 1975.

Species	<u>Creel Estimate</u>		Total Fish	Fish Per Trip	<u>Postal Estimate</u>		Bias***
	<u>Angler Group</u>				<u>Angler Group</u>		
	<u>Kodiak*</u> No. Fish	<u>Other**</u> No. Fish			<u>Kodiak*</u> No. Fish		
Dolly Varden							
Spring	6,952	2,055	9,007	1.90	11,909	1.7	
Fall	583	632	1,215	0.26			
Season	7,535	2,687	10,222	1.08	17,990	2.4	
Pink Salmon	366	62	428	0.05	3,674	10.0	
Coho Salmon	814	222	1,036	0.11	2,270	2.8	
Chum Salmon	4	0	4	0.00	146	36.5	
Sockeye Salmon	17	0	17	0.00	191	11.2	
Effort							
	<u>Angler Trips</u>		<u>Total</u>		<u>Angler Trips</u>	<u>Bias</u>	
Spring	3,179	1,573	4,752		6,937	2.2	
Fall	3,480	1,274	4,754		5,847		
Season	6,659	2,847	9,506		12,784	1.9	

\* Angler that purchased a sport fishing license in Kodiak.

\*\* Angler not required to have a sport fishing license or those that purchased a license out of Kodiak.

\*\*\*  $\frac{\text{Postal Estimate}}{\text{Creel Estimate}}$  \*

Spring = January 1 - July 15

Fall = July 16 - October 20

Season = January 1 - October 20

Table 11. Dolly Varden and Coho Salmon Harvest Estimates For Kodiak Roadside **Streams** and Beaches as Determined by a Postal **Survey** and Adjusted by Buskin River Creel Census, 1975.

Area	Angler Trips	Dolly Varden		Coho Salmon
		Spring	Season	
American River	2,009		364	184
Buskin River	9,506	9,007	10,222	1,036
Kalsin River	574		100	27
Olds River	428		20	41
Pasagshak River	3,960	1,378	1,291	1,873
Roslyn	339		229	192
Salonie River	92		13	34
Saltery River	1,414	254	1,241	654
Saltwater Beaches	<u>3,546</u>	<u>1,050</u>	<u>1,729</u>	<u>439</u>
Total	21,868	11,689	15,209	4,480

Table 12. Kodiak Island Sport Fish Harvest Estimates as Determined by a Postal Survey of Kodiak Licensed Anglers  
January 1 - October 20, 1975.

Area	Anglers	Trips	Pink Salmon		Chum Salmon		Coho Salmon		Dolly Varden		Sockeye Salmon		Chinook Salmon		Steelhead		Total		Halibut
			No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.
American %	963 13	2974 9	3035 17	67	436 37	10	405 4	9	643 2	14							4519 8	100	
Buskin %	1910 25	12,784 39	3674 21	15	146 12	1	2270 21	917,990	74	62	191 20	1					24,271 40	100	
<b>Kalsin</b> %	294 4	812 3	565 3	65	68 6	8	59 1	7	177 1	20							869 1	100	
Olds %	200 3	634 2	1003 6	82	96 8	8	90 1	7	35 1	3							1224 2	100	
<b>Pasagshak</b> %	1662 22	5865 18	1716 10	21	28 2	3	4106 39	50	2274 8	28	30 3	.4					8154 14	100	
<b>Roslyn</b> %	177 2	501 2	310 2	27	15 1	1	421 4	37	404 1	35							1150 2	100	
Salonie %	68 1	136 0	92 1	48	0 0	0	76 1	40	23 1	12							191 .3	100	
<b>Saltery</b> %	692 9	2093 6	3294 19	45	329 28	5	1434 14	20	2184 8	30				8 3	.1		7249 12	100	
Other Streams %	596 8	1426 4	684 4	14	15 1	.3	776 7	16	2106 7	44	744 77	15	169 53	4	310 97	6	4804 8	99	
Salt Wtr. Beach %	1036 13	5251 16	3316 19	44	38 3	1	961 9	13	3042 11	41	0 0	0	148 47	2	0 0	0	7505 13	101	
Total %	<b>7598</b> 100	32,476 99	17,689 102	30	1171 98	2	10,598 101	18	28,878 100	48	965 100	2	317 100	1	318 100	1	59,936 100	102	
Open Ocean	715	3044																	1881

(37%), coho (39%), and sockeye salmon (77%). All chinook salmon and 97% of the steelhead were caught in other streams or saltwater.

#### Sport Fish Harvest Estimates (1976):

Creel censuses conducted at Akalura Creek, Ayakulik Lagoon, Dog Salmon River, Karluk Lagoon and Olga Creek indicated angler use and fish harvest was light. However, fishing quality was excellent and more fish were released than retained. Data, as presented in Table 13, indicated Karluk Lagoon received most of the fishing pressure where 72 anglers retained 15 steelhead, 3 rainbow trout, 13 Dolly Varden, 89 chinook and 27 sockeye. Total harvest for Karluk River was not estimated as the creel census was conducted at Karluk Lagoon.

Sport fish harvest estimates for northeast Kodiak Island as determined by postal questionnaires are not reported because of delays in completing computerized statistical analysis of the data.

#### Discussion

##### Lake and Stream Surveys:

The following recommendations were made to the U.S. Forest Service regarding logging operations on Afognak Island (Figure 1): (1) exclude the portions of units 40 and 91 from the permanent road to the lake shores and yard logs away from the inlet and outlet streams; (2) move unit 90 approximately 100 yards east of West Portage Creek; (3) eliminate the southwest half of unit 41 and selectively log the east shore of Otter Lake; (4) move the access road between roads 1400-1200 and 1300 south, or confine its use to sale administrative purposes.

Margaret, Bull and Lupine lakes were stocked in July, 1975 with equal ratios of Ennis, 588/kg (267/pound) and Winthrop 3,983/kg (1807/pound) trout. However, Winthrop fish were captured more frequently (1.6 Winthrop trout/Ennis trout) in the gill nets. Analysis of test netting data indicates Ennis trout (n=36,  $\bar{x}$ =194 mm) were larger than Winthrop trout (n=58,  $\bar{x}$ =185 mm). (Table 2.) Sampling data indicates no appreciable advantage to stocking larger Ennis trout in Kodiak Island lakes devoid of threespine stickleback, Gasterosteus aculeatus Linnaeus; however, data are not available to compare angler catch rates for the two strains.

The presence of age II coho salmon (n=4,  $\bar{x}$ =196 mm) with age III rainbow trout (n=6,  $\bar{x}$ =250 mm) and native Dolly Varden (n=121,  $\bar{x}$ =231 mm) in Summit Lake (Table 2) indicates coho were introduced with the 1974 plant of 10,000 rainbow trout. Summit Lake outlet has a series of impassable falls which negates the possibility of natural coho production.

##### Assessment and Inventory of Anadromous Fish Populations:

Spawned-out steelhead were concentrated above Karluk Lagoon weir June 20-26 and 1,427 were passed downstream over the eight week period ending August 14. The condition (weight/length<sup>3</sup>) of 36 dead steelhead removed

Table 13. Creel Census Estimates From Akalura Creek, **Ayakulik** River, Dog Salmon River, **Karluk** Lagoon and Olga Creek, 1976.

Area	Number of Anglers	Total Days	Total Hours	Steelhead		Rainbow Trout		Dolly Varden		Coho		Chinook'		Sockeye	
				Released	Retained	Released	Retained	Released	Retained	Released	Retained	Released	Retained		
<b>Akalura Cr.</b>	<b>5</b>	<b>8</b>	<b>37</b>	<b>0</b>	<b>3</b>	<b>21</b>	<b>12</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
Ayakulik R.	15	22	190	42	0	2	1	150	0	0	0	157	25	114	24
Dog Salmon R.	6	15	39	0	0	0	9	36	10	0	0	1	0	4	0
<b>Karluk Lgn.</b>	<b>72</b>	<b>289</b>	<b>1,439</b>	<b>24</b>	<b>15</b>	<b>10</b>	<b>3</b>	<b>325</b>	<b>13</b>	<b>0</b>	<b>0</b>	<b>148</b>	<b>89</b>	<b>15</b>	<b>27</b>
Olga Cr.	3	3	10	0	0	35	2	40	0	0	0	0	0	0	0

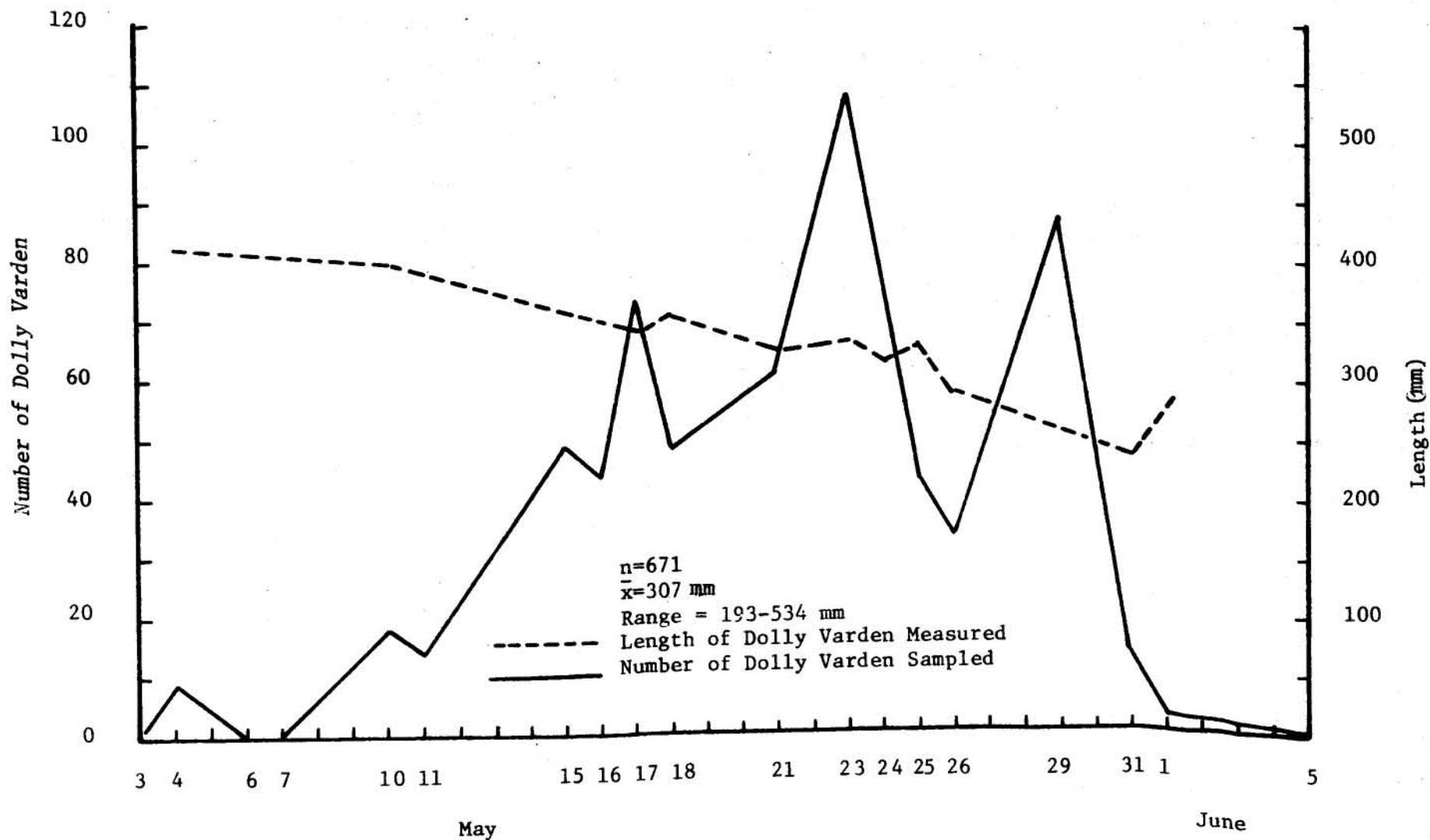


FIGURE 2. Number and Mean Length of Buskin River Dolly Varden Sampled from Angler Creels, May, 1975.

from the weir was 0.32, or approximately half the condition of 97 unspawned steelhead ( $k=0.66$ ) sampled during October 1973 (Murray and Van Hulle, 1974). The condition of nine spawned-out steelhead sampled below the weir was 0.42 and indicates the weir formed a barrier to downstream migrants that could reduce survival and growth of repeat spawners. Upstream migrants passed with no noticeable delay. However, flooding necessitated weir removal prior to obtaining complete escapement counts.

Karluk and Ayakulik chinook migrations peaked June 6-12 and approximately 90% had entered the rivers by July 3. Chinook were enumerated through Karluk Lagoon weir from 1921 through 1944. The facility was moved above major holding and spawning sites in 1945. The 1976 count ( $n=6,897$ ) was exceeded in 1929 ( $n=8,165$ ) and 1934 ( $n=9,581$ ). However, it exceeded by 1,520 fish the mean escapement observed during the 23 years of Karluk Lagoon weir operation. The 1976 Frazer River chinook run (28 adults above the falls plus an undetermined number down river) represents the first natural reproducing chinook introduction in Alaskan waters. Originally, only 160,000 fry (Karluk River origin) were stocked in the Frazer system between 1966 and 1969.

The presence of Pacific herring, Clupea harengus pallas Valenciennes, flounder, Platichthys stellatus (Pallas), yellow Irish lord sculpin, Hemilepidotus jordani Bean, and surf smelt, Hypomesus pretiosus (Girard), in Lake Rose Tead (Table 7) from March 24 through June 3 indicates partial salinity during this period.

The gill net sampled coho smolt ( $n=63$ ) were in excellent condition ( $k=.70$ ). Total age composition, size and relative abundance were not determined due to the high incidental catch of marine fish that reduced net efficiency through entanglement and damage. Age 0.0 coho ( $n=100$ ) on June 17 were smaller on the average (by 6 mm and 3.2 grams) than 22,500 stocked chinook. A June 30 sample ( $n=260$  SS, 27 KS) indicated a 2 mm average size increase in chinook and 4 mm average increase in coho size; however, chinook fry were not captured or observed in the area after July 9.

In mid-November age 0.0 coho in Lake Rose Tead were 70 mm in length and 58 and 55 mm in length in American River and Olds River, respectively (Table 8). Traps yielded 2-4 rearing Dolly Varden for each coho in the rivers; however, Dolly Varden were not captured in Lake Rose Tead. Fewer predators and less competition coupled with a partially saline environment probably cause Lake Rose Tead smolts to survive better and grow faster than in other Kodiak systems.

#### Sport Fish Harvest Estimates (1975):

Buskin River creel census provided data on angler use and sport fish harvest, and was used to check the postal survey. Dolly Varden and coho harvests were commensurate with previous estimates (Murray and Van Hulle 1973 and 1974). Catch per unit of effort, fish size, and escapement, as presented in Tables 9 and 10 and Figure 2 indicate healthy fish populations. The chum harvest ( $n=4$ ) was commensurate with observed escapements ( $n=0$ ) while sockeye ( $n=17$ ) and pink salmon ( $n=428$ ) harvests

were low in relation to respective escapements of 3,500 and 65,000 fish. The low sockeye **harvest** was attributed to strict enforcement of snagging **regulations while the low pink salmon harvest was due to airport and highway construction which limited angler access to the river.**

The postal surveys appeared meaningful in determining catch trends, fishing areas, species sought and catch composition ratio for each major stream on northeast Kodiak Island; however, some problems were **encounter** (1) the postal estimate for Buskin River chum salmon was 36.5 times greater than the creel estimate; (2) a large portion of the chinook harvest (53%) was caught from saltwater beach areas; and (3) the seasonal Dolly Varden estimate (**n=1,291**) for Pasagshak River was less than the spring estimate (**n=1,378**).

The discrepancy in chum and chinook salmon estimates probably resulted from an error in fish identification; **i.e.**, pink salmon identified as chum salmon or jack chinook. The low seasonal harvest estimate for Pasagshak Dolly Varden probably resulted from anglers forgetting the number of fish they caught during the spring fishery.

#### Sport Fish Harvest Estimates (1976):

The blanket creel censuses conducted at fish counting facilities on southwest Kodiak Island yielded complete use and harvest estimates for the respective areas except Karluk River where the census was conducted at Karluk **Lagoon**. **Sport** fish harvest for Karluk was considered similar or less than the 1975 harvest as the 1976 lagoon harvest was less than the 1975 lagoon harvest, and 1976 recreational use of the Portage cabin, as reported by USFWS logbook was similar to the use received in **1975**.

Sport fish harvest estimates for northeast Kodiak Island as determined by postal questionnaires are not presented in this report because of delays in completing computerized statistical analysis of the data.

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