

Volume 21

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

John B. Murray
Frank Van Hulle

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

SPORT FISH DIVISION
Rupert E. Andrews, Director

Compiled and Edited by: Mark C. Warner, Ph.D.
Laurie M. Wojeck, M.A.

TABLE OF CONTENTS

STUDY NO. G-I	INVENTORY AND CATALOGING	Page
Job No. G-I-B	Inventory and Cataloging of the Sport Fish and Sport Fish Waters in Southwestern Alaska	
	By: John B. Murray and Frank Van Hulle	
Abstract		1
Background		2
Recommendations		4
Objectives		4
Techniques Used		4
Findings		6
Discussion		50
Lake and Stream Surveys		50
Rainbow Trout Brood Stock Surveys		54
Development and Enhancement of Anadromous Fish		54
Sport Fish Harvest Estimates		55
United States Coast Guard Coho Salmon Derby		56
Assessment and Inventory of Anadromous Fish		56
Northeast Kodiak Island Salmon Escapement		57
Acknowledgements		57
Literature Cited		57

LIST OF FIGURES

Figure 1.	Map of the Kodiak-Afognak Island Group	3
Figure 2.	Location of Lakes Surveyed on Afognak Island	7
Figure 3.	Flow Readings for American River and Buskin River	12
Figure 4.	Flow Readings for Roslyn Creek, Olds River and Salonie Creek	13
Figure 5.	Number and Mean Length of Buskin River Dolly Varden Sampled from Angler Creels, April and May, 1979	39
Figure 6.	Sockeye Salmon Smolt Escapement Counts by Weekly Periods at Lake Genevieve Weir	51

LIST OF TABLES

Table 1.	List of Common Names, Scientific Names and Abbreviations Used in this Report	5
Table 2.	Summary of Morphometric and Fish Sampling Data for Afognak Island Lakes	8
Table 3.	A Summary of Water Chemistry Observations for Lakes Surveyed on Afognak Island	10
Table 4.	A Summary of Plankton Samples, Afognak Island Lakes	11
Table 5.	Water Characteristics of Five Kodiak Streams Sampled Monthly, January-December, 1979	15
Table 6.	Temperature Data for Five Kodiak Streams as Determined by Ryan Recording Thermographs	16

TABLE OF CONTENTS (Cont'd.)

	Page
Table 7. Fish Sampling Summary of Select Kodiak Area Waters	17
Table 8. Population Estimates of Abercrombie Lake Rainbow Trout and Arctic Grayling	20
Table 9. Population Estimates of Long Lake Rainbow Trout, Arctic Grayling and Dolly Varden	21
Table 10. Population Estimates of Pony Lake Landlocked Coho Salmon	22
Table 11. Population Estimates of Southern Lake Landlocked Coho Salmon	23
Table 12. Sampling Summary of Four Kodiak Management Lakes	24
Table 13. Kodiak Island Dolly Varden and Sockeye Salmon Harvest as Determined by a Postal Survey of Kodiak Licensed Anglers, Spring 1978	28
Table 14. Kodiak Island Sport Fish Harvest as determined by a Postal Survey of Kodiak Licensed Anglers, 1978	29
Table 15. Kodiak Island Dolly Varden and Sockeye Salmon Harvest as determined by a Postal Survey of Kodiak Licensed Anglers, Spring 1979	32
Table 16. Kodiak Island Sport Fish Harvest as determined by a Postal Survey of Kodiak Licensed Anglers, 1979	33
Table 17. Number and Percentage of Kodiak Licensed Anglers that fished for various species	36
Table 18. Buskin River Dolly Varden Harvest by Angler Group as determined by a Creel Census	37
Table 19. Buskin River Sport Fish Harvest Estimates as determined by a Creel Census	38
Table 20. Age, Sex and Size Composition of Buskin River Coho Salmon Sampled during the Creel Census	40
Table 21. A Comparison of Buskin River Dolly Varden, Coho Salmon and Pink Salmon Harvest Estimates	42
Table 22. Creel Census Estimates from Weir Camps at Afognak River, Dog Salmon River and Karluk Lagoon	43
Table 23. Fish Escapement Counts through Weirs on Kodiak and Afognak Islands	44
Table 24. Age and Size of Coho Salmon Entered in the United States Coast Guard Coho Derby	45
Table 25. Summary of Chinook, Coho and Steelhead enumerated through Karluk Lagoon Weir	46
Table 26. Length, Age and Sex Composition of Steelhead captured by hook and line at Karluk Portage	47
Table 27. Age, Sex and Size Composition of Karluk River Chinook Salmon	48
Table 28. Size, Age and Sex Composition of Steelhead Kelts tagged at Karluk Lagoon	49
Table 29. Peak Salmon Escapement Estimates, Northeast Kodiak Island	52

TABLE OF CONTENTS (Cont'd.)

Job No. G-I-C Inventory and Cataloging of Kenai Peninsula,
and Cook Inlet Drainages and Fish Stocks
By: Joe Wallis and Stephen Hammarstrom

Abstract	59
Background	60
Stocked Lake Evaluation	60
Skilak Lake Creek Census	60
Kenai River Creel Census	64
Anchor River Creel Census	64
Recommendations	64
Objectives	65
Techniques Used	65
Stocked Lake Evaluation and Lake Survey	65
Kenai River Creel Census	65
Skilak Lake Creel Census	66
Anchor River Creel Census	66
Findings	66
Stocked Lake Evaluation	66
Kenai River Creel Census	70
Skilak Lake Creel Census	73
Anchor River Creel Census	77
Marked Fish Returns	83
Kachemak Bay Feeder Chinook Salmon	86
Tutka Bay Lagoon Dolly Varden	88
Literature Cited	88

LIST OF FIGURES

Figure 1. Vicinity map showing location of the study area	61
Figure 2. Map Depicting Creel Census Areas on the Kenai River	62
Figure 3. Catch Rates for the Kenai River Coho Salmon Fishery	71

LIST OF TABLES

Table 1. List of common names, scientific names and abbreviations	63
Table 2. Summary of recent stocking history of Kenai Peninsula area lakes sampled with gill nets	68
Table 3. Summary of Results of Gill Net Sampling of Kenai Peninsula Stocked Lakes	69
Table 4. Summary of length-weight data from coho salmon samples captured in the Kenai River recreational fishery	72
Table 5. Summary of Kenai River coho salmon sport harvest and effort	74
Table 6. Harvest and effort, by month, by species, for the Kenai River	75
Table 7. Kenai River historical sport harvest and effort data for 1976-1978	76

TABLE OF CONTENTS (Cont'd.)

	Page
Table 8. Estimated total angler effort and harvest on Anchor River, by weekly intervals	78
Table 9. Estimated sport fish harvest from Anchor River, by species and weekly intervals	79
Table 10. Summary of historical creel census data from Anchor River for harvest of Dolly Varden, coho salmon and Steelhead trout	80
Table 11. Summary of tagging and recovery data for Anchor River coho salmon	81
Table 12. Summary of tagging and recovery data for Anchor River steelhead trout	82
Table 13. Length frequency of coho salmon from Anchor River, by sex and age classification	84
Table 14. Summary of age composition and lengths of Anchor River steelhead trout	85
Table 15. Data for tagged chinook salmon caught in Kachemak Bay sport fishery	87

Job No. G-I-D Inventory and Cataloging of the Sport Fish and Sport Fish Waters in Upper Cook Inlet
By: David Watsjold

Abstract	91
Background	92
Recommendations	93
Objectives	93
Techniques Used	93
Findings	96
Lake Stocking Evaluations	96
Chinook Salmon Studies	98
Coho Salmon Studies	114
Literature Cited	120

LIST OF FIGURES

Figure 1. Study Area in Matanuska-Susitna Valleys	95
Figure 2. Chinook Salmon Harvest and Effort by Weekly Period	104
Figure 3. Comparison of Chinook Salmon Age Composition as Determined by Length Frequency Analysis of Angler Caught and Carcass Recoveries on Montana and Willow Creeks	115
Figure 4. Age Composition as Determined by Scale Analysis of 1979 Chinook Salmon Sport Harvest	117

LIST OF TABLES

Table 1. List of Common Names, Scientific Names and Abbreviations	94
Table 2. Gill Net Results and Stocking Histories of Managed Lakes, Matanuska-Susitna Valleys	97

TABLE OF CONTENTS (Cont'd.)

	Page
Table 3. Effort and Harvest Data of the Chinook Salmon Sport Fishery, Matanuska-Susitna Valleys	100
Table 4. Angling Effort by Weekly Period During the Chinook Salmon Fishery, Upper Cook Inlet	101
Table 5. Chinook Salmon Catch by Weekly Period	102
Table 6. Catch Rates and Harvest Estimates of Miscellaneous Species Caught During the Chinook Salmon Fishery at Chunilna Creek	103
Table 7. Chinook Salmon Escapement Counts and Population Estimates, East Side Susitna River Tributaries	106
Table 8. Observed Chinook Escapement Counts, Upper Cook Inlet	107
Table 9. Comparison of Scale Analysis and Length Frequency Distributions to Determine Chinook Salmon Age Composition	109
Table 10. Age and Length Data from Chinook Salmon Carcasses, Willow Creek	110
Table 11. Age and Length Data from Angler-Caught Chinook Salmon, Willow Creek	111
Table 12. Age and Length Data from Chinook Salmon Carcasses, Montana Creek	112
Table 13. Age and Length Data from Angler-Caught Chinook Salmon, Montana Creek	113
Table 14. Age Composition as Defined by Scale Analysis of 1979 Chinook Salmon Sport Harvest	116
Table 15. Number of Coho Salmon in Escapement Index Areas, Upper Cook Inlet	118
Table 16. Adult Coho Salmon Escapement Counts, Fish Creek	119

RESEARCH PROJECT SEGMENT

State: Alaska Name: Sport Fish Investigations
of Alaska

Project No.: F-9-12 Study Title: INVENTORY AND CATALOGING

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

Job No.: G-I-B

Period Covered: July 31, 1979 to June 30, 1980.

ABSTRACT

Afognak Island catalog and inventory studies determined 10 of the 11 waters studied contained natural populations of Dolly Varden, Salvelinus malma (Walbaum); three waters contained rainbow trout, Salmo gairdneri Richardson; and one lake was barren of fish.

Karluk Lagoon 1979 weir escapement was composed of 2,980 steelhead kelts, S. gairdneri Richardson; 9,555 chinook salmon Oncorhynchus tshawytscha (Walbaum); 45,262 coho salmon, O. kisutch (Walbaum); 81,473 pink salmon, O. gorbuscha (Walbaum); 511,037 sockeye salmon, O. nerka (Walbaum); and 965 upmigrant adult steelhead. Age-growth data for Karluk River steelhead and chinook salmon and a summary of the weir count are presented.

A downstream migrant fish trap on the Lake Genevieve fish barrier was operated from May 8 to June 18. Timing, size and age of all fish migrants are discussed. An estimated 18 adult coho salmon migrated into the lake during September and October.

Chinook salmon fingerlings ($n=65,562$, \bar{x} wt = 1.02 g, \bar{x} ln = 35.0 mm), stocked in Lake Rose Tead on June 7, should return as adults in 1984 and 1985. Four returning adult chinook salmon (one Age 2.0 and three Age 2.1) were caught in the sport fishery during June and August.

Harvest data, as determined through a series of postal questionnaires and creel censuses, are presented for 1978 and 1979. The 1978 postal harvest estimates are included in this report because installation of a new computer system delayed a timely analysis of the data. Buskin River sport fish harvest for 1979 totaled 15,615 Dolly Varden, 1,967 coho salmon and 3,537 pink salmon. A comparison of Buskin River creel and postal harvest estimates indicate the postal survey is inaccurate and cannot be used to determine Kodiak Island sport fish harvest estimates.

Population estimates, determined by mark and multiple recapture methods, indicated Swanson River rainbow trout fingerlings (976/kg) stocked in

Abercrombie Lake and Long Lake had survival rates to Age I of 16.1 percent and 8.5 percent, respectively. Coho salmon fingerlings (848/kg) stocked in Pony Lake and Southern Lake had respective survival rates of 36.6 percent and 31.5 percent to Age I. Both fishes approached a catchable size (148.7-203.0 mm) at Age I and would 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 the populations; however, a summary of age-growth data for all fishes is presented.

Salmon escapement counts indicated approximately 364,460 pink salmon, 15,050 chum salmon, O. keta (Walbaum), 60,367 sockeye salmon and 11,401 coho salmon spawned in 17 northeast Kodiak Island streams during 1979.

BACKGROUND

The primary objective of the Division of Sport Fish 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 (10a) or larger in size, and 229 known anadromous fish streams.

A fish stocking program 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 conditions of lakes on northeast Kodiak Island have been examined in some detail and the results of these observations are shown in annual Federal Aid in Fish Restoration reports, 1953-1979. 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, flow, water chemistry 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.

The Federal Aid in Fish Restoration reports for the Kodiak area from 1953 to the present depict specific data concerning size, age and growth of



Figure 1. Map of the Kodiak-Afognak Island Group.

coho, Dolly Varden, chinook salmon, sockeye salmon and steelhead trout 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 a list of the fishes observed or studied in this report.

RECOMMENDATIONS

1. The creel census on Buskin and Pasagshak Rivers should be continued as needed to determine angler effort and harvest of Dolly Varden and salmon.
2. Kodiak area postal survey should be discontinued.
3. The fish-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.
4. Survival, growth and quality of fishing produced by various races and species of stocked fish should be evaluated.
5. The Karluk Lagoon weir should be maintained until approximately November 15, 1980, to collect adult steelhead life history data and to monitor sport fish harvest and effort at Karluk Lagoon.
6. A study should be developed to determine the salmonid carrying capacity of northeast Kodiak Island waters.

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 Murray and Van Hulle (1979) 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	<u>Thymallus arcticus</u> (Pallas)	GR
Black bass	<u>Sebastodes</u> sp.	...
Chinook salmon	<u>Oncorhynchus tshawytscha</u> (Walbaum)	KS
Chum salmon	<u>Oncorhynchus keta</u> (Walbaum)	CS
Cod	<u>Gadidae</u> family	...
Coho salmon	<u>Oncorhynchus kisutch</u> (Walbaum)	SS
Dolly Varden	<u>Salvelinus malma</u> (Walbaum)	DV
Flatfish	<u>Pleuroncetidae</u> family	...
Greenling	<u>Hexagrammus</u> sp.	...
Halibut	<u>Hypoglossus stenolepis</u> Schmidt	H
Pink salmon	<u>Oncorhynchus gorbuscha</u> (Walbaum)	PS
Rainbow trout	<u>Salmo gairdneri</u> Richardson	RT
Sockeye salmon	<u>Oncorhynchus nerka</u> (Walbaum)	RS
Steelhead trout	<u>Salmo gairdneri</u> Richardson	SH
Threespine stickleback	<u>Gasterosteus aculeatus</u> Linnaeus	TST

Fish population estimates in Abercrombie, Long, Pony and Southern Lakes were made by Robson and Regier's (1967) mark and multiple recapture estimator or the Peterson estimator (Ricker, 1970). 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. When sufficient numbers of fish could not be recaptured with fyke nets, variable mesh monofilament gill nets (38.1 m x 1.8 m) composed of five different net panels (7.6 m long) with mesh ranging in size from 12.7 mm to 50.8 mm bar measure were used.

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

Down migrant steelhead kelts were caught in front of Karluk Lagoon weir by hook and line, as well as seined, tagged and sampled for age-growth data without the aid of anesthetic. Floy Mark II tagging guns were used to insert sequentially numbered green anchor tags under the dorsal fin in such a manner that the tag anchor passed through the fin pterygiophores and remained as the applicator was withdrawn. All tagged fish were released downstream from the weir after tagging.

On June 17, 65,562 chinook salmon (1.02 grams) were introduced into Lake Rose Tead.

FINDINGS

Lake and Stream Surveys:

Afognak Island. Lake surveys during 1979 determined the physical, chemical and biological characteristics of 11 unnamed lakes on Afognak Island (Figure 2). During 207.5 hours of gill-netting and 209.5 hours of minnow-trapping, an aggregate of 262 Dolly Varden, 30 rainbow trout, 17 juvenile coho salmon, 6 sockeye salmon, and numerous threespine stickleback were captured. Lake number 13613 was barren of fish while each of the remaining lakes (n=10) contained Dolly Varden. Other fishes captured were rainbow trout in lakes 13622, 13607 and 13611; sockeye salmon in lakes 13607 and 13611; and juvenile coho salmon in lake 13607.

Physical characteristics of the above waters, as presented in Table 2, indicate surface area, surface temperature and maximum depth respectively ranged from 2.5 to 8.3 ha, 12.0°-19.0° and 3.1 to 14.9 m. Chemical characteristics presented in Table 3 indicated the total hardness (CaCO₃) ranged from 10-50 ppm and total alkalinity (CaCO₃) from 15 to 40 ppm. The pH of all waters was near neutral (7.5) to slightly acid (6.0). Table 4 shows the density of invertebrates per cubic meter for four waters sampled was 0 to 5,000 cladocera, 2,083 to 5,000 copepoda and 2,500 to 30,000 rotifera, with moderate concentrations of phytoplankton.

Kodiak Island. Monthly flow readings for Amercian River, Buskin River, Olds River, Roslyn Creek and Salonie Creek (Figures 3 and 4) indicate the highest flow occurred in Buskin River (20.8 cms) and the lowest in Roslyn Creek (0.3 cms).

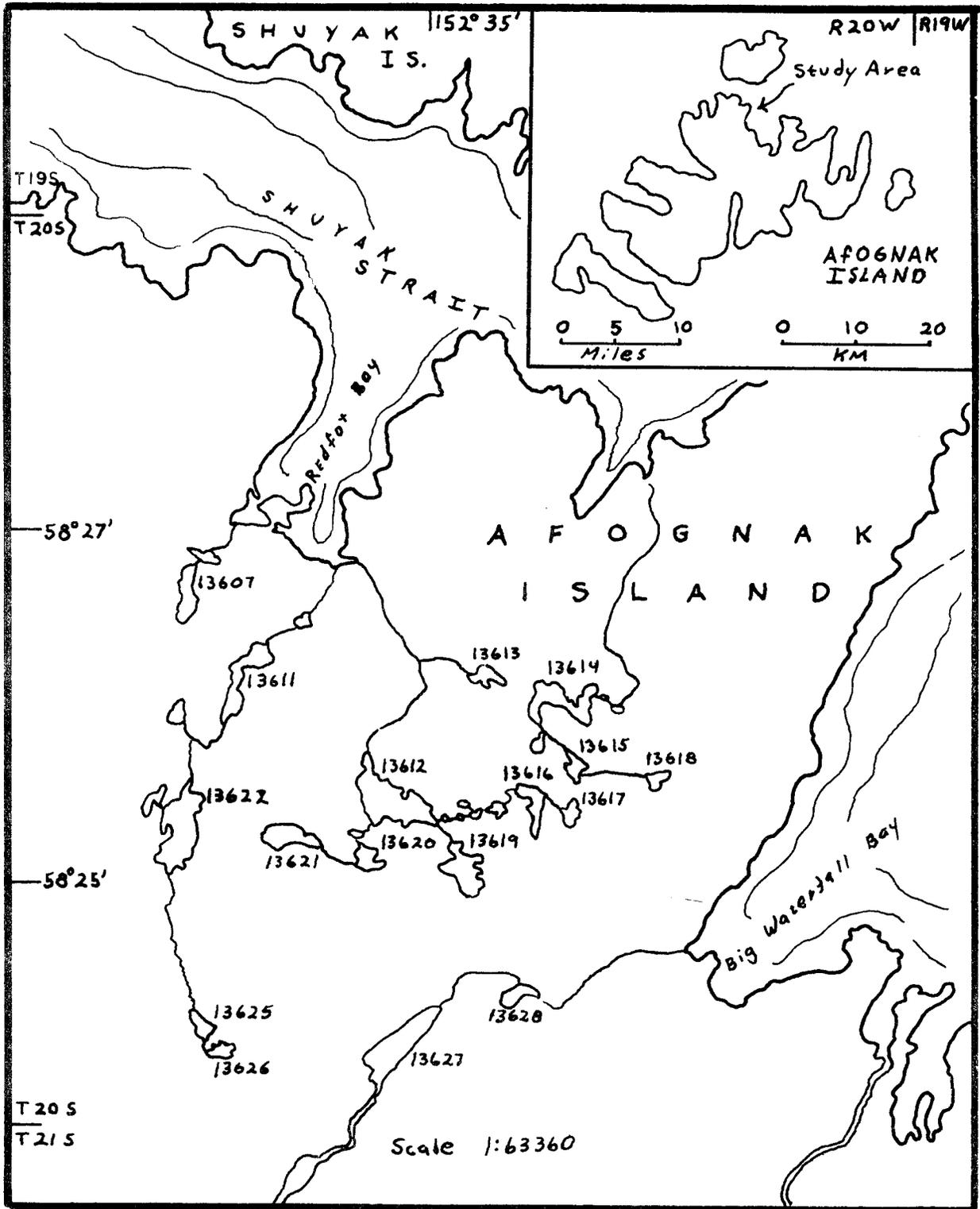


Figure 2 . Location of Lakes Surveyed on Afognak Island, 1979.

Table 2. Summary of Morphometric and Fish Sampling Data for Afognak Island Lakes, 1979.

Lake Name and Location	Survey Date	Surface Water ^o C	Elevation		Surface Area		Maximum Depth		Trap Hours	Net Hours	Fish Species	Number Fish Captured	Fork Length (mm)	
			(m)	(ft)	(ha)	(ac)	(m)	(ft)					Range	Mean
13607 T20S,R203 Sec. 17	July 29	19.0	22.9	(75)	8.1	(200)	8.5	(28)	60.0	20.0	DV	21	70-254	162.8
											TST	29	...	...
											RT	5	125-188	164.4
											SS	17	95-119	105.5
											RS	1	...	...
13611 T20S,R20W Sec.17 & 20	July 28	19.0	45.7	(150)	10.7	(26.4)	8.5	(28)	60.0	20.0	DV	27	70-365	203.5
											RT	19	45-290	150.0
											RS	5	500-610	542.0
13613 T20S,R20W Sec. 15 & 22	July 27	17.0	152.4	(500)	4.5	(11.1)	7.3	(24)	0.0	24.0	...	...	...	...
13614 T20S,R20W Sec. 22	July 27	17.0	152.4	(500)	7.9	(19.5)	5.8	(19)	100.0	24.0	DV	62	50-297	158.6
											TST	26	...	...
13615 T20S,R20W Sec. 22	July 28	16.0	152.4	(500)	4.4	(10.9)	7.6	(25)	0.0	12.0	DV	55	109-244	170.4
										
13616 T20S,R20W Sec.22 & 27	July 29	17.5	152.4	(500)	7.2	(17.8)	12.8	(42)	0.0	24.0	DV	22	150-284	238.9
												

Table 2 (cont.). Summary of Morphometric and Fish Sampling Data for Afognak Island Lakes, 1979.

Lake Name and Location	Survey Date	Surface Water C	Elevation		Surface Area		Maximum Depth		Trap Hours	Net Hours	Fish Species	Number Fish Captured	Fork Length(mm)	
			(m)	(ft)	(ha)	(ac)	(m)	(ft)					Range	Mean
13607 T20S,R203 Sec. 17	July 28	19.0	183.0	(600)	3.6	(8.9)	8.5	(28)	0.0	24.0	DV TST	22 ...	114-263 ...	227.1 ...
13618 T20S,R20W Sec. 23	July 28	17.0	221.0	(725)	2.5	(6.2)	3.1	(10)	10.0	2.5	DV	6	365-470	391.2
13619 T20S,R20W Sec. 27 & 28	July 29	17.5	144.8	(475)	12.4	(30.6)	8.5	(28)	15.0	12.0	DV	26 ...	51-294 ...	167.8 ...
13622 T20S,R20W Sec. 20 & 29	July 27	12.0	66.7	(219)	21.8	(53.9)	11.0	(36)	19.5	20.0	DV RT	21 6	60-355 104-350	178.2 188.2
13627 T20S,R20W Sec. 33	July 26	12.0	117.0	(384)	28.3	(69.9)	14.9	(49)	45.0	25.0	DV	...	65-355	...

DV = Dolly Varden
TST = Threespine Stickleback
RT = Rainbow Trout
RS = Sockeye Salmon
SS = Coho Salmon

Table 3. A Summary of Water Chemistry Observations for Lakes Surveyed on Afognak Island, 1979.

Lake Number	Date	Water Temp (°C)	Total Hardness* (ppm)	Total Alk.* (ppm)	pH	D.O. (ppm)
13607	July 29	19.0	> 50	40	7.5	9.0
13611	July 28	19.0	> 50	20	7.0	9.0
13613	July 27	17.0	40	35	7.0	...
13614	July 27	17.0	40	35	7.5	...
13615	July 28	16.0	45	25	7.2	...
13616	July 29	17.5	...	...	...	...
13617	July 28	17.0	45	25	7.2	...
13618	July 28	17.0	40	35	7.5	...
13619	July 29	17.5	10	15	7.0	...
13622	July 27	12.0	> 50	25	6.0	...
13627	July 26	12.0	> 50	24	7.0	...

ppm - parts per million

CaCO₃

Table 4. A Summary of Plankton Samples, Afognak Island Lakes, 1979.

Lake Number	Depth (m) at Station	(ft)	Date	Organisms/Meter ³ *			
				Cladocera	Copepoda	Rotifera	Phyto
13607	3.1	(10.2)	July 29	5,000	5,000	30,000	Moderate
13611	6.1	(20.4)	July 28	0	2,500	2,500	Moderate
13622	7.3	(24.0)	July 27	2,083	2,083	8,333	Moderate
13627	8.5	(27.9)	July 26	3,571	3,571	7,142	Moderate

* 0.33M² Net, 10 Micron Porosity

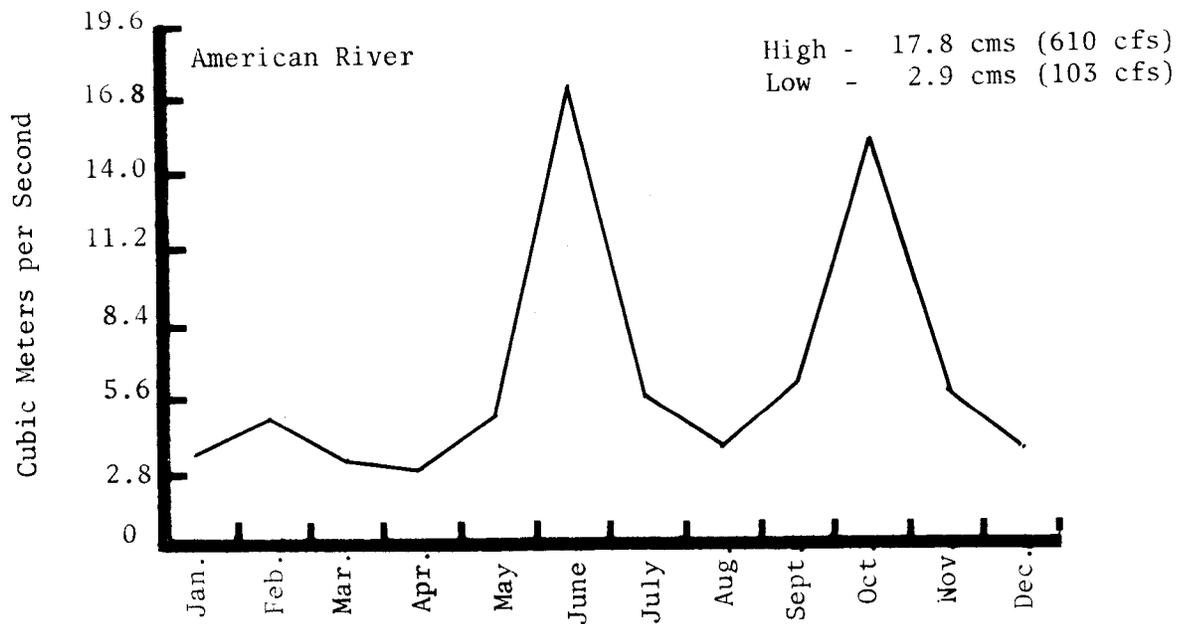
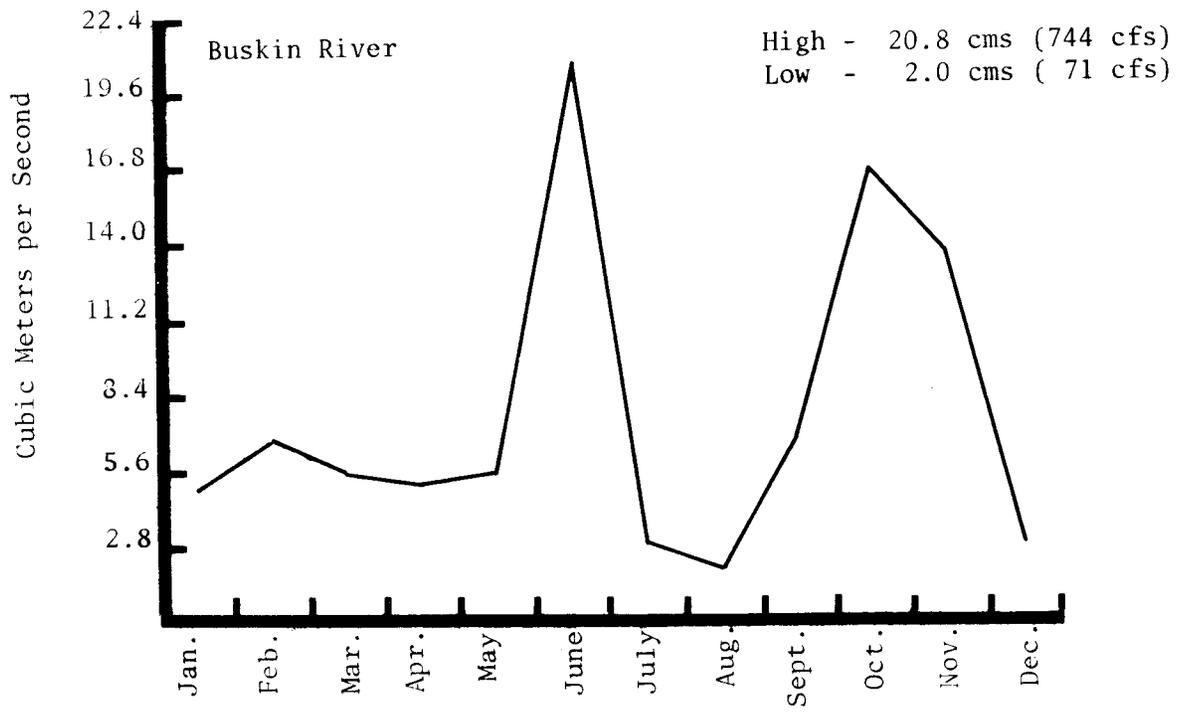


Figure 3. Flow Readings for American River and Buskin River January 1979 through December 1979.

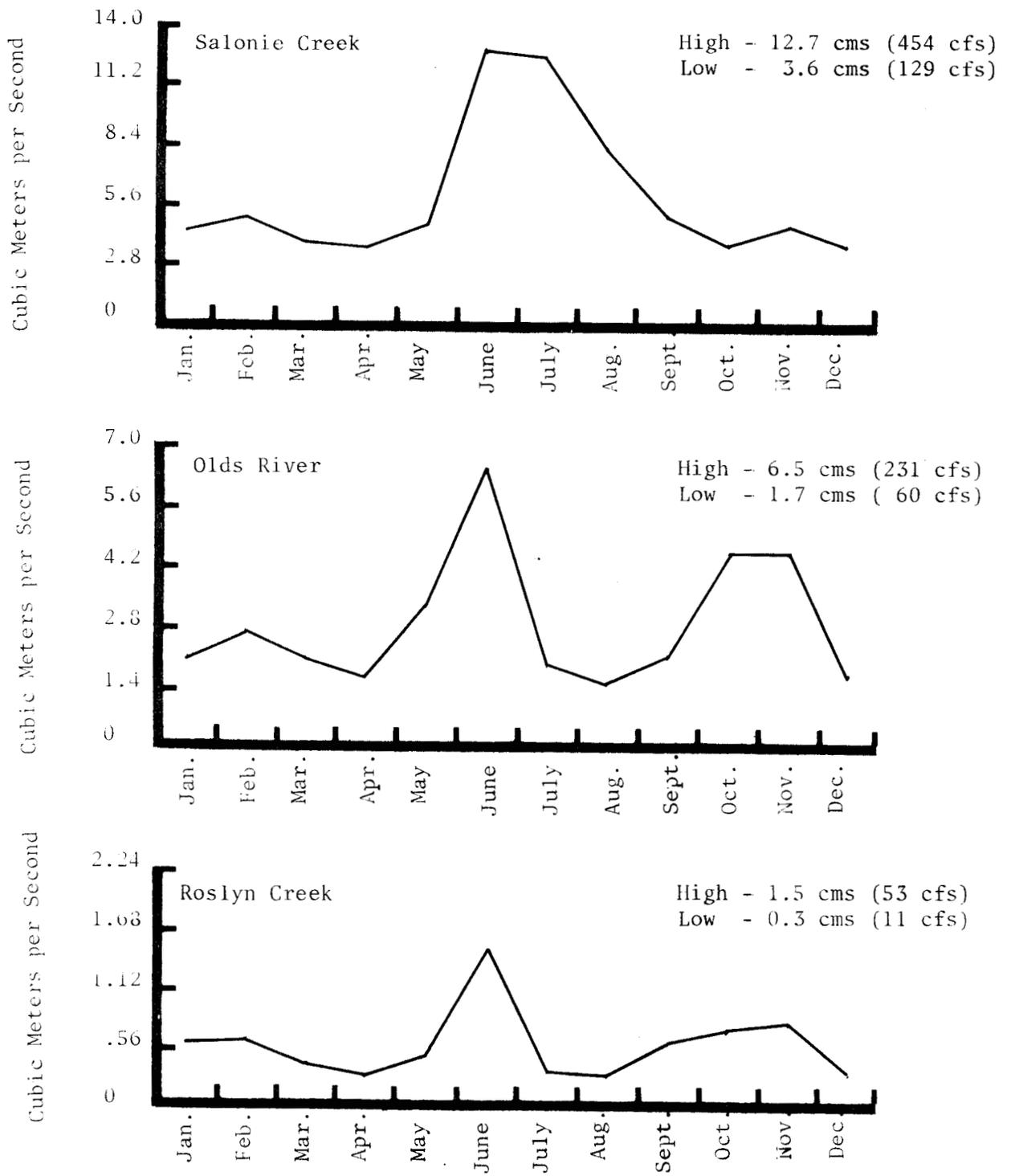


Figure 4. Flow Readings for Roslyn Creek, Olds River and Salonie Creek January, 1979 through December, 1979.

Generally speaking, flows were high in June and October and low in April and August. Analysis of monthly water chemistries for the above waters (Table 5) indicates the ranges for total hardness (CaCO_3), total alkalinity (CaCO_3), dissolved oxygen and pH were 8-20 ppm, 10-30 ppm, 9-13 ppm and 6.3-7.1 units, respectively. Table 6 shows the lowest number of temperature units occurred in American River (1,580.0) and the highest in Buskin River (2,032.8). Daily high (17.0°C) and low (-0.3°C) temperatures both occurred in Roslyn Creek during July and March respectively.

The Ryan thermographs (H-30) stopped recording periodically and were completely inoperative for 2 weeks or more during the season. Consequently, 5 months of data were lost on Salonie Creek and 1 month of data on American River, Buskin River and Roslyn Creek. Some of the machines were also out of calibration which necessitated one or another of the six operational thermographs to be repaired eight times.

Rainbow Trout Surveys:

Table 7 presents age and length data of fishes from eight Kodiak-Afognak Island waters investigated to determine the presence of rainbow trout and the feasibility of implementing a rainbow trout egg take. Although sampling was not extensive enough to determine population parameters, the data presented for Afognak Lake, Pinnel Creek, Kitoi Lake, Lake No. 13611 and Little River show general characteristics of the spawning trout populations. Rainbow trout sampled for maturity were found to spawn at Age IV in Lake No. 13611 and Little River, Age V in Kitoi Lake and Age VI in Pinnel Creek. The largest sample of fish (n=103 RT) came from Afognak Lake which was subsequently transplanted to the trout barren waters of Waterfall Lake. Secondary sex characteristics of these fish indicated they probably spawn at Age IV.

Kodiak Lakes. Three fyke net traps set in Abercrombie Lake from September 27 to October 1 (360 trap hours) captured 512 Age I (Swanson River strain), 9 Age II and 1 Age III rainbow trout and 47 Arctic grayling. The population estimate for Age I rainbow trout (Table 8) was 661 ± 20 fish with an estimated survival rate of 16.1%. Population estimates for grayling and rainbow trout Age II or older were not determined, as only two grayling and no large trout were recaptured. Age I rainbow trout (n=210) averaged 203.0 mm and 97.5 g, while Age II rainbow trout (n=9 Alaska Ennis stock) averaged 337.8 mm in length (Table 12). The 47 grayling sampled contained Age Classes I (n=7), II (n=29), III (n=7), and IV (n=3) with respective mean lengths of 146.9 mm, 232.9 mm, 230.1 mm and 287.0 mm.

Three fyke traps set in Long Lake from August 8 to August 17, for 432 trap hours, captured 313 Age I and 14 Age II or older rainbow trout, 136 Arctic grayling and 442 Dolly Varden. Population estimates for the above fishes, as presented in Table 9, were 443 ± 23 Age I rainbow trout with an estimated survival rate of 8.5%, and $1,053 \pm 376$ Arctic grayling (all age classes). None of 14 Age II or older trout were recaptured, which precluded a population estimate; however, age classes II, III, IV and V, as presented in Table 12, were represented in the sample. Age I rainbow trout (n=210, Swanson River strain) averaged 148.7 mm and 21.8 g, while Age II Arctic grayling (n=82) averaged 196.0 mm and 78.5 g (Table 12). The Dolly Varden (n=326) captured had a mean length of 160 mm and range of 81.2-310 mm.

Table 5. Water Characteristics of Five Kodiak Streams Sampled Monthly, January-December, 1979.

Stream	Dissolved Oxygen (ppm)		Total Hardness* (ppm)		Total Alkalinity* (ppm)		pH	
	Mean	Range	Mean	Range	Mean	Range	Mean	Range
American	11.7	10.0-13.0	13.5	10-15	16.5	15-20	6.9	6.7-7.0
Buskin	11.6	9.0-13.0	10.7	10-15	16.8	15-20	7.0	6.9-7.1
Olds	11.4	9.0-12.5	11.0	8-15	16.2	12-20	6.7	6.6-6.8
Roslyn	11.8	10.0-13.0	9.7	8-12	12.3	10-15	6.6	6.3-6.8
Salonie	11.7	10.5-12.5	16.0	10-20	22.0	15-30	6.9	6.7-7.0

*CaCO₃

ppm = parts per million

Table 6. Temperature Data for Five Kodiak Streams as Determined by Ryan Recording Thermographs, January 1 through December 31, 1979.

Temp° C	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total*
<u>Stream: American River</u>													
TU**	70.0	34.7	99.0	115.5	119.5	170.0	204.0	195.0	200.3	164***	118.0	90.0	1,580.0
High	3.5	3.0	6.0	7.0	8.0	9.0	10.0	9.5	9.0	...	5.0	4.5	10.0
Low	2.0	0.5	1.5	1.5	2.0	4.0	4.5	4.0	4.5	...	3.0	0.5	0.5
Mean	2.3	1.2	3.2	3.8	3.8	5.7	6.6	6.3	6.7	5.3	3.9	2.0	...
<u>Stream: Buskin River</u>													
TU	22.5	14.0	29.5	111.5	170.5	252.0	414.2	362.7***	297.0	226.3	114.0	18.6	2,032.8
High	1.1	1.1	2.2	4.5	6.0	11.1	16.1	...	11.7	8.9	5.6	2.2	16.1
Low	0.0	0.0	0.6	1.7	4.5	5.0	11.1	...	8.9	4.4	1.1	0.0	0.0
Mean	0.7	0.5	1.0	3.7	5.5	8.4	13.4	11.7	9.9	7.3	3.8	0.6	...
<u>Stream: Olds River</u>													
TU	17.2	17.3	85.5	131.0	133.0	127.5	285.5	271.0	231.5	194.0	114.0	92.5	1,700.0
High	2.0	3.0	6.0	8.5	8.0	7.0	13.5	11.5	10.0	8.0	6.0	4.0	13.5
Low	0.0	0.0	1.5	2.0	2.5	3.5	7.0	6.5	5.0	4.5	1.0	1.0	0.0
Mean	0.6	0.6	2.8	4.4	4.3	4.3	9.2	8.7	7.7	6.3	3.8	3.0	...
<u>Stream: Roslyn Creek</u>													
TU	39.7	1.7	37.1	118.0	148.5	238.0	404.5	300.0	276.5	225.0	126.0***	35.1	1,950.1
High	3.0	1.1	3.1	9.5	10.5	15.0	17.0	15.0	11.0	8.0	...	1.5	17.0
Low	0.0	0.0	-0.3	0.3	2.0	4.0	8.0	7.5	6.0	6.0	...	0.0	-0.3
Mean	1.3	0.1	1.2	3.9	4.8	7.9	11.9	9.7	9.2	7.3	4.2	1.1	...
<u>Stream: Salonie Creek</u>													
TU	...	18.0	86.5	...	...	134.0	182.0	...	...	147.5	134.5	87.0	****
High	...	1.5	5.0	...	...	7.5	8.5	...	...	6.0	6.0	4.0	****
Low	...	0.0	1.0	...	...	2.5	4.5	...	...	4.5	2.5	1.5	****
Mean	...	0.6	2.8	...	...	4.0	5.9	...	...	4.8	4.5	2.9	****

* Negative temperatures are considered 0 temperature units and therefore not deducted from total temperature units.

** 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 five months.

Table 7. Fish Sampling Summary of Select Kodiak Area Waters, 1979.

Water	Date	Species	Age	Sex	n	Mean Ln (mm)	+S.D.	Remarks		
Afognak L.	Aug. 19	RT	O	...	4	64.8	7.8	Trans. to Waterfall L.		
			I+	...	31	160.3	18.9	" " " "		
			II+	...	50	208.5	17.7	" " " "		
			III+	...	7	256.4	23.6	" " " "		
			IV+	...	3	271.5	32.8	" " " "		
			Regen	...	8	272.4	28.0	" " " "		
Kitoi L.	May 4 to May 25	RT	III	F	1	225.0	...	Immature		
			IV	M	3	274.0	35.5	Spawn 1980		
			IV	F	2	290.0	14.1	Spawn 1980		
			V	F	4	376.0	60.5	3 Immature, 1 Spent		
			V	M	2	495.0	24.0	1 Mature, 1 Spent		
			VI	F	1	570.0	...	Spent		
Lake No. 13611	July 29	RT	II	...	8	123.3	14.3	Immature		
			III	...	3	193.3	27.5	Immature		
			IV	M	2	235.5	17.6	Spawned 1979		
			IV	F	2	285.0	7.1	Spawned 1979		
		RS	2.2	...	4	525.0	17.8	Spawning Cond.		
			2.3	...	1	610.0	...	Spawning Cond.		
		DV	II	...	1	118.0	...	...
			III	...	2	126.0	12.7	...		
			IV	...	4	223.0	38.0	...		
			V	...	5	292.8	21.6	...		
			VI	...	5	338.6	23.3	...		
		Lake No. 13607	July 29	RT	II	...	2	131.0	8.5	...
					III	...	3	186.7	2.3	...

Table 7 (cont.). Fish Sampling Summary of Select Kodiak Area Waters, 1979.

Water	Date	Species	Age	Sex	n	Mean Ln (mm)	+S.D.	Remarks
		SS	1.0	...	17	105.5	6.5	Will smolt 1980
		DV	III	...	9	147.3	36.0	...
			IV	...	8	201.6	9.5	...
			V	...	1	254.0	...	...
Lake No. 13622	July 27	RT	II	...	3	119.0	14.1	...
			III	...	1	198.0	...	...
			IV	...	1	223.0	...	...
			V	...	1	350.0	...	...
		DV	IV	...	3	261.7	32.5	...
			V	...	5	277.6	45.1	...
			VI	...	2	345.0	14.1	...
Lake No. 13627	July 26	DV	III	...	6	173.1	32.4	...
			IV	...	5	226.0	32.7	...
			V	...	4	227.8	32.3	...
			VI	...	1	355.0	...	...
Little R.	May 9	RT	II	F	1	168.0	...	Immature
			III	M	1	150.0	...	"
			IV	M	3	215.3	10.5	Ripe
			V	M	3	310.0	26.5	Ripe
			VI	M	1	350.0	...	Ripe
			Regen	M	1	235.0	...	Ripe
			3.2	M	1	530.0	...	Ripe
			3.2	F	1	530.0	...	Ripe
		DV	...	...	40	324.9	78.5	Outmigrants

Table 7 (cont.). Fish Sampling Summary of Select Kodiak Area Waters, 1979.

Water	Date	Species	Age	Sex	n	Mean Ln (mm)	+S.D.	Remarks
Pinnel Cr.	May 8	RT	IV	F	3	364.0	23.1	Immature
			V	F	3	405.0	43.6	Immature
			V	M	8	377.3	47.4	Immature
			VI	F	2	447.0	52.3	1 Immature, 1 Spent
			VI	M	2	465.0	63.6	1 Immature, 1 Spent
		DV	...	...	50	368.6	32.0	Residents

RT = Rainbow Trout
 RS = Sockeye Salmon
 DV = Dolly Varden
 SS = Coho Salmon

Table 8. Population Estimates of Abercrombie Lake Rainbow Trout (Age I) and Arctic Grayling (all age classes) from a Sequence of Five Samples, September 27 through October 1, 1979.

Sample	Experimental Results				Summary Statistics			Estimates	
	Catch	Re- Captures	Number Dead or Injured upon Capture	Number of Marked Released	Un- Marked Catch	Cumula- tive Un- Marked Catch	Number Previously Dead or Injured	N±S.E.(N)	
<u>Rainbow Trout (Age I):</u>									
1	147	0	1	146	147	0	0	...	...
2	114	24	0	114	90	237	1	694 ±	115
3	158	56	0	158	102	339	1	674 ±	55
4	236	124	0	236	112	451	1	652 ±	28
5	187	126	2	185	61	512	1	661 ±	20
<u>Arctic Grayling</u>									
1	11	0	0	11	11	0	0	...	...
2	5	0	0	5	5	16	0	0 ±	0.5
3	8	1	0	8	7	23	0	0 ±	0.2
4	18	0	0	18	18	41	0	0 ±	0.1
5	7	1	1	6	6	47	0	0 ±	0.0

Table 9. Population Estimates of Long Lake Age I Rainbow Trout (Swanson River Strain), Arctic Grayling (all age classes), and Dolly Varden (all age classes) From a Sequence of Six Samples, August 7 through 10, 15 and 16, 1979.

Sample	Experimental Results				Summary Statistics			Estimates	
	Catch	Re-Captures	Number Dead or Injured on Capture	Number of Marked Released	Un-Marked Catch	Cumulative Un-Marked Catch	Number Previously Dead or Injured	N±S.E. (N)	
<u>Age I Rainbow Trout:</u>									
1	210	0	0	210	210	0	0	...	...
2	91	43	0	91	48	258	0	444 ±	44
3	80	47	0	80	33	291	0	441 ±	28
4	31	19	1	30	12	303	0	448 ±	26
5	13	9	0	13	4	307	1	447 ±	25
6	22	16	0	22	6	313	1	443 ±	23
<u>Arctic Grayling:</u>									
1	55	0	0	55	55	0	0	...	...
2	29	2	0	29	27	82	0	798 ±	531
3	36	3	0	36	33	115	0	911 ±	383
4	11	0	0	11	11	126	0	1,169 ±	496
5	5	0	0	5	5	131	0	1,298 ±	554
6	4	2	0	7	5	136	0	1,053 ±	376
<u>Dolly Varden:</u>									
1	118	0	0	188	188	0	0	...	...
2	146	34	0	146	112	300	0	807 ±	109
3	133	37	0	133	96	396	0	959 ±	90
4	12	3	0	12	9	405	0	986 ±	91
5	14	1	14	0	13	418	0	1,053 ±	98
6	26	2	26	0	24	442	14	1,173 ±	109

Table 10. Population Estimates of Age 0 and Age I, II and III Pony Lake Landlocked Coho Salmon From a Sequence of Three Samples, September 27 through October 1, 1979.

Sample	Experimental Results				Summary Statistics			Estimates	
	Catch	Re-Captures	Number Dead or Injured upon Capture	Number of Marked Released	Un-Marked Catch	Cumulative Un-Marked Catch	Number Previously Dead or Injured	N	S.E. (N)
<u>Age 0 Coho:</u>									
1	329	0	0	329	329	0	0	...	...
2	441	84	0	441	357	686	0	1,727	+ 146
3	154	70	0	154	84	770	0	1,623	+ 98
<u>Age I, II and III Coho</u>									
1	44	0	0	44	44	0	0	...	...
2	41	3	0	41	38	82	0	601	+ 322
3	34	3	0	34	31	113	0	769	+ 242

Table 11. Population Estimate of Southern Lake Landlocked Coho Salmon (Age I, II and III) From a Sequence of Six Samples, September 21 through 26, 1979.

Sample	Experimental Results				Summary Statistics			Estimates	
	Catch	Re-Captures	Number Dead or Injured upon Capture	Number of Marked Released	Un-Marked Catch	Cumulative Un-Marked Catch	Number Previously Dead or Injured	N	S.E. (N)
1	59	0	1	58	0	0	0	...	...
2	65	0	0	65	65	124	1	...	...
3	41	2	1	40	39	163	1	4,390	\pm 2,942
4	42	3	0	42	39	202	2	3,100	\pm 1,364
5	39	5	0	39	34	236	2	2,319	\pm 703
6	40	4	0	40	36	272	2	2,325	\pm 592

Table 12. Sampling Summary of Four Kodiak Management Lakes, 1979.

Lake Name and Location	Date Sampled	Species	Number	Age	Length(mm)		Weight(g)		Population Estimate		Percent Survival	Date Stocked	Number Stocked	Per kg	Per ha
					\bar{x}	\pm S.D.	\bar{x}	\pm S.D.	Number	\pm S.D.					
Abercrombie T27S,R19W Sec. 15	9/27	RT(S)	453	I	203.0	19.9	97.5	27.0	661	20	16.1	8/24/78	4,100	976	541
	thru	RT(AE)	9	II	337.8	28.4	...	...	NE	...	...	6/21/77	2,391	1,097	316
	10/1	RT(O)	1	III	420.0	0.0	...	...	NE	...	...	8/31/76	3,300	2,436	436
	9/27	GR	7	I	146.9	23.4	...	...	NE	...	...	6/12/78	10,000	fry	1,322
	thru	GR	29	II	232.9	14.8	...	...	NE	...	...	6/21/77	10,000	fry	1,322
	10/1	GR	7	III	230.1	8.7	...	...	NE	...	...	6/25/76	25,000	fry	3,304
		GR	3	IV	287.0	12.6	...	...	NE	...	...	6/26/75	50,000	fry	6,608
	8/8	RT(S)	210	I	148.7	21.8	36.5	14.0	443	23	8.5	8/24/78	5,200	976	357
	thru	RT(AE)	1	II	237.0	...	172.0	...	NE	...	...	6/21/77	2,689	1,097	184
	8/17	RT(O)	1	III	330.0	...	330.0	...	NE	...	...	8/05/76	2,700	2,436	186
	RT(W)	3	IV	322.0	24.0	364.6	102.0	NE	...	...	7/21/75	5,300	3,984	363	
	RT(W)	1	V	371.0	...	500.0	...	NE	...	...	6/24/74	5,400	3,194	371	
	8/8	GR	1	I	92.0	...	8.0	...	(Pop. est. for all age classes equal		...	...	...	...	...
	thru	GR	82	II	196.0	6.0	78.5	7.6	1,053 \pm 376		NE	6/21/77	10,000	fry	686
	8/17	GR	10	III	261.2	7.0	190.0	14.1			...	6/25/76	25,000	fry	1,714
		GR	11	IV	272.1	17.9	215.5	...			...	6/26/75	1,258	441	86
	8/8	DV	4	I	107.8	...	13.1	...	(Pop. est. for all age classes equal		NE	Natural Reproduction			
	thru	DV	4	II	169.0	...	46.6	...	1,173 \pm 109)		...				
	8/17	DV	2	III	186.0	...	65.5	...			...
		DV	2	IV	290.5	...	225.0	...			...
Pony T19S,R19W Sec. 36	9/5	SS	139	0	102.4	7.9	11.9	3.4	1,623	98	101.4	6/06/79	1,600	848	276
	thru	SS	86	I	186.7	10.8	67.9	12.8	585** (Pop. est. 36.6		...	6/02/78	1,600	852	276
	9/7	SS	25	II	223.2	12.9	112.5	21.3	170** for age I, 10.7		...	6/21/77	1,595	1,227	275
		SS	2	III	272.5	...	249.0	...	14** II & III = 0.9		...	6/22/76	1,600	969	276
								769 \pm 242)							

Table 12 (cont.). Sampling Summary of Four Kodiak Management Lakes, 1979.

Lake Name and Location	Date Sampled	Species	Number	Age	Length(mm)		Weight(g)		Population Estimate		Percent Survival	Date Stocked	Number Stocked	Per kg	Per ha
					\bar{x}	\pm S.D.	\bar{x}	\pm S.D.	Number	\pm S.D.					
Southern	8/21	SS	141	I	179.3	12.9	60.4	11.2	944*(pop. est.	31.5	6/02/78	3,000	852	423	
T28S,R19W	thru	SS	18	II	219.9	18.9	116.8	32.4	246* for all age	8.2	6/21/77	3,008	1,227	423	
Sec. 14	8/26	SS	7	III	254.3	14.1	178.0	24.6	76* classes equal	2.5	6/23/76	3,000	969	423	
									1,266 \pm 284)						

* Pop. est. based on ratio of marked and unmarked fish captured in the gill nets after fyke trapping was completed.

** Pop. est. based on a percentage of each age class in the sample.

S = Swanson River stock
 AE = Alaska-Ennis stock
 O = Green River Oregon stock
 W = Winthrop Washington stock
 GR = Arctic Grayling
 DV = Dolly Varden
 SS = Coho Salmon
 NE = No Estimate

Three fyke traps set in Pony Lake on September 5, 6 and 7, for a total of 216 trap hours, captured 883 landlocked coho salmon composed of Age 0 (n=770), Age I (n=86), Age II (n=25) and Age III (n=2) fish. Population estimates for two size classes of fish identified in the field (Table 10) were 1,623 + 98 Age 0 coho salmon (small fish <150 mm) and 769 + 292 Age I, II and III coho salmon (large fish >150 mm). The latter population estimated (769 + 292, broken down by the percentage of each age class in the sample (Age I = 76.1%, Age II = 22.1%, Age III = 1.8%), yielded 585 Age I, 170 Age II and 14 Age III landlocked coho salmon. Survival rates for the above fish (Age 0-III) were 101.4%, 36.6%, 10.7% and 0.9%, respectively. Age 0, I, II and III coho salmon (Table 12) respectively averaged 102.4 mm, 186.7 mm, 223.2 mm and 272.5 mm in length, and 11.9 g, 67.9 g, 112.5 g and 249.0 g in weight.

Three fyke traps set in Southern Lake from August 21 through August 26, for a total of 432 trap hours, captured 272 landlocked coho salmon. The population estimate presented in Table 11 indicated 2,325 + 592 coho salmon were in the lake; however, since the recapture rate was extremely low (5.1%, or 14 of 272), three variable mesh gill nets were fished for 72 net hours and captured 66 unmarked and 15 marked (18.5% recapture) coho salmon. The population estimate, based on gill net data, was 1,266 + 284 coho salmon. Age class population estimates based on age composition of gill net captured fish (Age I = 74.6%, Age II = 19.4%, Age III = 6.0%) were 944 Age I, 246 Age II and 76 Age III coho salmon with estimated survival rates of 31.5%, 8.2% and 2.5% respectively. Age I, II and III coho salmon (Table 12) respectively averaged 179.3 mm, 219.9 mm, and 254.3 mm in length, and 60.4 g, 116.8 g and 178.0 g (6.27 oz). (Note--unmarked fish (n=36) caught during the sixth day of fyke-trapping were not marked, therefore, only 234 marked fish were released.)

Development and Enhancement of Anadromous Fish Populations:

Chinook salmon fry (n=65,562), stocked in Lake Rose Tead on June 7, 1979, averaged 35 mm long and 1.02 g. Approximately 100 hours of minnow-trapping, in the lake shoals and inlets on July 25, captured numerous Dolly Varden, juvenile coho salmon and one juvenile chinook salmon. Consequently, relative growth rates of the 1979 experimental chinook salmon plant were undetermined.

Cursory creel censuses, conducted on Pasagshak River from June 23 through August 26, 1979, indicated 84 completed anglers fished 264 hours and retained 109 pink salmon, 7 coho salmon and 1 chinook salmon. Sport anglers brought in three chinook salmon for age-growth analysis and 15 additional chinook salmon were reported caught; however, these fish were not positively identified.

The four Pasagshak chinook salmon analyzed for age-growth data were composed of three Age 2.1 males (\bar{x} ln = 475.7 mm or) and one Age 2.0 male (ln = 314 mm).

Approximately 140,000 chinook salmon eggs were taken from 21 Chignik River females and fertilized with seven males on August 28. Age-growth analysis indicates the dominant 1.4 age class contained five males (\bar{x} ln = 965.2 mm) and 19 females (\bar{x} ln = 938.6 mm). Two Age 1.3 males and two Age 1.5 females respectively averaged 793.5 mm and 965.0 mm in length.

Sport Fish Harvest Estimates:

1978 Kodiak Postal Survey. Kodiak sport fish harvest estimates for 1978, as determined by a spring postal survey (Table 13) and a fall postal survey (Table 14), are presented in this report as the new computer system was incompatible with the current DP program. Subsequent reprogramming and data analysis in 1979 (Table 14) indicated a total of 69,635 fish were harvested (excluding marine fish) with 37% and 33% of the catch respectively composed of pink salmon and Dolly Varden. Buskin River received 48.4% of the fishing effort and produced 44.8% of the fish harvested for the entire Kodiak area. Buskin River, American River and Roslyn Creek produced 57.7%, 9.4% and 8.4% of the pink salmon catch. American River produced 29.5% of the chum salmon catch, while 30.0% of the coho salmon and 45.7% of the sockeye salmon catch came from Buskin River. All chinook salmon and 92.8% of the steelhead trout came from other streams. All landlocked coho salmon and grayling, and 76.7% of the rainbow trout came from lakes. Approximately 1,666 anglers pursued marine fish for a total harvest of 5,400 halibut, 5,557 black bass, 1,336 cod, 3,705 flatfish and 905 greenling.

1979 Kodiak Postal Survey. Sport fish harvest estimates for Kodiak Island waters, as reported by two postal surveys, are presented in Tables 15 and 16. A total catch of 94,893 fish were harvested (excluding marine fish), with most of the catch (66%) composed of Dolly Varden (29.0%) and pink salmon (37.0%). Buskin River received 35.0% of the fishing effort and produced 28.2% of the fish harvested for the entire Kodiak area. The largest catches of chum, coho, sockeye and pink salmon respectively came from American River (88.9%), Pasagshak River (23.6%), other streams (42.2%) and American River (47.6%). Other streams produced all of the chinook salmon and 92.3% of the steelhead. Approximately 1,683 anglers pursued marine fish for a total harvest of 7,740 halibut, 4,139 black bass, 168 cod, 2,204 flatfish and 555 greenling.

The number and percentage of Kodiak licensed anglers that pursued various fishes during 1979 are as follow: salmon, 4,813 - 80.6%; Dolly Varden, 2,896 - 48.5%; steelhead, 251 - 4.2%; landlocked coho salmon, grayling or rainbow trout, 484 - 8.1%; and marine fish, 1,837 - 31.1%. Angler interest for 1978 and 1979 were similar (Table 17); however, the number of 1979 sport fishing licenses sold (n=5,972) increased 10.6% (n=612) over the total number of licenses sold in 1978 (n=5,360).

Buskin River Creel Census. The Buskin River creel census indicated 15,615 Dolly Varden, 3,537 pink salmon, 1,967 coho salmon and 116 sockeye salmon were harvested during 27,522 angler hours (13,983 angler trips). Most of the Dolly Varden (n=12,936, 83.5%) were caught during the spring fishery (Table 18). All coho salmon, pink salmon and 1,967 Dolly Varden were caught during the summer-fall fishery (Table 19). Anglers who purchased their fishing license in Kodiak caught 94.8% of the spring Dolly Varden, 54.5% of the fall Dolly Varden, 89.8% of the pink salmon and 91.6% of the coho salmon during 12,595 angler trips. During the April 26 through May 2 creel census, a sample of 678 outmigrant Dolly Varden (Figure 5) from angler creels averaged 293 mm (11.5 in) in length with a range of 175-500 mm. A sample of sport-caught coho salmon (Table 20), retained during August and September, contained 39 males (\bar{x} ln = 718 mm, \bar{x} wt = 5.24 kg) and 35 females (\bar{x} ln = 718 mm, \bar{x} wt = 4.85 kg). Age classes 2.0, 1.1 and

Table 13. Kodiak Island Dolly Varden and Sockeye Salmon Harvest as Determined by a Postal Survey of Kodiak Licensed Anglers, Spring 1978.

Area	Anglers	Trips	Dolly Varden			Sockeye Salmon			Total		
			No.	Per Trip	Percent*	No.	Per Trip	Percent*	No.	Per Trip	Percent*
Buskin	1,664	10,038	18,910	1.88	96%	801	0.08	4%	19,711	1.96	100%
Percent**	67.5%	79.9%	86.0%			55.4%			84.1%		
Pasagshak	302	572	697	1.22	96%	31	0.05	4%	728	1.27	100%
Percent**	12.2%	4.6%	3.2%			2.1%			3.1%		
Beaches	135	437	520	1.19	100%	0	0.00	0%	520	1.19	100%
Percent**	5.5%	3.5%	2.4%			0.0%			2.2%		
Other Streams	364	1,519	1,872	1.23	75%	614	0.40	25%	2,486	1.64	100%
Percent**	14.8%	12.1%	8.5%			42.5%			10.6%		
Total	2,465	12,566	21,999	1.75	94%	1,446	0.12	6%	23,445	1.87	100%
Percent**	100.0%	100.0%	100.0%			100.0%			100.0%		

Number and Percent of Anglers That Did Not Fish: 1,178 - 31.1% That Did Fish: 2,610 - 68.9%
 Number and Percent of Anglers That Fished For: Dolly Varden: 2,428 - 64.1%; Sockeye Salmon: 1,477 - 39.0%
 Number of Licenses Issued: 3,788

* Percent of all fish harvested from the given area
 ** Percent of all the species harvested

Table 14. Kodiak Island Sport Fish Harvest as determined by a Postal Survey of Kodiak Licensed Anglers, January 1 through November 1, 1978.

Area	Anglers	Trips	Pink Salmon			Chum Salmon			Coho Salmon			Dolly Varden			Sockeye Salmon		
			No.	Per Trip	Percent*	No.	Per Trip	Percent*	No.	Per Trip	Percent*	No.	Per Trip	Percent*	No.	Per Trip	Percent*
American	1,063	3,203	2,413	0.75	55%	402	0.13	9%	474	0.15	11%	1,077	0.34	25%			
Percent**	10.6	7.5	9.4			29.4			4.1			4.7					
Buskin	2,786	20,665	14,806	0.72	47%	187	0.01	1%	3,490	0.17	11%	11,661	0.56	37%	1,063	0.05	3%
Percent**	27.9	48.4	57.7			13.7			30.0			50.9			45.7		
Kalsin	560	1,652	1,063	0.64	53%	129	0.08	6%	431	0.26	21%	388	0.23	19%			
Percent**	5.6	3.9	4.1			9.5			3.7			1.7					
Olds	316	919	416	0.45	43%	129	0.14	13%	359	0.39	37%	57	0.06	6%			
Percent**	3.2	2.2	1.6			9.5			3.1			0.2					
Pasagshak	1,364	3,375	833	0.25	28%	0	0.00	0%	1,537	0.46	51%	603	0.18	20%	29	0.01	1%
Percent**	13.6	7.9	3.2			0.0			13.2			2.6			1.2		
Roslyn	574	1,967	2,169	1.10	44%	86	0.04	2%	1,221	0.62	25%	1,450	0.74	29%			
Percent**	5.7	4.6	8.4			6.3			10.5			6.3					
Saltery	661	1,336	819	0.61	21%	302	0.23	8%	1,221	0.91	32%	1,135	0.85	29%	287	0.21	7%
Percent**	6.6	3.1	3.2			22.1			10.5			5.0			12.3		
Salonie	115	402	0	0.00	0%	14	0.03	2%	574	1.43	64%	302	0.75	34%			
Percent**	1.2	0.9	0.0			1.1			4.9			1.3					
Beaches	1,091	4,639	1,996	0.43	45%	86	0.02	2%	704	0.15	16%	1,580	0.34	36%	29	0.01	1%
Percent**	10.9	10.9	7.8			6.3			6.0			6.9			1.2		
Oth. Streams	833	2,800	1,163	0.42	14%	29	0.01	0%	1,537	0.55	18%	3,346	1.19	39%	919	0.33	11%
Percent**	8.3	6.6	4.5			2.1			13.2			14.6			39.9		
Lakes	632	1,709							101	0.06	2%	1,321	0.77	24%	0	0.00	0%
Percent**	6.3	4.0							0.9			5.8			0.0		
Total	9,995	42,667	25,678	0.60	37%	1,364	0.03	2%	11,649	0.27	17%	22,920	0.54	33%	2,327	0.05	3%
Percent**	99.9	100.0	99.9			100.1			100.1			100.0			99.9		

Table 14 (cont.). Kodiak Island Sport Fish Harvest as determined by a Postal Survey of Kodiak Licensed Anglers, January 1 through November 1, 1978.

Area	Chinook Salmon			Steelhead			Rainbow			Landlocked Coho			Grayling			Totals		
	No.	Per Trip	Percent*	No.	Per Trip	Percent*	No.	Per Trip	Percent*	No.	Per Trip	Percent*	No.	Per Trip	Percent*	No.	Per Trip	Percent*
American Percent**																4,366 6.3	1.36	100%
Buskin Percent**																31,206 44.8	1.51	99%
Kalsin Percent**																2,011 2.9	1.22	99%
Olds Percent**																962 1.4	1.05	101%
Pasagshak Percent**																3,001 4.3	0.89	100%
Roslyn Percent**																4,926 7.1	2.50	100%
Saltery Percent**				29 7.2	0.02	1%	57 1.6	0.04	1%							3,855 5.5	2.88	99%
Salonie Percent**																890 1.3	2.21	100%
Beaches Percent**	0 0.0	0.00	0%	0 0.0	0.00	0%										4,394 6.3	0.95	100%
Oth. Streams Percent**	388 100.0	0.14	5%	373 92.8	0.13	4%	775 21.7	0.28	9%							8,530 12.2	3.05	100%
Lakes Percent**							2,743 76.7	1.61	50%	646 100.0	0.38	12%	689 100.0	0.40	13%	5,500 7.9	3.22	101%
Total Percent**	388 100.0	0.01	1%	402 100.0	0.01	1%	3,576 100.0	0.08	5%	646 100.0	0.02	1%	689 100.0	0.02	1%	69,635 100.0	1.63	101%

Table 14 (cont.). Kodiak Island Sport Fish Harvest as determined by a Postal Survey of Kodiak Licensed Anglers, January 1 through November 1, 1978.

Area	Anglers	Trips	Halibut			Black Bass			Cod			Flatfish			Greenling			Totals		
			No.	Per Trip	Percent*	No.	Per Trip	Percent*	No.	Per Trip	Percent*	No.	Per Trip	Percent*	No.	Per Trip	Percent*	No.	Per Trip	Percent*
Marine	1,666	9,392	5,400	0.57	32%	5,557	0.59	33%	1,336	0.14	8%	3,705	0.39	22%	905	0.10	5%	16,917	1.80	100%
Percent**			31.9			32.8			7.9			21.9			5.3			99.8		

* Percent all of fish harvested from the given area.
 ** Percent of the species harvested.

Table 15. Kodiak Island Dolly Varden and Sockeye Salmon Harvest as determined by a Postal Survey of Kodiak Licensed Anglers, Spring 1979.

Area	Anglers	Trips	Dolly Varden			Sockeye Salmon			Total		
			No.	Per Trip	Percent*	No.	Per Trip	Percent*	No.	Per Trip	Percent*
Buskin	1,123	6,748	10,773	1.59	95%	525	0.08	5%	11,258	1.67	100%
	Percent**61.7%	74.7%	82.5%			54.7%			80.6%		
Pasagshak	281	697	616	0.88	92%	54	0.08	8%	670	0.96	100%
	Percent**15.4%	7.7%	4.7%			5.6%			4.8%		
Beaches	199	716	1,096	1.53	100%	0	0.00	0%	1,096	1.53	100%
	Percent**10.9%	7.9%	8.4%			0.0%			7.8%		
Oth. Strms.	217	870	562	0.65	60%	380	0.44	40%	942	1.08	100%
	Percent**11.9%	9.6%	4.3%			39.6%			6.7%		
Total	1,820	9,031	13,007	1.44	93%	959	0.11	7%	13,966	1.55	100%
	Percent**99.9%	99.9%	99.9%			99.9%			99.9%		

Number and Percent of Anglers that Did Not Fish: 1,021 - 34.3% That Did Fish: 1,955 - 65.7%
 Number and Percent of Anglers that Fished For: Dolly Varden: 1,791, 60.2%; Sockeye Salmon: 1,059, 35.6%
 Number of Licensed Issued: 2,976

* Percent of all fish harvested from the given area.

** Percent of the species harvested.

Table 16. Kodiak Island Sport Fish Harvest as determined by a Postal Survey of Kodiak Licensed Anglers, January 1 through November 1, 1979.

Area	Anglers	Trips	Pink Salmon			Chum Salmon			Coho Salmon			Dolly Varden			Sockeye Salmon		
			No.	Per Trip	Percent*	No.	Per Trip	Percent*	No.	Per Trip	Percent*	No.	Per Trip	Percent*	No.	Per Trip	Percent*
American Percent**	1,548 13.9	9,069 19.3	16,808 47.6	1.85	63%	7,824 88.9	0.86	29%	824 5.1	0.09	3%	1,262 4.5	0.14	5%			
Buskin Percent**	2,978 26.7	16,489 35.0	6,124 17.3	0.37	25%	219 2.5	0.01	1%	3,802 23.3	0.23	16%	13,292 47.9	0.81	55%	723 26.7	0.04	3%
Kalsin Percent**	673 6.0	1,598 3.4	909 2.6	0.57	48%	236 2.7	0.15	13%	303 1.9	0.19	16%	437 1.6	0.27	23%			
Olds Percent**	370 3.3	1,010 2.1	606 1.7	0.60	28%	34 0.4	0.03	2%	740 4.5	0.73	34%	791 2.9	0.78	36%			
Pasagshak Percent**	1,800 16.1	5,670 12.0	2,170 6.1	0.38	28%	0 0.0	0.00	0%	3,853 23.6	0.68	49%	1,582 5.7	0.28	20%	236 8.7	0.04	3%
Roslyn Percent**	723 6.5	1,985 4.2	2,036 5.8	1.03	46%	17 0.2	0.01	0%	1,514 9.3	0.76	34%	841 3.0	0.42	19%			
Saltery Percent**	589 5.3	1,413 3.0	1,918 5.4	1.36	32%	202 2.3	0.14	3%	1,481 9.1	1.05	25%	2,120 7.6	1.50	35%	219 8.1	0.15	4%
Salonie Percent**	101 0.9	168 0.4	151 0.4	0.90	100%	0 0.0	0.00	0%	0 0.0	0.00	0%	0 0.0	0.00	0%			
Beaches Percent**	1,010 9.1	4,661 9.9	2,372 6.7	0.51	45%	252 2.9	0.05	5%	993 6.1	0.21	19%	1,632 5.9	0.35	31%	17 0.6	0.00	0%
Oth. Streams Percent**	858 7.7	2,045 6.5	2,238 6.3	0.73	22%	17 0.2	0.01	0%	2,288 14.0	0.75	22%	3,029 10.9	0.99	30%	1,144 42.2	0.38	11%
Lakes Percent**	505 4.5	1,969 4.2							505 3.1	0.26	8%	2,759 9.9	1.40	46%	370 13.7	0.19	6%
Total Percent**	11,155 100.0	47,077 100.0	35,332 99.9	0.75	37%	8,801 100.1	0.19	9%	16,303 100.0	0.35	17%	27,745 99.9	0.59	29%	2,709 100.0	0.06	3%

Table 16 (cont.). Kodiak Island Sport Fish Harvest as determined by a Postal Survey of Kodiak Licensed Anglers, January 1 through November 1, 1979.

Area	Chinook Salmon			Steelhead			Rainbow			Landlocked Coho			Grayling			Totals		
	No.	Per Trip	Percent*	No.	Per Trip	Percent*	No.	Per Trip	Percent*	No.	Per Trip	Percent*	No.	Per Trip	Percent*	No.	Per Trip	Percent*
American Percent**																26,718	2.95	100%
																28.2		
Buskin Percent**																24,160	1.47	100%
																25.5		
Kalsin Percent**																1,885	1.18	100%
																2.0		
Olds Percent**																2,171	2.15	100%
																2.3		
Pasagshak Percent																7,841	1.38	100%
																8.3		
Roslyn Percent**																4,408	2.22	99%
																4.6		
Saltery Percent**				34	0.02	1%	67	0.05	1%							6,041	4.27	101%
				7.7			2.9									6.4		
Salonie Percent**																151	0.90	100%
																0.2		
Beaches Percent**	0	0.00	0%	0	0.00	0%										5,266	1.31	100%
																5.5		
Oth. Streams Percent**	656	0.22	6%	404	0.13	4%	454	0.15	4%							10,230	3.36	99%
	100.0			92.3			19.6									10.8		
Lakes Percent							1,800	0.91	30%	437	0.22	7%	151	0.08	3%	6,022	3.06	100%
							77.6			100.0			100.0			6.3		
Total	656	0.01	1%	438	0.01	0%	2,321	0.05	2%	437	0.01	0%	151	0.00	0%	94,893	2.02	98%
	100.0			100.0			100.1			100.0			100.0			100.1		

Table 16 (cont.). Kodiak Island Sport Fish Harvest as determined by a Postal Survey of Kodiak Licensed Anglers, January 1 through November 1, 1979.

Area	Anglers	Trips	Halibut			Black Bass			Cod			Flatfish			Greenling			Totals		
			No.	Per Trip	Percent*	No.	Per Trip	Percent*	No.	Per Trip	Percent*	No.	Per Trip	Percent*	No.	Per Trip	Percent*	No.	Per Trip	Percent*
Marine	1,683	8,699	7,740	0.89	52%	4,139	0.48	28%	168	0.02	1%	2,204	0.25	15%	555	0.06	4%	14,806	1.70	100%
			52.3			28.0			1.1			14.9			3.7			100%		

* Percent of all fish harvested from the given area.

** Percent of the species harvested.

Table 17. Number and Percentage of Kodiak Licensed Anglers that fished for various species, including those who did not fish, as determined by a Postal Survey in 1978 and 1979.

Species or Interest	1978 Anglers*		1979 Anglers**	
	Number	Percent	Number	Percent
Salmon	4,090	76.3	4,813	80.6
Dolly Varden	2,706	50.5	2,896	48.5
Steelhead	263	4.9	251	4.2
LL Coho GR/RT	647	13.8	484	8.1
Marine Fish	1,881	35.1	1,857	31.1
Did Fish	4,669	87.1	5,202	87.1
Did Not Fish	691	12.9	770	12.9

* Total 1978 Sport Angler Licenses Sold = 5,360

** Total 1979 Sport Angler Licenses Sold = 5,972

GR = Grayling

RT = Rainbow Trout

LL = Landlocked

Table 18. Buskin River Dolly Varden Harvest by Angler Group as determined by a Creel Census, April 24 to May 26, 1979.

Type	Angler				Dolly Varden Harvest		
	Trips	Percent	Hours	Percent	Number	Percent	Per Hour
Resident	2,584	61.6	5,016	60.7	10,353	80.0	2.06
Non-Resident	392	9.3	691	8.4	624	4.8	0.90
Military	781	18.6	1,754	21.2	1,595	12.3	0.91
Hardship*	12	0.3	21	0.2	3	0.0	0.14
Visit 10**	0	0.0	0	0.0	0	0.0	0.00
Visit 1***	10	0.2	52	0.6	21	0.2	0.40
Juvenile	397	9.5	685	9.3	340	2.6	0.50
No License	21	0.5	42	0.5	0	0.0	0.00
Pioneer	<u>0</u>	<u>0.0</u>	<u>0</u>	<u>0.0</u>	<u>0</u>	<u>0.0</u>	<u>0.00</u>
Total	4,197	100.0	8,261	99.9	12,936	99.9	1.57

* 25¢ license

** Ten-day visitor license

*** One-day visitor license

Table 19. Buskin River Sport Fish Harvest Estimates as determined by a Creel Census, July 14 to October 18, 1979.

Type	Angler				Fish Harvest								Fish Per Hour			
	Trips	Percent	Hours	Percent	Dolly Varden	Percent	Coho Salmon	Percent	Pink Salmon	Percent	Sockeye Salmon	Percent	Dolly Varden	Coho Salmon	Pink Salmon	Sockeye Salmon
Resident	4,724	48%	8,918	46%	624	23%	1,056	54%	1,253	35%	108	93%	0.07	0.12	0.14	0.01
Non-Resident	1,506	15%	3,041	16%	74	3%	366	19%	1,183	33%	0	0%	0.02	0.12	0.39	0.00
Military	1,110	11%	2,064	11%	211	8%	94	5%	635	18%	8	7%	0.10	0.05	0.31	0.01
Hardship*	27	0%	66	0%	166	6%	0	0%	0	0%	0	0%	2.52	0.00	0.00	0.00
Visit 10**	965	10%	1,901	10%	286	11%	305	15%	260	7%	0	0%	0.15	0.16	0.14	0.00
Visit 1***	52	1%	171	1%	261	10%	15	1%	0	0%	0	0%	1.53	0.09	0.00	0.00
Juvenile	1,358	14%	3,028	16%	1,057	39%	106	5%	202	6%	0	0%	0.35	0.04	0.07	0.00
No License	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0.35	0.04	0.07	0.00
Pioneer	44	0%	72	0%	0	0%	29	1%	4	0%	0	0%	0.00	0.40	0.06	0.00
Totals	9,786	99%	19,261	100%	2,679	100%	1,967	100%	3,537	99%	116	100%				
Average Fish Per Hour													0.14	0.10	0.18	0.01

* 25¢ license
 ** ten-day visitor license
 *** one-day visitor license

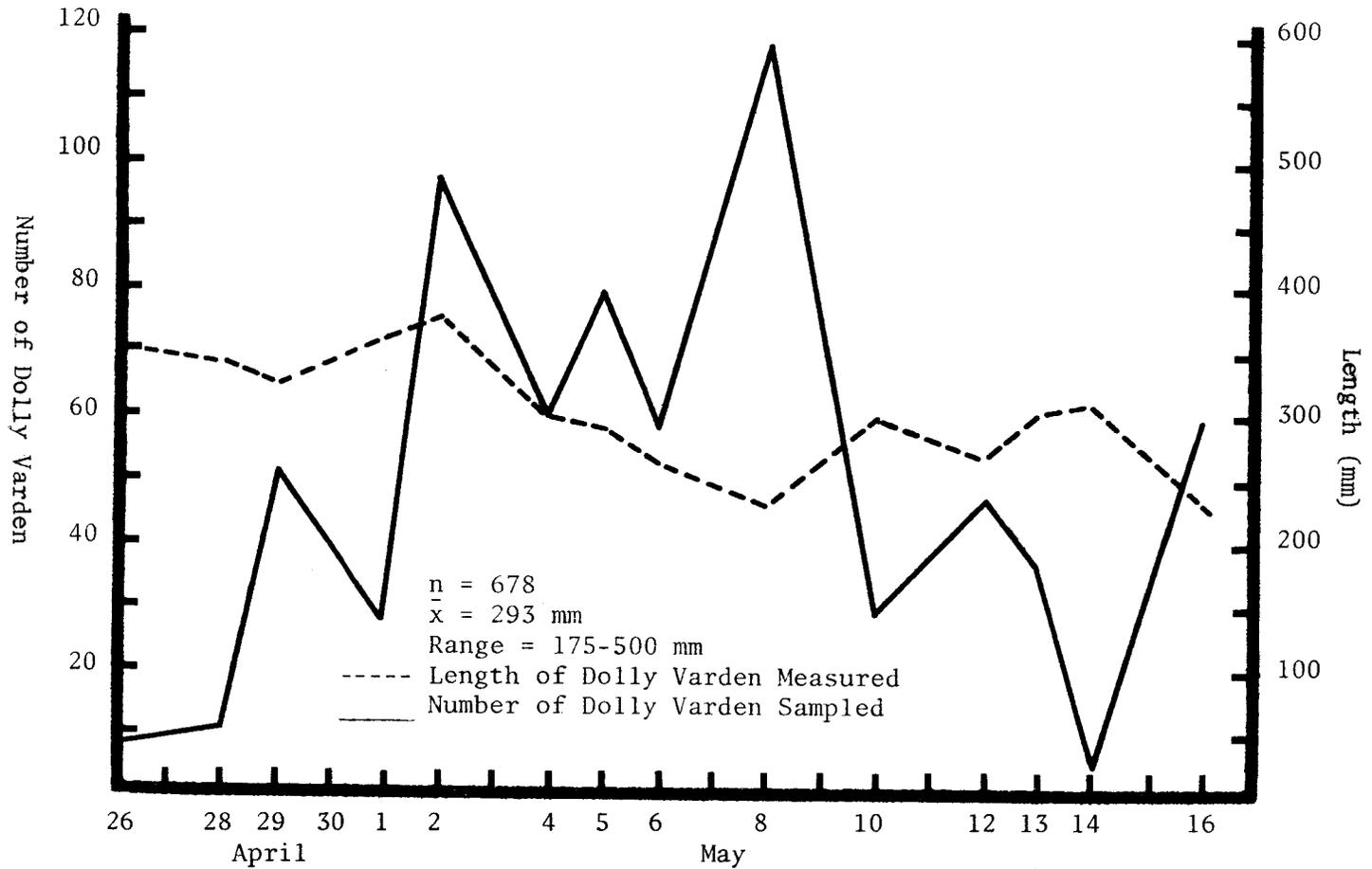


Figure 5 . Number and Mean Length of Buskin River Dolly Varden Sampled from Angler Creels, April and May, 1979.

Table 20. Age, Sex and Size Composition of Buskin River Coho Salmon Sampled during the Creel Census, 1979.

Age Class	Males						Females						Total	
	n	%	Length (mm)		Weight (kg)		n	%	Length (mm)		Weight (mm)		n	%
			\bar{x}	+S.D.	\bar{x}	+S.D.			\bar{x}	+S.D.	\bar{x}	+S.D.		
2.0	2	5.1	386	64.3	0.45	0.2	0	0.0	...	...	...	...	2	2.7
1.1	16	41.0	718	49.0	5.22	1.1	11	31.4	706	23.6	4.36	0.6	27	36.5
2.1	<u>21</u>	<u>53.8</u>	<u>760</u>	32.3	<u>5.72</u>	0.7	<u>24</u>	<u>68.6</u>	<u>724</u>	31.0	<u>4.94</u>	0.5	<u>45</u>	<u>60.8</u>
	39	99.9	724*		5.24*		35	100.0	718		4.85		74	100.0

* Mean size of males excluding the two jacks (Age 2.0) is 742 mm and 5.49 kg.

2.1 respectively comprised 2.7%, 36.5% and 60.8% of the sample. The largest fish were Age 2.1 males (n=21, \bar{x} ln = 760 mm, \bar{x} wt = 5.72 kg).

A comparison of Buskin River postal and creel estimates (Kodiak licensed anglers only), as presented in Table 21, indicated the postal surveys incorrectly reported the harvest of fish by the following factors: Dolly Varden 0.98, coho salmon 2.11, pink salmon, 1.92. A comparison by angler group (i.e., resident, non-resident, etc.) for the Dolly Varden harvest indicates extreme ratio biases of 0.66 to 698.0 which, computed as a total, yield a bias of only 0.98. Similar differences for various angler groups were also noted in the pink salmon (0.39-144.0) and coho salmon (0.91-10.98) harvest estimates.

Weir Camp Creel Censuses. Creel censuses conducted at weir camps on southwest Kodiak Island and Afognak Lake on Afognak Island (Table 22) indicated fishing effort and harvest were low in relation to magnitude of available fish (Table 23). Fishing quality in all waters was considered excellent, as anglers usually released more fish than they retained. Karluk Lagoon received the most fishing pressure with a minimum of 222 anglers fishing 3,822 hours for an estimated harvest of 43 steelhead, 9 rainbow trout, 64 Dolly Varden, 17 coho salmon, 139 chinook salmon and 160 sockeye salmon. Total harvest for Karluk River was not estimated as Karluk Portage and Karluk Lodge were not included in the census.

United States Coast Guard Coho Salmon Derby:

Age-growth and sex composition of 169 coho salmon entered in the USCG Salmon Derby (Table 24) indicated 117 males (\bar{x} ln = 707 mm, \bar{x} wt = 5.5 kg) and 52 females (\bar{x} ln = 706 mm, \bar{x} wt = 5.0 kg) were captured. Most of the fish (n=68) came from Buskin River while the largest fish (n=2, \bar{x} ln = 804 mm, \bar{x} wt = 6.80 kg) came from Saltery Creek.

Assessment and Inventory of Anadromous Fish Populations:

Karluk River. Fish escapement estimates through the Karluk Lagoon weir between May 14 and October 5 were comprised of 9,555 chinook salmon, 2,980 steelhead kelts, 45,262 coho salmon, 965 immigrant steelhead, 81,473 pink salmon and 511,037 sockeye salmon. Table 25 presents weekly counts of the former three species, while Tables 26 and 27 display age-growth and sex composition of angler-caught steelhead and chinook salmon. Age-growth and sex composition of 283 kelt steelhead tagged at the weir are presented in Table 28.

Ages 1.3 and 1.4 chinook salmon composed 96.4% of the 217 fish sampled, while Age 1.1, 1.2 and 1.5 comprised the remaining 3.6%. The dominant 1.4 age class contained 58 males (\bar{x} ln = 941 mm) and 99 females (\bar{x} ln = 916 mm). Age class 1.3 males (n=22) and females (n=30) respectively averaged 848 mm and 830 mm in length.

Steelhead (n=68) sampled at Karluk Portage from October 29 through November 1 contained 10 age classes with 14 (20.5%) repeat spawners, 44 (64.7%) initial spawners and 10 (14.7%) unageable fish. The dominant 2.2 age class contained 8 males (\bar{x} ln = 700.6 mm), while Age 2.1 contained 11 males and 2 females that respectively averaged 555.7 mm and 647.5 mm in length.

Table 21. A Comparison of Buskin River Dolly Varden, Coho Salmon and Pink Salmon Harvest Estimates by Kodiak Licensed Anglers as determined by a Postal Survey and a Creel Census, 1979.

Angler Group	Spring Dolly Varden Harvest			Total Dolly Varden Harvest			Coho Salmon Harvest			Pink Salmon Harvest		
	Postal Est.	Creel Est.	Bias*	Postal Est.	Creel Est.	Bias	Postal Est.	Creel Est.	Bias	Postal Est.	Creel Est.	Bias
Resident	6,693	10,190	0.66	6,695	10,814	0.53	2,130	1,027	2.07	2,885	1,225	2.36
Non-Res.	489	516	0.95	2,731	592	4.61	334	366	0.91	465	1,183	0.39
Military	2,694	1,538	1.75	3,625	1,750	2.07	1,021	93	10.98	1,474	565	2.61
Hardship	34	3	11.33	1**	3	0.33	1**	1**	1.00	1**	1**	1.00
Visitor 10 ^a	698	1**	698.0	797	286	2.79	300	301	1.00	1,142	204	5.60
Visitor 1	<u>1,393</u>	<u>21</u>	<u>66.33</u>	<u>444</u>	<u>282</u>	<u>1.57</u>	<u>17</u>	<u>15</u>	<u>1.13</u>	<u>144</u>	<u> </u>	<u>144.0</u>
Total	12,001	12,268	0.98	13,292	13,727	0.97	3,802	1,802	2.11	6,110	3,177	1.92

* Bias = Postal ÷ Creel

** Zero harvest estimates were substituted with the integer one for computing realistic biases; i.e., zero biases approach negative or positive infinity.

^a Visitor 10 = 10-day license

Visitor 1 = 1-day license

Table 22. Creel Census Estimates from Weir Camps at Afognak River, Dog Salmon River and Karluk Lagoon, 1979.

Area	Date	Number Anglers	Total		Steelhead*		Rainbow Trout		Dolly Varden		Coho Salmon		Chinook Salmon		Sockeye Salmon	
			Days	Hours	Rel.	Ret.	Rel.	Ret.	Rel.	Ret.	Rel.	Ret.	Rel.	Ret.	Rel.	Ret.
Afognak River	June 10- July 28	19	56	187	2	3	251	81	300	63	0	0	0	0	2	51
Dog Salmon River	May 1- June 10	19	42	113	45	6	55	3	37	0	0	0	0	0	0	0
Karluk	May 12-	222	752	3,822	112	43	25	9	952	64	19	17	613	139	166	160

Rel. = Released
Ret. = Retained

* All steelhead were caught between May 27 and July 8.

Table 23. Fish Escapement Counts through Weirs on Kodiak and Afognak Islands, 1979.

River	Sockeye Salmon	Chinook Salmon	Pink Salmon	Chum Salmon	Coho Salmon	Steelhead Trout
Afognak	84,702	***	4,984	***	5,521*	***
Upper Station	174,336	***	778	***	10,312	18
Ayakulik	222,270	4,833	10,278	56	1,747**	57***
Dog Salmon	126,742	53	10,179	***	***	***
Karluk Lagoon	513,137	9,555	82,973	1,085	45,262	965****

* Weir pulled August 19; therefore, total coho escapement was not counted.

** Weir pulled August 15; therefore, total coho escapement was not counted.

*** An additional 473 steelhead kelts moved down through the weir.

**** An additional 2,980 steelhead kelts moved down through the weir.

Table 24. Age and Size of Coho Salmon Entered in the United States Coast Guard Coho Derby, September 8-9 and 15-16, 1979.

Location	Age Class	n	Males				Females				
			Length (mm)		Weight (kg)		Length (mm)		Weight (kg)		
			\bar{x}	\pm S.D.							
Buskin R.	2.0	2	375	26.9	0.8	0.2	0	...	...	...	...
	1.1	13	741	24.5	5.7	0.8	8	708	25.6	4.9	0.5
	2.1	27	739	33.9	5.5	0.9	16	717	24.9	5.2	0.3
	3.1	2	715	21.9	5.1	1.3	0	...	...	...	...
Pasagshak R.	1.0	2	336	64.3	0.6	0.4	0	...	...	...	...
	3.0	1	394	...	0.9	...	0	...	...	...	...
	1.1	3	707	19.3	5.1	0.8	1	711	...	5.6	...
	2.1	14	759	23.2	6.2	0.9	4	740	11.4	5.9	0.4
	3.1	5	763	11.5	6.6	0.4	2	731	9.1	5.6	0.3
Roslyn Creek	2.0	1	343	...	0.5	...	0	...	...	...	...
	1.1	4	736	45.0	5.5	0.6	0	...	...	...	...
	2.1	6	734	36.5	5.6	0.5	1	692	...	4.9	...
Womens Bay	2.0	1	310	...	0.9	...	0	...	...	...	...
	1.1	6	745	22.5	5.5	0.5	0	...	...	...	...
	2.1	6	723	42.2	5.1	1.0	9	713	28.7	5.1	0.8
Chiniak Cr.	1.1	1	880	...	5.8	...	1	667	...	4.1	...
	2.1	2	731	9.2	5.6	0.4	2	692	26.8	5.0	0.6
Olds River	1.1	2	743	35.3	5.7	1.1	2	654	8.5	3.9	0.5
	2.1	3	739	16.6	5.9	0.7	0	...	...	...	...
	3.1	1	699	...	4.5	...	0	...	...	...	...
Saltery R.	1.1	13	737	33.0	5.8	0.9	5	655	54.6	4.4	1.2
	2.1	<u>2</u>	<u>804</u>	41.0	<u>6.8</u>	0.4	<u>1</u>	<u>679</u>	...	<u>4.6</u>	...
Total		117	707*		5.5*		52	706		5.0	

* Mean size of males minus the seven "jacks" is 726 mm and 5.8 kg.

Table 25. Summary of Chinook, Coho and Steelhead enumerated through Karluk Lagoon Weir, 1979.

Period	Chinook		SH Kelts				Up SH		Coho	
	No.	%	No.	%	Mortalities**	%	No.	%	No.	%
May 14 - 22	47	0.5	57	1.9	7	1.9	...	...	...	...
May 23 - 29	191	2.0	81	2.7	11	3.0	...	...	...	...
May 30 - June 5	224	2.3	59	2.0	7	1.9	...	...	...	...
June 6 - 12	3,175	33.2	37	1.2	11	3.0	...	...	...	...
June 13 - 19	2,879	30.1	221	7.4	32	8.7	...	...	...	...
June 20 - 26	1,223	12.8	786	26.4	59	16.0	...	...	...	...
June 27 - July 3	798	8.4	498	16.7	57	15.4	...	...	...	...
July 4 - 10	516	5.4	550	18.5	26	7.0	...	...	...	...
July 11 - 17	161	1.7	131	4.4	13	3.5	...	...	...	...
July 18 - 24	183	1.9	175	5.9	27	7.3	...	...	...	...
July 25 - 31	39	0.4	56	1.9	24	6.5	...	...	...	...
August 1 - 7	36	0.4	101	3.4	19	5.1			2	0.0
August 8 - 14	25	0.3	57	1.9	22	6.0	2	0.2	4	0.0
August 15 - 21	17	0.2	72	2.4	19	5.1	3	0.3	333	0.7
August 22 - 28	17	0.2	38	1.3	12	3.3	20	2.1	205	0.5
August 29 - Sept. 4	21	0.2	30	1.0	3	0.8	41	4.2	254	0.6
Sept. 5 - 11	3	0.0	9	0.3	6	1.6	42	4.4	524	1.2
Sept. 12 - 18	0	...	4	0.1	5	1.4	40	4.1	4,032	8.9
Sept. 19 - 25	0	...	6	0.2	0	...	154	16.0	12,418	27.4
Sept. 26 - Oct. 2	0	...	8	0.3	8	2.2	220	22.8	19,689	43.5
Oct. 3 - 5*	0	...	4	0.1	1	0.3	443	45.9	7,801	17.2
TOTAL	9,555	100.0	2,980	100.1	369	100.1	965	100.0	45,262	100.0

* Weir pulled on October 5

** Mortalities = Spawned-out, dead steelhead washed up on weir

Table 26. Length, Age and Sex Composition of Steelhead captured by hook and line at Karluk Portage, October 29 through November 1, 1979.

Age	Brood* Year	Males				Females				Total	
		n	Percent	Length (mm)		n	Percent	Length (mm)		n	Percent
				\bar{x}	+S.D.			\bar{x}	+S.D.		
2.1	1975	11	30.6	557.4	34.1	2	6.2	647.5	135.1	13	19.1
3.1	1974	3	8.3	605.0	32.8	0	0.0	...	...	3	4.4
2.2	1974	8	22.2	689.8	65.9	9	28.1	700.6	33.5	17	25.0
3.2	1973	3	8.3	769.7	80.5	7	21.9	694.6	33.2	10	14.7
2.3	1973	1	2.8	864.0	...	0	0.0	...	...	1	1.5
2.1S1	1973	1	2.8	724.0	...	1	3.1	760.0	...	2	2.9
2.2S1	1972	0	0.0	...	...	2	6.2	740.0	4.2	2	2.9
3.1S1	1972	5	13.9	737.6	34.5	2	6.2	727.5	24.7	7	10.3
3.2S1	1971	0	0.0	...	...	1	3.1	800.0	...	1	1.5
3.1S1S1	1970	0	0.0	...	...	2	6.2	810.0	32.5	2	2.9
Regenerate		4	11.1	...	...	6	18.8	...	...	10	14.7
Total		36	100.0			32	99.8			68	99.9

* Brood Year = year adults returned to stream

Table 27. Age, Sex and Size Composition of Karluk River Chinook Salmon, 1979.

Age Class	Males						Females						Total	%
	n	%	Length (mm)		Weight (kg)		n	%	Length (mm)		Weight (kg)			
			\bar{x}	+S.D.	\bar{x}	+S.D.			\bar{x}	+S.D.	\bar{x}	+S.D.		
1.1	1	1.1	445	0.0	0.9	...	0	...	...	...	...	...	1	0.5
1.2	3	3.3	695	60.5	3.4	...	0	...	...	...	...	...	3	1.4
1.3	22	23.6	848	55.8	7.7	...	30	23.2	830	26.0	7.9	1.5	52	24.0
1.4	58	62.4	941	60.7	10.6	...	99	76.1	916	45.4	10.3	1.6	157	72.4
1.5	3	3.2	883	50.1	8.3	...	1	0.8	1020	0.0	...	...	4	1.8
													217	100.1

Table 28. Size, Age and Sex Composition of Steelhead Kelts tagged at Karluk Lagoon in June 1979.

Age	Brood* Year	Males				Females				Total	
		n	Percent	Length (mm) \bar{x}	\pm S.D.	n	Percent	Length (mm) \bar{x}	\pm S.D.	n	Percent
2.1S	1974	20	24.1	558.7	24.1	6	3.0	546.0	25.5	26	9.2
3.1S	1973	8	9.6	568.8	36.1	5	2.5	554.2	30.8	13	4.6
2.2S	1973	11	13.3	708.6	37.5	59	29.5	676.5	37.2	70	24.7
2.1SS	1973	3	3.6	683.3	22.2	0	0.0	...	...	3	1.1
3.2S	1972	23	27.7	697.0	52.1	76	38.0	675.6	30.2	99	35.0
2.1S1S	1972	3	3.6	794.3	92.8	2	1.0	696.0	58.0	5	1.8
3.1SS	1972	2	2.4	699.5	34.6	0	0.0	...	...	2	0.7
4.1S	1972	0	0.0	...	...	1	0.5	616.0	...	1	0.4
3.1S1S	1971	4	4.8	752.5	115.0	3	1.5	763.0	19.1	7	2.5
2.2S1S	1971	0	0.0	...	...	6	3.0	741.5	51.2	6	2.1
4.1S1S	1970	1	1.2	700.0	...	0	0.0	...	...	1	0.4
3.2S1S	1970	0	0.0	...	...	13	6.5	772.7	34.6	13	4.6
3.2S1S1S	1968	0	0.0	...	...	1	0.5	865.0	...	1	0.4
Regenerate		8	9.6			28	14.0			36	12.7
Total		83	99.9			200	100.0			283	100.2

* Brood Year = year adults returned to stream

Steelhead kelts (n=283) tagged and sampled at the Karluk Lagoon weir contained 13 age classes with 38 (13.4%) repeat spawners, 209 (73.9%) initial spawners, and 36 (12.7%) unageable fish. The dominant 3.2S age class (n=99, 35.0%) contained 23 males (\bar{x} ln = 697.0 mm) and 76 females (\bar{x} ln = 675.6 mm), while Age 2.2S (n=70, 24.7%) contained 11 males (\bar{x} ln = 708.6 mm) and 59 females (\bar{x} ln = 676.5 mm). All female repeat spawners (n=25) spent 1 year plus (15 or 16 months) at sea before spawning a second or third time. Five repeat male spawners returned the following fall after spawning, while eight males spent 1 year plus (15 or 16 months) at sea before returning for the second spawn.

Lake Genevieve. A total of 234 Dolly Varden, 30 coho salmon smolts and 6,211 sockeye salmon smolts were enumerated through the Lake Genevieve weir from May 8 through June 18, 1979. The sockeye smolt migration (Figure 6) peaked May 22-28 and, possibly, during early June when the weir was inoperable for 3 days due to high water. Age-growth analysis of 293 sockeye smolts indicated 171 fish (58%) were Age 1.0 (\bar{x} ln = 93.2 mm, \bar{x} wt = 6.9 g) and 122 fish (42%) were Age 2.0 (\bar{x} ln = 107.8 mm, \bar{x} wt = 10.6 g). The coho salmon smolts (n=10) were Age 3.0 with a mean length and weight of 165.3 mm and 16.6 g. The Dolly Varden sampled (n=19) averaged 164.9 mm in length with a range of 80 mm to 231 mm.

During early October, 24 adult coho salmon (18 females and 6 males) passed through the Lake Genevieve weir into the lake. Twelve of the females were spent while the other females and males were ripe or in prespawning condition.

Northeast Kodiak Island Salmon Escapement:

Peak salmon escapement estimates for 17 Kodiak Island streams (Table 29) indicated 364,460 pink salmon, 15,050 chum salmon, 60,367 sockeye salmon and 11,401 coho salmon spawned.

DISCUSSION

Lake and Stream Surveys

Afognak Lakes:

Nine of the 11 lakes surveyed on Afognak Island contained Dolly Varden populations of sufficient size to support recreational fisheries (Table 2). Lake No. 13618 was relatively shallow (3.1 m maximum depth) and subject to winter kill; consequently, fish production may be marginal and cyclic. The barren lake, No. 13611, appears ideal for fish production and should be considered for experimental stocking. However, initial survey results should be confirmed and additional physical and biological data collected to determine species of fish suitable for stocking and optimum stocking densities. Exact population parameters of the salmon and rainbow trout in lakes No. 13607, No. 13611 and No. 13622 should be determined before logging commences and the waters are subject to a sport fishery.

The physical and chemical data collected from Kodiak streams (Tables 5 and 6 and Figures 3 and 4) are impossible to correlate with annual fish produc-

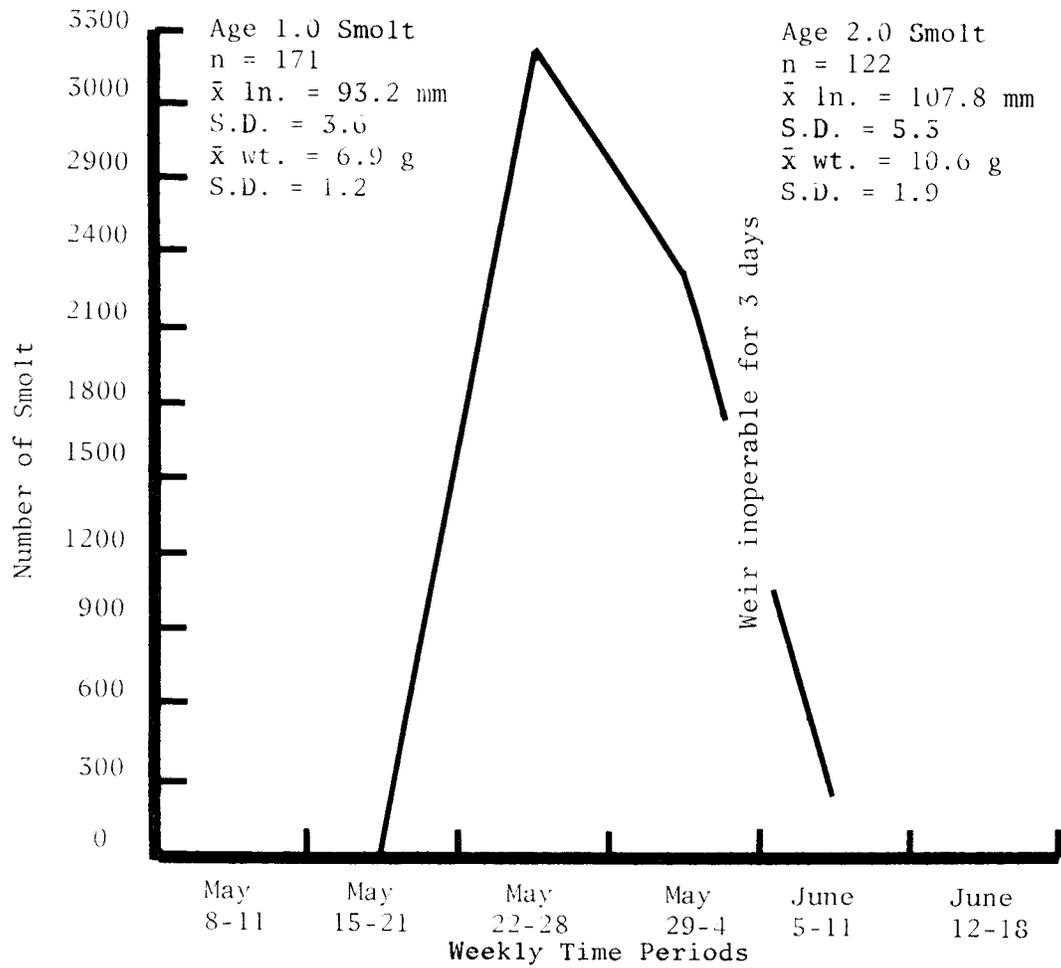


Figure 6. Sockeye Salmon Smolt Escapement Counts by Weekly Periods at Lake Genevieve Weir, 1979.

Table 29. Peak Salmon Escapement Estimates, Northeast Kodiak Island, 1979.

System	Chum Salmon		Coho Salmon		Pink Salmon		Sockeye Salmon	
	Date	Escpmt.***	Date	Escpmt.*	Date	Escpmt.***	Date	Escpmt.
American	August 31	5,000	November 7	740	August 31	45,300	NA	...
Buskin	NA	...	October 26	1,010	September 16	61,000	August 21**	5,367
Chiniak	NA	...	October 25	202	August 22	4,000	NA	...
Hurst	August 21	100	NC	...	August 1	17,000	NA	...
Kalsin	September 6	50	November 16	237	August 28	1,100	NA	...
Monashka	NA	...	November 2	75	August 17	3,000	NA	...
Myrtle	NA	...	August 22	200	August 1	60	NA	...
Olds	August 30	6,000	October 28	1,355	September 6	80,000	NA	...
Pasagshak	NA	...	October 17	1,103	August 1	5,000	August 22***	12,000
Pillar	NA	...	November 2	33	August 20	850	NA	...
Roslyn	September 9	0	October 25	1,825	September 9	11,500	NA	...
Russian	August 20	500	October 24	24	September 6	24,200	NA	...
Salonie	August 20	200	November 5	597	September 6	19,550	NA	...
Saltery	July 20	3,200	September 9	4,000	August 1	76,000	August 2***	43,000
Sargent	August 20	0	NC	...	August 20	1,400	NA	...

Table 29 (cont.). Peak Salmon Escapement Estimates, Northeast Kodiak Island, 1979.

System	Chum Salmon		Coho Salmon		Pink Salmon		Sockeye Salmon	
	Date	Escpmt.***	Date	Escpmt.*	Date	Escpmt.***	Date	Escpmt.
Twin	NA	...	NC	...	August 22	500	NA	...
#410	August 22	0	NA	...	August 22	14,000	NA	...
Total		15,050		11,401		364,460		60,367

* Foot Survey

** Boat Survey

*** Aerial Survey

NA - Not Applicable

NC - No Count

tion until stream surveys and specific fish survival information are completed and analyzed.

Rainbow Trout Brood Stock Surveys

Rainbow trout surveys of Kodiak and Afognak waters (Table 7) indicated Afognak Lake, in terms of access, available fish, and fish maturity, was the best of eight waters investigated for an experimental rainbow trout egg take or transplant.

Kodiak Lakes:

Fyke net trapping in four Kodiak area stocked lakes was successful in capturing fish to determine growth rates and the population size of landlocked coho salmon and Age I rainbow trout. Reliable population estimates were not determined for grayling, Dolly Varden, and Age II or older rainbow trout, as significant numbers of these fish were not captured. Conversely, several young fish were captured and some obviously recaptured four or five times; they became lethargic and showed signs of stress, i.e., scarred noses, split tails, etc. The conspicuous absence of Age I grayling in Abercrombie Lake and Long Lake 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 unreasonably high survival rate (101.4%) of Age 0 Pony Lake coho salmon is probably due to an error in estimating the total fish stocked. Past stocking practices have been to weigh fish and estimate the number stocked based on the number of fish per pound. Due to this possible error, all fish stocked for research purposes will be individually enumerated.

Valid conclusions that can be made from the fyke net trapping are:

1. Survival rates of all stocked fish to Age I are low; i.e., highest survival rate = 36.6% for Pony Lake coho salmon.
2. Age I landlocked coho salmon had a higher survival rate (31.5% to 36.6%) than Age I rainbow trout (8.5% to 16.1%).
3. Grayling, rainbow trout and landlocked coho salmon reach pan-size (200-250 mm or 8-10 inches) at Age I+ or II.

Development and Enhancement of Anadromous Fish

The four chinook salmon caught in Pasagshak River, plus 15 additional reported chinook salmon, indicate the 1976 (n=22,500) and 1977 (n=133,309) experimental fry plants survived. These were the first returning fish observed or reported, which is encouraging because the predicted return was only six to 60 fish based on a 0.1% to 1.0% survival of fingerling to adult. If all chinook salmon fingerling smolt at Age 2.0, as the returning adults did, the largest adult returns should occur in 1981 and 1982 rather than 1980 and 1981 as previously forecasted.

Sport Fish Harvest Estimates

1978 Kodiak Postal Survey:

The 1978 Kodiak area postal survey appeared meaningful in determining catch trends, fishing areas, species sought and catch composition for each major stream on northeast Kodiak Island; however, the actual sport fish harvest was undetermined as the Buskin River creel census, which is conducted only on odd years, was not available to determine reporting biases. Murray and Van Hulle (1975 and 1977) found negative and positive postal reporting biases in 1975 and 1977, which suggest the postal estimates are not reliable, nor do they follow a positive bias as originally assumed.

1979 Kodiak Area Postal Survey and Summary:

The 1979 Kodiak area postal surveys (Tables 15 and 16) reported catch trends, fishing areas, species sought and catch composition for Kodiak Island streams; however, a comparison of Buskin River creel and postal estimates (Table 21) indicate the postal estimates are in error by factors of 0.98 for spring Dolly Varden, 0.97 for total Dolly Varden, 2.11 for coho salmon and 1.92 for pink salmon. In summary, the postal survey was conducted concurrently with the Buskin River creel census in 1975 as an inexpensive and timely method of collecting area wide sport fish harvest data. The creel census, conducted every other year, was to be correlated with the postal census, therefore determining reporting biases and consequently used to correct reporting errors. In 1975, Murray and Van Hulle found all Buskin River postal estimates positively biased; i.e., Dolly Varden = 2.4; pink salmon = 10.0; coho salmon = 2.8; sockeye salmon = 11.2; and chum salmon = 32.0. However, in 1977, negative and positive biases were both observed (Dolly Varden = 0.58; pink salmon = 0.61; coho salmon = 2.1; and chum salmon = 29.0). The 1979 postal data (Table 21) also contained negative and positive biases which indicate postal survey estimates do not follow a set trend. The above biases coupled with the extreme biases between angler groups (e.g., 0.66 and 698.0 biases for spring Dolly Varden respectively harvested by resident and visitor anglers) indicate the postal survey is inconsistent, inaccurate and cannot be used to determine sport fish harvest estimates for Kodiak Island.

Buskin River Creel Census:

Buskin River angler effort (n=13,983 trips), Dolly Varden harvest (n=15,615) and coho salmon harvest (n=1,967) were the highest creel estimates ever recorded. The pink salmon harvest (n=3,537) was considered normal; however, the sockeye salmon harvest estimate (n=116) was incomplete as the censuses were not conducted during peak sockeye immigrations.

Spring Dolly Varden length data in Figure 5 (n=678, \bar{x} ln = 293 mm, range = 175-500 mm) were similar to data collected by Murray and Van Hulle in 1973 (n=591, \bar{x} ln = 321 mm, range = 199-505 mm) and 1975 (n=671, \bar{x} ln = 307 mm, range = 193-534 mm). Consequently, the Dolly Varden population is considered to be in a stable, healthy condition. Buskin River coho salmon age-growth data presented in Table 20 contained a normal male/female ratio and a reasonable proportion (2.7%) of jack salmon (Age 2.0 males).

United States Coast Guard Coho Salmon Derby

This was the first year age-growth and sex data were collected from coho salmon entered in the USCG Coho Salmon Derby (Table 24). Although the data are biased toward large fish and of little use in determining population characteristics, it will be useful in making future management decisions; i.e., special area closures, small bag limits, etc.

Since the object of the derby was to catch large fish, it is interesting to note that Age 2.1 male coho (\bar{x} wt = 5.7 kg) sampled during the Buskin River creel census were 0.2 kg heavier than Age 2.1 Buskin male coho salmon (\bar{x} wt = 5.5 kg) entered in the derby.

Assessment and Inventory of Anadromous Fish

Karluk River:

Fish escapements through fish counting facilities on Kodiak and Afognak Islands (Table 22) were sufficient to support the current sport fisheries (Table 23). In general, sport fishing effort was low and fish escapements were comparatively high. Effort at Karluk Lagoon dropped to 752 angler-days compared to 927 angler-days in 1978. The steelhead kelt outmigration (n=2,980) was the largest recorded since the weir was installed in 1921, and the chinook salmon escapement (n=9,555) was the third largest recorded, exceeded only in 1934 (n=9,581) and 1978 (n=9,795). The multiple age classes and repeat steelhead spawners sampled during June and October concur with 1975, 1977 and 1978 sampling data (Murray and Van Hulle, 1975, 1977 and 1978), suggesting the Karluk River steelhead run is in excellent condition. Age analysis of immigrant steelhead scales (Table 26) and kelt/steelhead scales (Table 28) confirmed 1977 and 1978 findings that postspawn fish spend 4 to 15 months of ocean residency prior to a second spawn. Generally speaking, most male and female kelts remain at sea for 15 months, while only a few males return the following fall.

Since the obscure marine annulus in Karluk steelhead kelts was not documented until 1978 (Murray and Van Hulle, 1978), all previous age data must be reevaluated, as many kelts were misaged by 1 or 2 years. If age analysis of the 2.2 SISIS female in Table 28 is correct, Karluk steelhead live to be at least 10 years of age.

Lake Genevieve:

A review of Lake Genevieve sampling data (Murray & Van Hulle, 1974-1978) indicates sockeye salmon have negotiated the fish barrier and spawned in the lake every year since 1973; however, coho salmon did not negotiate the barrier or spawn in the lake in 1973, 1974, 1977 or 1978. Consequently, adult coho salmon immigration is cyclic and undoubtedly dependent on fall rains. A comparison of 1978 (Murray and Van Hulle, 1978) and 1979 Age 1.0 sockeye salmon growth data shows the 1979 smolts were 9.4% longer (8.7 mm) and 24.5% heavier (1.7 g) than 1978 smolts. This growth increase is not explained but may be related to one or a combination of the following: (1) the absence of Age 1.0 and 2.0 coho salmon competition; and (2) loss of intraspecific competition as the sockeye salmon population may have been smaller in 1979 and 1978. In conclusion, since rainbow trout have not been

stocked for 3 years and the potential for adequate numbers of fish for future stocking remain uncertain, a recommended management alternative is to turn Lake Genevieve into coho salmon production to enhance the Buskin River sport fishery.

Northeast Kodiak Island Salmon Escapement

Peak salmon escapement counts for 17 northeast Kodiak Island streams (Table 29) were sufficient to sustain the traditional sport harvest.

ACKNOWLEDGEMENTS

We gratefully acknowledge the assistance and cooperation of the Kodiak Commercial Fisheries Division, United States Forest Service and the National Marine Fisheries Service.

LITERATURE CITED

- Van Hulle, F.D. and Murray, J.B., 1974. Inventory and cataloging of the fish and sport fish waters in southwest Alaska. Alaska Dept. of Fish and Game. Fed. Aid in Fish Restoration, Annual Report of Progress, 1973-1974, Project F-9-6, 15(G-I-B);1-21.
- Regier, H.A. and Robson, D.S., 1967. Estimating population number and mortality rates. The Biological Basis of Freshwater Fish Production, p. 31. Shelby D. Gerking (ed). Blackwell, Oxford.
- Ricker, W.E., 1970. Methods of assessment of fish production of fish in freshwater (IBP Handbook No. 3) 2nd ed. International Biological Programme, London; 126: 313 pp.
- _____, 1975. Inventory and cataloging of the fish and sport fish waters in southwest Alaska. Alaska Dept. of Fish and Game. Fed. Aid in Fish Restoration, Annual Report of Progress, 1974-1975, Project F-9-7, 16(G-I-B): 1-27.
- _____, 1976. Inventory and cataloging of the fish and sport fish waters in southwest Alaska. Alaska Dept. of Fish and Game. Fed. Aid in Fish Restoration, Annual Report of Progress, 1975-1976, Project F-9-8, 17(G-I-B): 1-34.
- _____, 1977. Inventory and cataloging of the fish and sport fish waters in southwest Alaska. Alaska Dept. of Fish and Game. Fed. Aid in Fish Restoration, Annual Report of Progress, 1976-1977, Project F-9-8, 18(G-I-B).
- _____, 1978. Inventory and cataloging of the fish and sport fish waters in southwest Alaska. Alaska Dept. of Fish and Game. Fed. Aid in Fish Restoration, Annual Report of Progress, 1977-1978, Project 19(G-I-B): 1-41.

_____, 1979. Inventory and cataloging of the fish and sport fish waters in southwest Alaska. Alaska Dept. of Fish and Game. Fed. Aid in Fish Restoration, Annual Report of Progress, 1978-1979, Project 20(G-I-B): 1-47.

Prepared by:

Approved by:

John B. Murray
Fishery Biologist

Rupert E. Andrews, Director
Division of Sport Fish

Frank Van Hulle
Area Management Biologist

Mark C. Warner, Ph.D.
Sport Fish Research Chief