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MONTANA STATE DEPARTMENT OF FISH AND GAME
FEDERAL AID IN FISH RESTORATION SECTION
HELENA, MONTANA

JOB COMPLETION REPORT
INVESTIGATIONS PROJECTS

State of Montana

Project No. F-12-R-2 Job No. II-A

Title of Job: Comparisons of Fish Populations of Six Clearwater Lakes

Abstract:

The six main Clearwater Lakes were netted simultaneously by six survey crews on June 5-10, 1955. All crews followed the same daily schedule. All fish captured were counted, weighed and measured and scale samples were taken from up to fifty individuals of each species. Scale samples were mounted, aged and analyzed for rate of growth.

Comparison of lakes were made by catch per net night of species and by growth rates of species. Data is presented by fiducial intervals of catch per net night at the 80, 90 and 95 percent levels and of calculated lengths at each annulus formation at the 95 percent level.

Indications of daily and seasonal catch variations between lakes are shown to demonstrate the necessity of netting all the lakes at the same time in order to minimize these variations.

It is recommended that this job be repeated in 1956 and that small fish collections be made to aid in the age and growth analysis. It is further recommended that a life history study of the squawfish and Columbia River chub in this drainage be considered when funds and personnel permit.

Objectives:

To obtain the best possible figures on the present fish populations in the main Clearwater Lakes--Salmon, Seeley, Placid, Inez, Alva and Rainy--as a basis for the evaluation of future management measures on these lakes. Specifically, to obtain indices of relative abundance and rates of growth of the various species of fish in the Clearwater Lakes.

Techniques Used:

During the week of May 29-June 4, 1955, one crew made an overnight set in Salmon, Seeley, Placid, Inez and Alva Lakes using one 250-foot and two 125-foot nylon experimental gill nets in each lake. In each of the lakes the 250-foot net was set deep (over 50 feet) and the two 125-foot nets were set shallow (less than 35 feet). All fish captured were weighed and measured, and scale samples were taken from some of the least numerous species to add to those from the later collections. This catch data (presented in Table I) was used to determine the best areas in which to set during the regular netting and was not included with the data from the later netting.

TABLE I

Comparison of Deep to Shallow Sets by Lake -- Preliminary Netting

Lake	No. & Size of Nets	Depth of Set	RB X CT	DV	EB	KOK	WF	SQ	CRC	FSu	CSu	YP	PS	Total Fish
Salmon	1 - 250'	55' - 55'	0	0	0	0	0	2	1	0	0	0	0	3
	2 - 125'	6' - 20' 6' - 35'	0	1	10	0	0	24	40	11	3	147	0	236
Seeley	1 - 250'	75' - 80'	0	0	0	0	0	1	0	0	0	0	0	1
	2 - 125'	20' - 25' 7' - 25'	0	1	0	0	3	21	11	0	4	5	0	45
Placid	1 - 250'	65' - 65'	0	2	0	0	0	0	3	0	0	0	0	5
	2 - 125'	8' - 15' 10' - 20'	0	2	1	2	17	7	33	5	0	0	1	68
Inez	1 - 250'	50' - 55'	0	0	0	0	5	1	0	0	0	0	0	6
	2 - 125'	18' - 23' 6' - 11'	0	0	0	3	9	21	12	1	3	9	2	60
Alva	1 - 250'	55' - 70'	0	0	0	0	0	3	0	0	0	0	0	3
	2 - 125'	6' - 29' 15' - 22'	1	1	0	0	10	8	22	3	0	1	0	46

It is apparent that at the time of year this netting was done, the shallow water sets consistently captured more fish of the same kinds than did the deep water sets. Therefore, the crews on the regular netting project were instructed to make shallow water sets only.

On June 5, six two-man crews assembled in the Seeley Lake area with netting equipment, and the first net sets were made before dark. Nets were lifted and re-set on June 6, 7, 8 and 9 and were lifted and removed on June 10. Pertinent data on each set was recorded on Montana's standard netting forms and the location of each set was marked on a large scale outline map of each lake. All nets used were of the nylon experimental type which consist of five equal sections of one and one-half, two, two and one-half, three and four inch stretch measure mesh. Twenty of the nets were 125 feet long and two were 250 feet. The following number and size of nets were used in each lake: Salmon, four 125-foot; Seeley, five 125-foot; Placid, five 125-foot; Inez, three, 125-foot and one 250-foot; Alva, three 125-foot and one 250-foot; Rainy, two 125-foot. The 250-foot nets were added to Alva and Inez in an attempt to gain some information on comparison of catches between the two sizes and to increase the size of the fish sample from the two lakes upon which the most differing management measures are expected to be applied.

The following daily schedule was used by all crews: Nets were lifted, all fish were worked, nets were mended when necessary and nets were re-set. All fish captured were counted, weighed and measured and scale samples were taken from up to fifty individuals of each species, except squawfish from which one hundred samples were taken. Fifty of the squawfish samples from each lake were sent to the U. S. Fish and Wildlife Service in Portland, and all other scale samples were mounted at the Department's fishery laboratory. Readable scales were aged and tabbed, and growth rates were calculated.

Findings:

Following is a list of abbreviations used on the tables in this report, common names and scientific names of the species of fish taken during the netting project:

Abbreviation	Common Name	Scientific Name
CT	Cutthroat trout	*Salmo clarkii*
EB	Eastern brook trout	*Salvelinus fontinalis*
RB	Rainbow trout	*Salmo gardnerii*
DV	Dolly Varden trout	*Salvelinus malma*
KOK	Kokanee	*Oncorhynchus nerka*
WF	Mountain whitefish	*Prosopium williamsoni*
SQ	Squawfish	*Ptychocheilus oregonensis*
CRC	Columbia River chub	*Mylocheilus caurinus*
FSu	Fine-scaled sucker	*Catostomus catostomus*
CSu	Coarse-scaled sucker	*Catostomus macrocheilus*
YP	Yellow perch	*Perca flavescens*
PS	Pumpkinseed sunfish	*Lepomis gibbosus*
RSh	Red-sided shiner	*Richardsonius balteatus*
LMB	Largemouth bass	*Micropterus salmoides*

Growth Rates

The calcualted length at each annulus formation and number of fish in each age group sample are shown by species on Tables II through XII. It is apparent that the sample size is not large enough for some species to warrant statistical analysis of all the growth data. For the species from which the sample size was in general over 30 for most lakes sigma and the plus and minus fiducial interval (by the procedure descibed on page 64, Snedecore, 1946) at the 95 percent level were computed through the age groups which had in general at least ten samples remaining. These species were squawfish, Columbia River chub, fine-scaled sucker, whitefish and yellow perch. In addition, the same analysis were applied to the growth rate of the Dolly Varden, the most numerous trout in the catch. These fiducial intervals are compared by lakes on Tables XIII through XVIII.

TABLE II

Cutthroat

Average Calculated Length at Each Annulus Formation and Number of Samples by Lake

Lake		I	II	III	IV	V
Salmon	No.	1	1	1	1	
	Av. L.	2.6	5.7	9.2	12.0	
Seeley	No.	22	22	22	13	
	Av. L.	2.4	4.7	8.9	11.4	
Placid	No.	5	5	5	5	2
	Av. L.	2.7	5.4	8.7	11.2	12.5
Inez	No.	4	4	4	1	
	Av. L.	2.6	5.4	7.6	9.5	
Alva	No.	8	8	7	5	
	Av. L.	2.7	5.7	8.6	12.3	
Rainy	No.	6	6	6	4	3
	Av. L.	2.4	4.9	8.2	10.0	12.2

TABLE III

Dolly Varden

Average Calculated Length at Each Annulus Formation and Number of Samples by Lake

Lake		I	II	III	IV	V	VI	VII
Salmon	No.	8	8	8	8	4	3	3
	Av. L.	2.5	4.7	6.9	9.5	13.7	18.4	21.7
Seeley	No.	35	35	35	31	14	2	
	Av. L.	3.0	5.6	8.5	11.4	14.3	18.5	
Placid	No.	25	25	25	25	15	2	1
	Av. L.	3.0	5.5	8.7	11.8	15.0	18.2	23.0
Inez	No.	14	14	14	13	7	2	
	Av. L.	3.0	5.7	8.1	10.8	13.3	16.2	
Alva	No.	12	12	12	12	4	1	
	Av. L.	2.7	5.3	7.8	10.7	13.2	16.5	
Rainy	No.	9	9	9	9	4	1	1
	Av. L.	2.7	5.1	7.9	10.9	13.7	19.0	22.0

TABLE IV

Kokanee

Average Calculated Length at Each Annulus Formation and Number of Samples by Lake

None Taken in Salmon, Alva and Rainy

Lake		I	II	III	IV
Seeley	No.	21	21	11	
	Av. L.	3.3	8.2	11.2	
Placid	No.	8	8	4	2
	Av. L.	2.8	6.8	9.3	10.7
Inez	No.	6	6	2	
	Av. L.	3.4	7.8	9.7	

TABLE V

Eastern Brook

Average Calculated Length at Each Annulus Formation and Number of Samples by Lake

Taken in Placid Only

Lake		I	II	III	IV	V
Placid	No.	15	15	15	13	6
	Av. L.	2.8	5.5	8.4	11.1	14.5

TABLE VI

Whitefish

Average Calculated Length at Each Annulus Formation and Number of Samples by Lake

Lake		I	II	III	IV	V	VI	VII
Salmon	No.	50	50	48	18	1		
	Av. L.	3.7	8.2	10.3	11.3	12.6		
Seeley	No.	47	47	45	19			
	Av. L.	3.4	7.6	9.9	10.8			
Placid	No.	52	52	42	26	5	2	
	Av. L.	4.0	7.8	9.5	10.8	12.3	13.3	
Inez	No.	48	48	35	13	1		
	Av. L.	3.6	7.2	9.0	9.9	11.5		
Alva	No.	54	54	46	30	10	1	1
	Av. L.	4.0	7.8	9.7	10.7	11.8	13.1	14.0
Rainy	No.	52	52	36	9			
	Av. L.	3.9	6.9	8.5	9.4			

TABLE VII

Squawfish

Average Calculated Length at Each Annulus Formation and Number of Samples by Lake

Lake		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV
Salmon	No.	49	49	49	49	49	44	20	8	3	3	1			
	Av. L.	1.8	3.3	4.7	6.2	7.4	8.7	10.0	12.5	15.7	17.4	20.4			
Seeley	No.	47	47	47	46	39	34	18	7	2	1	1			
	Av. L.	2.1	3.9	5.8	7.4	8.9	10.4	11.8	12.8	15.3	17.7	19.1			
Placid	No.	51	51	51	51	49	34	7	7	3	2	1			
	Av. L.	2.0	3.9	5.9	7.9	9.6	11.3	12.9	14.4	15.2	17.7	19.3			
Inez	No.	44	44	44	44	43	38	29	21	14	6	4	3		
	Av. L.	1.9	3.4	5.1	6.7	8.2	9.7	11.4	12.9	14.3	16.2	17.5	18.4		
Alva	No.	46	46	46	46	46	45	31	22	11	8	6	5	3	
	Av. L.	1.7	3.1	4.6	6.1	7.6	9.0	10.8	12.5	14.0	15.7	17.1	18.3	19.5	
Rainy	No.	52	52	52	52	52	51	46	15	8	5	3	2	1	1
	Av. L.	1.6	3.0	4.5	5.8	7.2	8.4	9.6	12.1	13.6	15.2	16.1	17.2	17.1	18.4

TABLE VIII

Columbia River Chub

Average Calculated Length at Each Annulus Formation and Number of Samples by Lake

Lake		I	II	III	IV	V	VI	VII	VIII	IX
Salmon	No.	50	50	50	48	43	18	4		
	Av. L.	2.5	4.6	6.6	8.3	9.6	10.9	11.9		
Seeley	No.	43	43	43	38	34	18	5		
	Av. L.	2.4	4.8	7.0	8.7	10.3	11.6	12.3		
Placid	No.	53	53	53	47	46	35	15	3	1
	Av. L.	2.4	4.5	6.5	8.2	9.6	10.8	12.0	13.0	13.8
Inez	No.	31	31	31	28	27	22	12	4	1
	Av. L.	2.3	4.5	6.6	8.5	9.9	11.3	12.3	13.2	13.5
Alva	No.	32	32	32	31	31	19	7		
	Av. L.	2.0	3.8	5.6	7.2	8.7	10.0	11.1		
Rainy	No.	34	34	34	34	34	27	9	1	
	Av. L.	2.0	3.7	5.5	7.2	8.7	10.0	11.1	12.6	

TABLE IX

Fine-scaled Sucker

Average Calculated Length at Each Annulus Formation and Number of Samples by Lake

Lake		I	II	III	IV	V	VI	VII	VIII
Salmon	No.	48	48	48	44	35	27	8	
	Av. L.	1.9	4.2	6.8	9.3	11.0	12.6	13.5	
Seeley	No.	50	50	49	47	40	30	14	1
	Av. L.	2.0	4.9	8.2	11.0	13.2	15.1	16.9	18.9
Placid	No.	39	39	39	38	35	19	6	
	Av. L.	1.9	5.0	8.7	11.9	14.0	15.6	16.8	
Inez	No.	45	45	45	19	14	9	3	
	Av. L.	1.6	4.4	7.5	9.6	12.0	13.9	15.2	
Alva	No.	43	43	43	40	35	31	24	13
	Av. L.	1.6	3.5	6.0	8.2	10.2	12.1	13.7	15.0
Rainy	No.	37	37	37	34	31	27	18	4
	Av. L.	1.6	3.5	5.7	8.0	10.0	11.9	13.1	14.3

TABLE X

Coarse-scaled Sucker

Average Calculated Length at Each Annulus Formation and Number of Samples by Lake

Lake		I	II	III	IV	V	VI	VII	VIII	IX
Salmon	No.	48	48	48	47	42	36	14	4	1
	Av. L.	1.8	3.8	6.0	8.0	9.8	11.4	12.8	16.7	17.0
Seeley	No.	41	41	41	38	33	24	16	10	2
	Av. L.	1.8	3.9	6.7	9.5	12.0	14.1	16.0	17.3	19.0
Placid	No.	9 samples taken 15.8" -- 21.2" T.L. not readable								
Inez	No.	20	20	20	17	15	11	6	2	
	Av. L.	1.7	3.6	6.1	8.2	10.2	12.1	14.2	16.7	
Alva	No.	10	10	10	10	10	6	5	2	
	Av. L.	1.7	3.6	5.5	7.8	9.7	11.1	13.3	16.7	
Rainy	No.	26	26	26	26	25	23	18	12	5
	Av. L.	1.6	3.3	5.2	7.1	9.0	10.8	12.8	14.2	15.7

TABLE XI

Yellow Perch

Average Calculated Length at Each Annulus Formation and Number of Samples by Lake

None Taken in Placid

Lake		I	II	III	IV	V	VI	VII	VIII	IX	X
Salmon	No.	51	51	51	51	43	34	6			
	Av. L.	1.6	3.3	4.4	5.3	5.8	6.2	6.7			
Seeley	No.	50	50	50	50	46	38	17	1		
	Av. L.	1.3	2.7	3.9	5.0	5.8	6.7	7.3	9.2		
Inez	No.	49	49	49	48	43	28	14			
	Av. L.	1.4	2.8	4.2	5.3	6.1	6.8	7.8			
Alva	No.	5	5	5	5	5	2	1	1	1	
	Av. L.	1.2	2.4	3.6	4.8	6.0	6.5	8.1	9.2	10.0	
Rainy	No.	9	9	9	9	9	8	3	3	2	1
	Av. L.	1.6	3.0	4.5	5.4	6.2	6.9	8.2	8.7	8.8	9.0

TABLE XII

Pumpkinseed Sunfish

Average Calculated Length at Each Annulus Formation and Number of Samples by Lake

None Taken in Alva and Rainy

Lake		I	II	III	IV	V	VI	VII	VIII	IX
Salmon	No.	4	4	4	4	4	2	1		
	Av. L.	1.0	2.2	3.3	4.3	5.4	5.4	5.8		
Seeley	No.	33	33	33	33	31	27	17	8	1
	Av. L.	0.9	2.0	3.3	4.7	5.7	6.4	6.8	7.2	7.3
Placid	No.	35	35	35	27	18	4			
	Av. L.	0.9	2.1	3.5	4.6	5.9	6.7			
Inez	No.	2	2	2	2	2	2	2	2	2
	Av. L.	1.2	2.5	3.7	4.7	5.5	6.0	6.4	6.8	7.2

TABLE XIII

Dolly Varden

Comparison by Lakes of Fiducial Intervals at 95% Level for Calculated Length at Each Annulus Formation

Lake	Annulus					
	I	II	III	IV	V	VI
Salmon	2.1-2.9	3.8-5.6	5.8-8.0	7.8-11.2	-- --	-- --
Seeley	2.8-3.2	5.3-5.9	8.1-8.6	10.8-12.0	13.2-15.4	-- --
Placid	2.8-3.2	5.2-5.8	8.3-9.1	11.3-12.3	14.3-15.7	-- --
Inez	2.8-3.2	5.5-5.9	7.7-8.5	10.1-11.5	-- --	-- --
Alva	2.4-3.0	4.8-5.8	7.4-8.2	10.0-11.4	-- --	-- --
Rainey	2.4-3.0	4.7-5.5	7.2-8.6	9.8-12.0	-- --	-- --

TABLE XIV

Squawfish

Comparison by Lakes of Fiducial Intervals at 95% Level for Calculated Length at Each Annulus Formation

Lake	Annulus							
	I	II	III	IV	V	VI	VII	VIII
Salmon	1.7-1.9	3.2-3.4	4.5-4.9	6.0-6.4	7.2-7.6	8.5-9.0	9.3-10.7	-- --
Seeley	2.0-2.2	3.8-4.0	5.6-6.0	7.2-7.6	8.7-9.1	10.1-10.7	11.3-12.3	-- --
Placid	1.9-2.1	3.8-4.0	5.7-6.1	7.7-8.1	9.5-9.7	11.1-11.5	-- --	-- --
Inez	1.8-2.0	3.3-3.5	4.9-5.3	6.5-6.9	8.0-8.4	9.4-10.0	11.1-11.7	12.5-13.3
Alva	1.6-1.8	3.0-3.2	4.5-4.7	5.9-6.3	7.4-7.8	8.8-9.2	10.5-11.1	12.2-12.8
Rainy	1.5-1.7	2.9-3.1	4.4-4.6	5.6-6.0	7.0-7.4	8.2-8.6	9.3-9.9	11.7-12.5

TABLE XV

Columbia River Chub

Comparison by Lakes of Fiducial Intervals at 85% Level for Calculated Length at Each Annulus Formation

Lake	Annulus					
	I	II	III	IV	V	VI
Salmon	2.4-2.6	4.5-4.7	6.4-6.8	8.1-8.5	9.4-9.8	10.6-11.2
Seeley	2.3-2.5	4.7-4.9	6.9-7.1	8.6-8.8	10.1-10.5	11.3-11.9
Placid	2.3-2.5	4.4-4.6	6.4-6.6	8.0-8.4	9.5-9.7	10.6-11.0
Inez	2.2-2.4	4.3-4.7	6.3-6.9	8.2-8.8	9.6-10.2	11.0-11.6
Alva	1.9-2.1	3.6-4.0	5.4-5.8	7.0-7.4	8.5-8.9	9.7-10.3
Rainy	1.9-2.1	3.6-3.8	5.3-5.7	7.0-7.4	8.5-8.9	9.7-10.3

TABLE XVI

Fine-scaled Sucker

Comparison by Lakes of Fiducial Intervals at 95% Level for Calculated Length at Each Annulus Formation

Lake	Annulus						
	I	II	III	IV	V	VI	VII
Salmon	1.8-2.0	4.0-4.4	6.5-7.1	9.0-9.6	10.7-11.3	12.2-13.0	-- --
Seeley	1.9-2.1	4.6-5.2	7.8-8.6	10.6-11.4	12.7-13.7	14.6-15.6	16.2-17.6
Placid	1.8-2.0	4.8-5.2	8.3-9.1	11.5-12.3	13.6-14.4	15.1-16.1	-- --
Inez	1.5-1.7	4.2-4.6	7.3-7.7	9.1-10.1	11.5-12.5	13.1-14.7	-- --
Alva	1.5-1.7	3.3-3.7	5.7-6.3	7.8-8.6	9.8-10.6	11.7-12.5	13.2-14.2
Rainy	1.5-1.7	3.3-3.7	5.5-5.9	7.8-8.2	9.7-10.3	11.6-12.2	12.9-13.3

TABLE XVII

Whitefish

Comparison by Lakes of Fiducial Intervals at 95% Level for Calculated Length at Each Annulus Formation

Lake	Annulus			
	I	II	III	IV
Salmon	3.6-3.8	8.0-8.4	10.1-10.5	11.0-11.6
Seeley	3.2-3.6	7.3-7.9	9.6-10.2	10.3-11.3
Placid	3.8-4.2	7.6-8.0	9.3- 9.7	10.5-11.1
Inez	3.4-3.8	7.0-7.4	8.8- 9.2	9.6-10.2
Alva	3.9-4.1	7.6-8.0	9.5- 9.9	10.4-11.0
Rainy	3.8-4.0	6.7-7.1	8.3- 8.7	8.8-10.0

TABLE XVIII

Yellow Perch

Comparison by Lakes of Fiducial Intervals at 95% Level for Calculated Length at Each Annulus Formation

Lake	Annulus						
	I	II	III	IV	V	VI	VII
Salmon	1.5-1.7	3.2-3.4	4.3-4.5	5.2-5.4	5.7-5.9	6.0-6.4	-- --
Seeley	1.2-1.4	2.6-2.9	3.7-4.1	4.8-5.2	5.6-6.0	6.4-7.0	6.9-7.7
Inez	1.3-1.5	2.7-2.9	4.1-4.3	5.1-5.5	5.9-6.3	6.4-7.2	7.1-8.5

Indices of Relative Abundance

The total catches by number of species and the numbers of 125-foot overnight net sets made are shown for each lake on Table XIX. From this data, the catch per net night was computed for the following species: Cutthroat trout, Dolly Varden trout, kokanee, mountain whitefish, squawfish, Columbia River chub, fine-scaled sucker, coarse-scaled sucker, yellow perch and pumpkinseed sunfish.

This is the average catch per overnight set with a 125-foot net. No consideration was given to the slight variations in the daily hours of set, because approximately the same daily schedule was followed on all lakes and all sets concerned were fished through the morning and evening periods. The plus and minus fiducial intervals at the 80, 90 and 95 percent levels of these catch figures are presented in Tables XX, XXI, and XXII, respectively. Because individual catches are extremely variable, and consequently, the fiducial intervals of the average catches are large, it is felt that comparisons should most likely be considered at the 80 percent probability level. This is the same level used by Moyle (1950) in comparison of Minnesota gill net catches.

TABLE XIX

125-FOOT OVERNIGHT NET SETS
CLEARWATER LAKES, JUNE 5-10, 1956

TOTAL CATCHES BY NUMBERS OF SPECIES

Lake	No. of Sets	CT	EB	RB	CT x RB	DV	KOK	WF	SQ	CRC	FSu	CSu	YP	PS	RSh	LMB	Total
Salmon	20	1	0	0	0	7	0	52	170	110	56	49	323	5	2	0	775
Seeley	25	23	0	2	0	35	21	111	185	276	56	37	85	35	1	0	867
Placid	25	5	14	0	0	23	6	178	49	298	37	9	0	34	0	1	654
Inez	15	2	0	0	1	4	3	104	90	14	43	6	25	0	0	0	292
Alva	16	7	0	0	0	9	0	45	83	12	35	8	4	0	0	0	203
Rainy	9	5	0	0	0	8	1	84	49	23	33	21	8	0	0	0	232
TOTAL		43	14	2	1	86	31	574	626	733	260	130	445	74	3	1	3023

TABLE XX

Comparison of Lakes of Fiducial Intervals at 80% Level for Catch Per Net Night by Numbers of Species

LAKE	CT	DV	KOK	WF	YP	PS	SQ	CRC	FSu	CSu
Salmon	0.0-0.2	0.2-0.6	-- --	1.6-3.6	11.0-21.4	0.1-0.5	6.1-10.9	3.3-7.7	1.9-3.9	1.2-3.8
Seeley	0.6-1.2	1.0-1.8	0.5-1.1	3.4-5.4	2.3-4.5	0.9-1.9	6.3-8.5	9.2-12.8	1.6-2.8	1.1-1.9
Placid	0.1-0.3	0.7-1.1	0.1-0.3	5.7-8.5	-- --	0.8-2.0	1.6-2.4	8.9-14.9	0.9-2.1	0.2-0.6
Inez	0.0-0.2	0.1-0.5	0.1-0.3	5.0-8.8	0.7-2.7	-- --	4.2-7.6	0.5-1.3	1.4-4.4	0.2-0.6
Alva	0.1-0.7	0.3-0.9	-- --	0.8-3.0	0.1-0.5	-- --	3.8-6.6	0.4-1.2	1.5-2.9	0.2-0.8
Rainy	0.2-1.0	0.4-1.4	0.0-0.3	6.8-11.8	0.5-1.3	-- --	3.6-7.2	1.2-4.0	2.3-5.1	1.2-3.4

TABLE XXI

Comparison by Lakes of Fiducial Intervals at 90% Level for Catch per Net Night by Numbers of Species

Lake	CT	DV	KOK	WF	YP	PS	SQ	CRC	FSu	CSu
Salmon	0.0-0.2	0.1-0.7	-- --	1.2-4.0	9.4-23.0	0.1-0.5	5.3-11.7	2.7-8.3	1.4-4.4	0.8-4.2
Seeley	0.5-1.4	0.8-2.0	0.4-1.2	3.0-5.8	2.0-4.8	0.7-2.1	5.9-8.9	8.7-13.3	1.5-2.9	1.0-2.0
Placid	0.1-0.3	0.6-1.2	0.1-0.3	5.3-9.1	-- --	0.6-2.2	1.4-2.6	8.0-15.8	0.8-2.2	0.1-0.7
Inez	0.0-0.3	0.0-0.6	0.1-0.5	4.4-9.4	1.4-3.0	-- --	3.9-8.1	0.4-1.4	0.9-4.9	0.1-0.7
Alva	0.0-0.8	0.2-1.0	-- --	1.3-4.3	0.0-0.6	-- --	3.4-7.0	0.2-1.4	1.3-3.1	0.1-0.9
Rainy	0.1-1.1	0.2-1.6	0.0-0.3	6.0-14.6	0.3-1.5	-- --	3.0-7.8	0.8-4.4	1.8-5.6	0.8-3.8

TABLE XXII

Comparison by Lakes of Fiducial Intervals at 95% Level for Catch per Net Night by Numbers of Species

Lake	CT	DV	KOK	WF	YP	PS	SQ	CRC	FSu	CSu
Salmon	0.0-0.2	0.1-0.7	-- --	1.0-4.2	8.0-24.4	0.1-0.5	4.7-12.3	2.1-8.9	1.4-4.4	0.5-4.5
Seeley	0.5-1.3	0.7-2.1	0.3-1.3	2.8-6.0	1.7-5.1	0.5-2.3	5.6-9.2	8.2-13.8	1.3-3.1	0.9-2.1
Placid	0.0-0.4	0.6-2.2	0.0-0.4	5.0-9.4	-- --	0.4-2.4	1.3-2.7	7.2-16.6	0.6-2.4	0.0-0.8
Inez	0.0-0.3	0.0-0.6	0.0-0.6	3.9-9.9	0.2-3.2	-- --	3.2-8.6	0.2-1.6	0.4-5.4	0.0-0.8
Alva	0.0-0.9	0.2-1.0	-- --	1.0-4.6	0.0-0.7	-- --	3.0-7.4	0.1-1.5	1.1-3.3	0.1-0.9
Rainy	0.0-1.3	0.0-1.8	0.0-0.4	5.2-13.4	0.2-1.6	-- --	2.4-8.4	0.4-4.8	1.3-6.1	0.4-4.2

Indications of Daily and Seasonal Catch Variations

Because this job was designed to equalize the effect of daily catch variations on all the lakes and to eliminate the effect of seasonal variations, an attempt was made to analyze the data to indicate such variations. This was done in order to demonstrate better the necessity of setting up this particular netting schedule to obtain the best comparative catch figures between the six lakes.

Figure 1 shows the percent of the total catch taken in each daily lift for each of the six lakes. It is realized that differences in relative locations between sets in different lakes might tend to mask any weather effect on the catch. However, note that while from the 6th through the 8th, no general trend is indicated, from the 8th to the 9th there was a decided decline in catch on all lakes, and from the 9th to the 10th there was a sharp increase in catch on four lakes, a lesser increase on one and a small decrease on only one.

Table 23 shows the percent rough and percent game fish in the catches of 1954 (from job completion report I-A, project F-12-R-1) and 1955, along with dates of survey. Note that in 1954, the two upper lakes (Alva and Inez), which were netted in July showed a higher percentage of game fish than did the three lower lakes, which were netted in June. Because this same grouping is not apparent in the 1955 catch, it is assumed that the 1954 differences were due more to the season of the year than to an actual difference in populations in the two groups of lakes.

It is felt that these indications of daily and seasonal catch variations amply indicate the need of a netting program as was used in 1955 to reduce the effect of such variations on comparative catch figures.

Recommendations:

A large number of individual comparisons between lakes are possible, both by growth rates and catch per net night of species. By themselves, these comparisons mean little at present to the management of the lakes. They will have value for management evaluation when this project is repeated in the future, and change (or lack of change) in the comparisons is noted. Therefore, it is not felt that a detailed discussion of these comparisons is necessary at this time.

Because it would be impossible to schedule this job for the same phenotypical time of year and the same kind of weather as was encountered in 1955, it is not intended to compare the same lakes in different years. Comparisons will be made on the basis of the relationship of one lake to the others in one year to that same relationship in a later year.

In order to evaluate better such comparisons, it is felt that it would be well to have two years' data at the outset. Therefore, it is recommended that this netting job be repeated in 1956 with the following changes:

1. Scale samples should be taken only from those species from which less than 50 samples were taken last year, to a total of 50 samples for both years. Samples where certain size groups are low or missing should be noted and crews informed so that needed size samples can be collected if they are encountered this year.

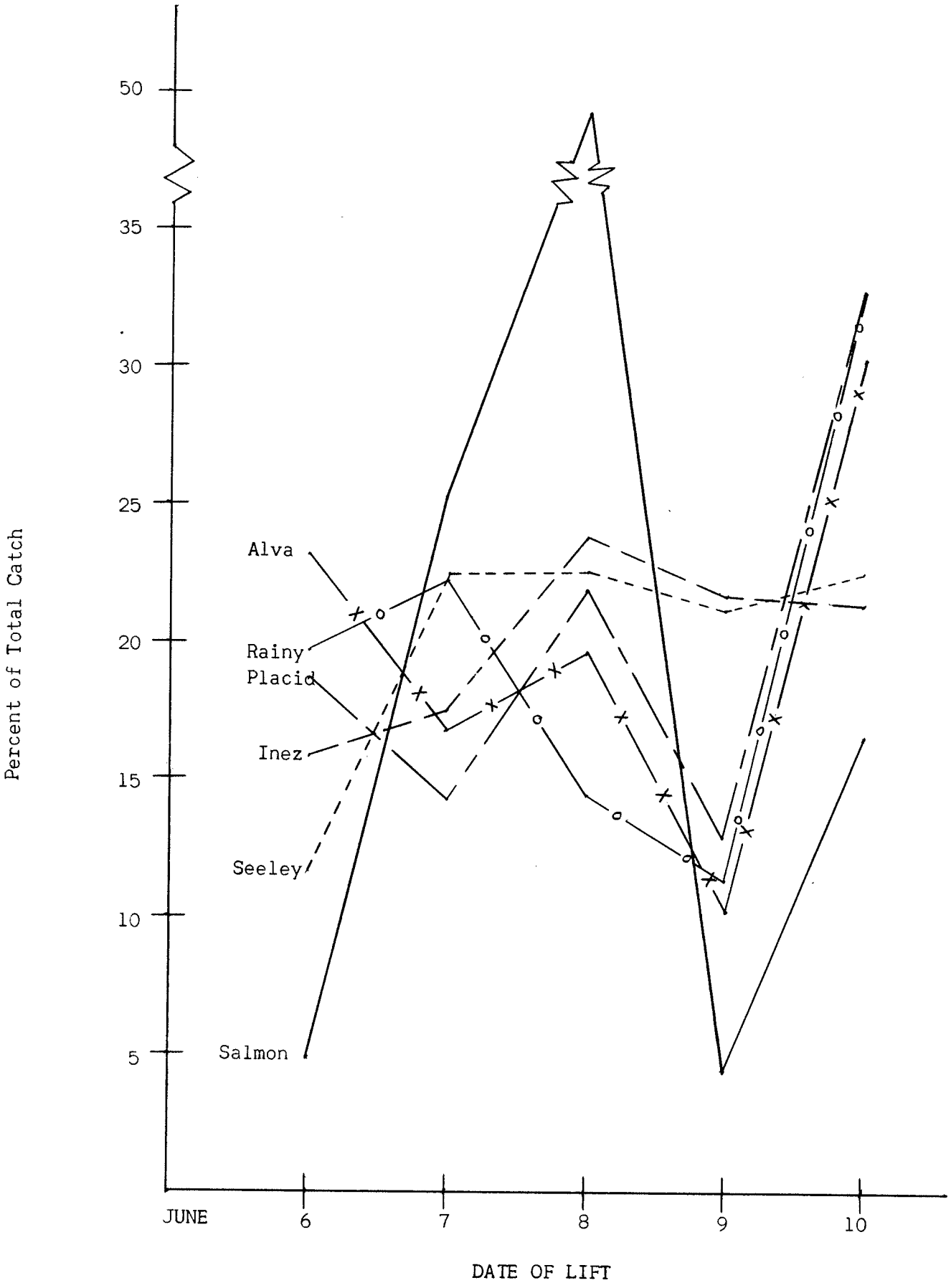

FIGURE NO. 1 -- Percent of Total Catch by Days of Lift on Each Lake

TABLE XXIII

Comparison by Lakes of the Percentage of Rough and Game Fish in the 1954 and 1955 Net Catches

Lake	1954				1955			
	No. of Sets	Date	% Rough Fish	% Game Fish	No. of Sets	Date	% Rough Fish	% Game Fish
Salmon	4	6/8,9	83.8	16.2	20	6/5,10	84.7	15.3
Seeley	3	6/10,11	84.2	15.8	25	6/5,10	81.3	18.7
Placid	3	6/9,10	85.2	14.8	25	6/5,10	70.3	29.7
Inez	3	7/8,9	54.8	45.2	15	6/5,10	76.9	23.1
Alva	4	3 on 7/9,10 1 on 11/14	50.8	49.2	16	6/5,10	77.0	23.0

2. Because several of the species concerned have little recorded on their growth rates and life histories, interpretations of scale markings was sometimes difficult. To aid in the growth analysis, small fish collections should be made either during the regular netting or by a special crew later in the season. Present scale readings should be re-evaluated after growth rates of small fish have been analyzed.

The two species most numerous in the catches from these lakes are the squawfish and the Columbia River chub. Therefore, if any partial or complete control measures are ever attempted in this drainage, they should probably be directed toward one or both of these fish. Very little information is available on either the squawfish or chub in general and practically nothing is available in this drainage. Therefore, it is apparent that information on their life histories, especially concerning their times and places of spawning, would be of value to the management of the fishery of this drainage. Such a study would be beyond the scope of this job, and because it would entail a full season or several season's work in just one part of the district, it should not be attempted by the project leader alone. However, it is recommended that when suitable assistance is available in the Western District, a life history study on these species in the Blackfoot drainage be set up.

Summary:

1. Comparison of deep to shallow sets made in five of the Clearwater Lakes just prior to the regular netting schedule showed that shallow sets took more fish of the same kinds than did the deep water sets. From June 5-10, six two-man crews made five overnight sets in the six main Clearwater Lakes. The following number of nets were used in each lake: Salmon, four 125-foot; Seeley, five 125-foot; Placid, five 125-foot; Inez, three 125-foot, and one 250-foot; Alva, three 125-foot, and one 250-foot; Rainy, two 125-foot. All crews were under the direction of fishery personnel familiar with lake survey methods and each crew followed the daily schedule of lifting

nets, working fish, mending nets when necessary, and re-setting nets. Sets progressed around the littoral zones of the lakes and their locations were marked on outline maps of the lakes.

2. All fish captured were counted, weighed and measured and scale samples were taken, in general, from up to fifty individuals of each species. All scale samples taken were mounted and all readable mounts were aged and tabbed for growth rate analysis. Three thousand twenty-three fish were taken in the 125-foot overnight sets. From these, 1,770 scale samples were taken and mounted, of which 1,692 samples were analyzed for age and rate of growth.

3. The total catch of all species and the average calculated lengths at annulus formation for all but the two rainbow, two redsided shiners and one rainbow-cutthroat hybrid are given by lakes in Tables II through XII and Table XIX. These data were summarized for comparison of lakes by catch per net night of cutthroat, Dolly Varden, kokanee, whitefish, yellow perch, pumpkinseed sunfish, squawfish, Columbia River chub, fine-scaled sucker and coarse-scaled sucker; and by average length at each annulus formation for Dolly Varden, whitefish, fine-scaled sucker, Columbia River chub, squawfish, and yellow perch. Fiducial intervals (obtained by the procedure described of page 64 in Snedecore, 1946) were computed at the 80,90 and 95 percent levels for catch per net night, and at the 95 percent level for average calculated length at annulus formation. These intervals are given in Tables XIII through XVIII and XX through XXII.

4. Indications of daily and seasonal variations in the catch were shown by the change in percent of daily catch on each day for each lake and by a comparison of the percent of game fish and percent of rough fish in the 1955 and 1956 catches respectively. These data are presented in Figure 1 and Table XXIII to demonstrate the need for the netting schedule used in this job.

5. The value of the comparisons of one lake to the others by the data presented here will be realized mainly in the future when this job is repeated and changes, or lack of changes in the relationships are noted. Therefore, such comparisons are not discussed in this report.

6. It is recommended that the job be repeated in 1956 with the following changes:

   a. Scale samples should be taken only to a total of 50 samples for each species for both years or to supply samples from sizes of fish lacking in last year's scale collections.

   b. Small fish collections should be made to aid in the growth analysis.

   c. Present scale readings should be re-evaluated after growth rates of the small fish collections have been analyzed and all readings from both years' collections should be combined.

7. It is recommended that when funds and personnel permit, life history studies of the squawfish and Columbia River chub in this drainage be set up, with particular emphasis on time and place of spawning.

Data and Reports:

The original data and reports are with the project leader in Missoula. All field

scale data, scale mounts and duplicate copies of the age and growth data are at the Department's fishery laboratory at Bozeman.

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