

IDAHO FISH & GAME DEPARTMENT

John R. Woodworth, Director

FEDERAL AID TO FISH RESTORATION

LAKE AND RESERVOIR INVESTIGATIONS

Annual Completion Report Project F 53-R-3



ANDERSON RANCH RESERVOIR

Job No. A1. Experimental Control of Nongame Fish Populations

Job No. A2 & A4. Production of Kokanee in Anderson Ranch Reservoir and Return
of Trout in Anderson Ranch Reservoir

March 1, 1967 to February 28, 1968

By

John T. Heimer Fishery Biologist
Boise, Idaho

State of Idaho
Fish and Game Department John R. Woodworth, Director

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Job Completion Report
Research Project Statement

State of Idaho
Project No. F-53-R-3
Job No. AI

Name LAKE AND RESERVOIR
INVESTIGATIONS
Title Experimental Control
of Nongame Fish Popu-
lations in Anderson
Ranch Reservoir

Period Covered: March 1, 1967 to February 29, 1968

ABSTRACT

Gill net catches indicate that squawfish are still very abundant in Anderson Ranch Reservoir, but kokanee and coho salmon are being caught in increasing numbers.

Age class data indicated that 90 percent of the squawfish captured in experimental gill nets were four and five years old. Average growth was about 50 millimeters per year.

Drift net catches indicated that squawfish fry were not recruited from tributary streams; however, large numbers of coarsescale sucker fry entered the reservoir from the South Fork Boise River.

Rotenone and explosive sampling in streams tributary to Anderson Ranch Reservoir indicated that the smaller streams were generally free of rough fish. Large numbers of coarsescale sucker fry were found in South Fork Boise River and Lime Creek.

Hundreds of thousands of squawfish fry and fingerling were killed by the shoreline rotenone treatment; however, it was not possible to estimate numbers killed.

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RECOMMENDATIONS:

The rotenone shoreline treatment of squawfish fry should be continued. Other fish toxicants should be tested to determine their effectiveness,

OBJECTIVES:

To explore the feasibility of reducing squawfish populations by rotenone treatments of shoreline concentrations of fry and fingerlings.

To conduct a life history study of squawfish in the reservoir.

Description of the Area

Anderson Ranch Reservoir is 4,196 feet above sea level on South Fork Boise River in Elmore County, Idaho. Primary purposes of the reservoir are irrigation and flood control. The dam, completed in 1946, backs up water approximately 12 miles. Reservoir capacity is 493,000 acre-feet and the maximum depth exceeds 300 feet. The reservoir shoal area is steep rubble and sand. Annual water level fluctuation is about 30 feet.

TECHNIQUES USED:

Life History Studies

Species Composition of the Reservoir

Species composition (Figure 1.) was sampled at 10 stations using horizontal experimental gill nets described in the Annual Progress Report for F-53-R-2. Each station was sampled once in mid-May and again in late August. Total lengths and weights of captured fish were recorded.

During late August multifilament vertical gill nets described in the 1966 Annual Progress report F-53-R-2 were set at four stations (Figure 1). Each station was sampled twice with each of the six nets. The number of each species taken at each depth segment was recorded. Vertical temperature profiles were taken at all sampling stations,

Species Composition of Tributary Streams

The lower 100 yards of seven small tributaries of Anderson Ranch Reservoir -

were sampled with rotenone during July. Drift nets were set in the lower end of the rotenone treated area to collect fish killed by the treatment.

The South Fork Boise River drainage was sampled with prima-cord detonating fuse at eight locations during July and August.

Age and Growth

Scales taken from squawfish captured in gill nets were read for age and growth studies. Scale samples were taken from the left side of the fish midway between the dorsal fin and lateral line. Total length of each fish was measured in millimeters. Scales were mounted dry between glass slides. Back calculations were used to estimate length at each annuli.

Fry and Fingerling Recruitment

Four nylon bobbinet drift nets were set in the South Fork Boise River above Anderson Ranch Reservoir on four occasions during July and August to determine if squawfish fry were drifting into the reservoir. On sample days the nets were set at 10:00 a.m. and fished until 4:00 p.m.

On July 30 and 31, the nets were fished continuously for 24 hours to determine the diurnal pattern of fry movement. The nets were cleaned every hour and fry caught were preserved for later identification. Drift net sampling was discontinued after August 17 because few fry were being captured.

A fyke net with a 21-inch by 34-inch opening was fished in the river to estimate the fingerling recruitment into the reservoir on the same dates,

Population Control

The shoreline treatment started August 9 and ended August 16. Squawfish fry were hatched by this time and were concentrated along the shoreline. Rotenone was dispersed by boat bailer from a barrel in the boat. The barrel was refilled by gravity flow from the bank above.

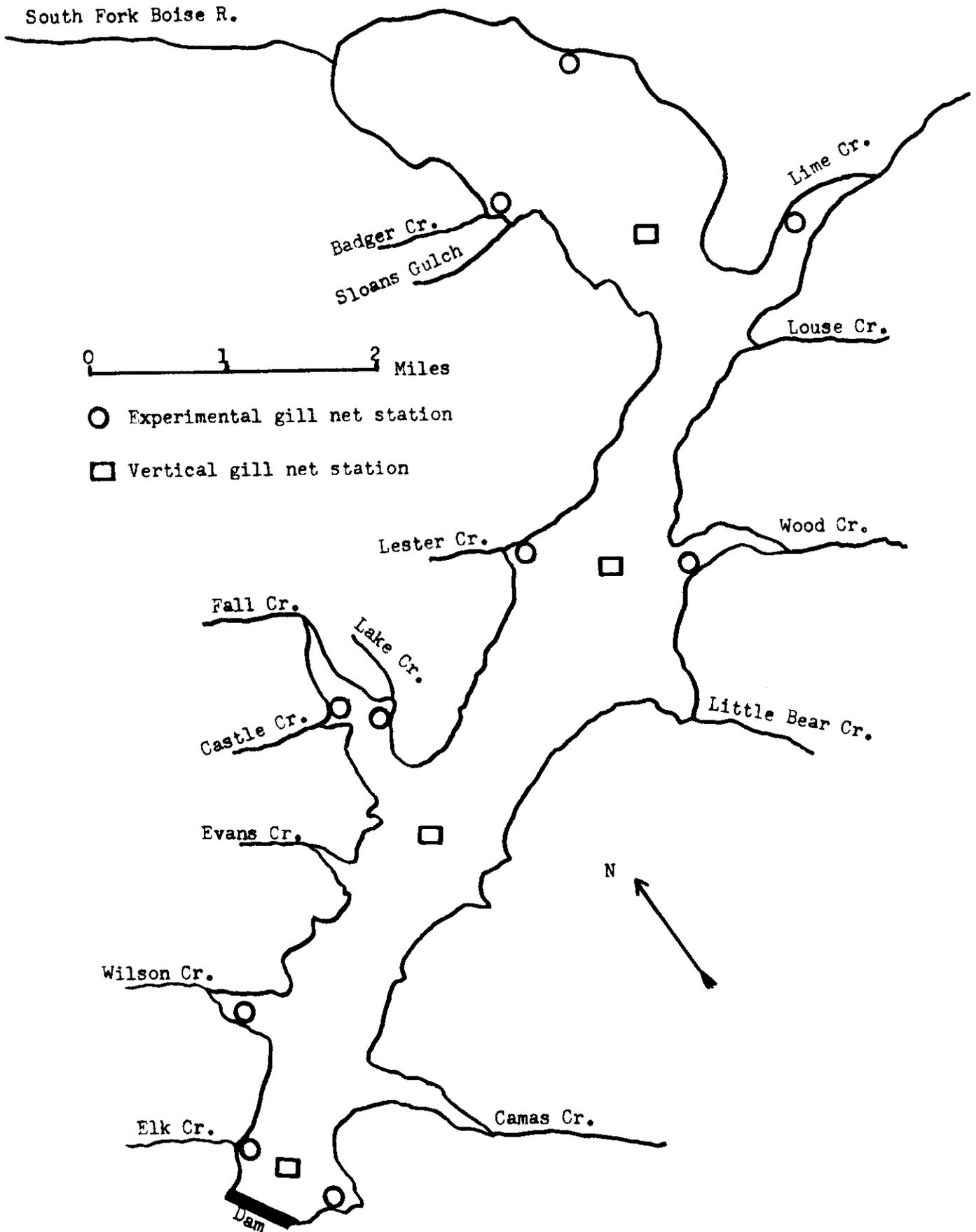


Figure 1. Location of gill net stations, Anderson Ranch Reservoir, 1967.

The triangular cross section was treated by releasing rotenone during one pass of the boat as close to the shore as was practical (10-20 feet). The entire 30 miles of shoreline cross section was treated at an estimated concentration of 1.7 parts per million.

FINDINGS:

Life History Studies

Experimental gill net catches indicate that squawfish are still the dominant fish in the reservoir (Table I). Of a total of 1,254 fish captured in nets 943, or 75 percent, were squawfish.

Experimental gill nets were fished a total of 190 hours in the spring and in the fall of 1967. Squawfish catch per hour was 3.2 and 1.8 for spring and fall sets, respectively (Table I). Total numbers of fish captured at each location by season are given in Tables 2 and 3.

During late August 1967, 48 vertical gill net sets caught 53 percent kokanee and 37 percent squawfish (Table 4) and 79 percent of the squawfish captured were in the upper 50 feet where temperatures ranged from 54^o F. to 70^o F. Species composition of the catches by depth, temperature, and sampling station is listed in Tables 5 through 12.

Species Composition of Tributary Streams

The smaller tributary streams of Anderson Ranch Reservoir were sampled with rotenone. Small rainbow trout predominated in the streams (Table 13); however, large numbers of coarsescale suckers and a few squawfish were found in the lower portion of Lime Creek. Squawfish fry were not found in any of the smaller tributary streams; therefore, squawfish recruitment from these streams, if it occurs, is probably insignificant.

During July and August, 408 fish were collected from the South Fork Boise River with prima-cord (Table 14). Of these, 252 fish (62 percent) were coarsescale suckers. Only 16 squawfish were found in the river. Squawfish fry and fingerlings were not found in the stream during the sampling.

Table 1. Species composition and catch rates of fish taken in experimental gill nets in spring and fall sets, Anderson Ranch Reservoir, 1967.

Species Captured	Number Captured			Catch per Hour*			Percent of Total Fish Captured		
	Spring	Fall	Total	Spring	Fall	Total	Spring	Fall	Total
Squawfish	601	342	943	3.2	1.8	2.5	69	90	75
Coarsescale sucker	122	11	133	.6	< .1	.3	14	3	11
Rainbow trout	73	4	77	.4	< .1	.2	8	1	6
Chiselmouth	37	13	50	.2	< .1	.1	4	3	4
Yellow perch	12	12	24	< .1	< .1	< .1	1	3	2
Dolly Varden	15	0	15	< .1	0.0	< .1	2	0	1
Redside shiner	5	0	5	< .1	0.0	< .1	< 1	0	< 1
Bridgelip sucker	4	0	4	< .1	0.0	< .1	< 1	0	< 1
Mountain whitefish	2	0	2	< .1	0.0	< .1	< 1	0	< 1
Kokanee	<u>1</u>	<u>0</u>	<u>1</u>	<u>< .1</u>	<u>0.0</u>	<u>< .1</u>	<u>< 1</u>	<u>0</u>	<u>< 1</u>
Totals	872	382	1,254	4.6	2.0	3.3	100	100	100

* 190 hours of fishing per spring and fall sets

Table 2. Species composition of the catch of experimental gill nets at 10 sampling stations, Anderson Ranch Reservoir, May 11 - 18, 1967.

Location	Date Set	Species Captured										Total
		SQ	CSS	RB	CM	DV	YP	SH	BLS	MWF	KOK	
Lester Creek Bay	May 11	35	18	10	-	1	-	1	-	-	1	66
Wood Creek Bay	May 11	41	4	3	2	-	-	1	-	-	-	51
Badger Creek Bay	May 16	153	11	7	-	3	-	-	-	-	-	174
Above Lime Creek	May 16	83	13	7	1	2	11	-	2	-	-	119
Lake Creek Bay	May 16	39	4	5	7	1	-	-	-	-	-	56
Lime Creek Bay	May 16	105	49	12	1	3	1	1	2	1	-	175
Forebay	May 17	7	2	4	1	-	-	-	-	-	-	14
Elk Creek Bay	May 17	47	10	8	3	-	-	-	-	-	-	68
Wilson Creek Bay	May 18	30	2	12	10	3	-	2	-	-	-	59
Castle Creek Bay	May 18	<u>61</u>	<u>9</u>	<u>5</u>	<u>12</u>	<u>2</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>1</u>	<u>-</u>	<u>90</u>
Totals		601	122	73	37	15	12	5	4	2	1	872
Percent		69	14	8	4	2	1	<1	<1	<1	<1	100

SQ - Squawfish

CSS - Coarcescale sucker

RB - Rainbow trout

CM - Chiselmouth

DV - Dolly Varden

YP - Yellow perch

SH - Redside shiner

BLS - Bridgelip sucker

MWF - Mountain whitefish

KOK - Kokanee

Table 3. Species composition of the catch of experimental gill nets at 10 sampling stations, Anderson Ranch Reservoir, August 30 - September 1, 1967.

Location	Date Set	Species Captured					Totals
		SQ	CM	YP	CSS	RB	
Badger Creek Bay	August 30	53	6	2	4	-	65
Above Lime Creek	August 30	11	-	-	-	-	11
Lime Creek Bay	August 30	57	1	1	-	-	59
Lester Creek Bay	August 31	34	1	-	1	1	37
Wood Creek Bay	August 31	35	1	1	-	-	37
Castle Creek Bay	August 31	30	-	-	-	-	30
Lake Creek Bay	August 31	44	-	3	-	-	47
Wilson Creek Bay	September 1	36	4	5	5	-	50
Forebay	September 1	19	-	-	-	-	19
Elk Creek Bay	September 1	<u>23</u>	<u>-</u>	<u>-</u>	<u>1</u>	<u>3</u>	<u>27</u>
Totals		342	13	12	11	4	382
Percent		90	3	3	3	1	100

SQ - Squawfish
 CM - Chiselmouth
 YP - Yellow perch
 CSS - Coarsescale sucker
 RB - Rainbow trout

Table 4. Species composition of 48 vertical gill net set catches by depth and temperature, Anderson Ranch Reservoir, August 20 - 29, 1967.

Temperature Data			Vertical Distribution (Ft.)	Species Captured							
Depth (Ft.)	Temperature Range (°F)	Average Temperature(°F)		KOK	SQ	RB	CSS	Coho	CM	YP	Totals
0	69 - 71	70	0 - 12	-	22	-	-	-	-	-	22
10	68 - 70	69	12 - 25	-	28	-	-	-	1	-	29
20	68 - 70	69	25 - 37	3	29	2	3	-	-	-	37
30	62 - 68	64	37 - 50	25	21	-	1	-	-	1	48
40	56 - 68	59	50 - 62	38	5	5	-	2	-	-	50
50	51 - 68	54	62 - 75	60	8	2	-	4	-	-	74
60	50 - 67	53	75 - 87	32	4	1	-	3	-	-	40
70	50 - 64	52	87 - 100	20	9	-	6	-	1	-	36
80	49 - 60	51									
90	48 - 57	50	Totals	178	126	10	10	9	2	1	336
100	48 - 53	49	Percent	53	37	3	3	3	<1	<1	100

KOK - Kokanee
 SQ - Squawfish
 RB - Rainbow
 CSS - Coarsescale sucker
 CM - Chiselmouth
 YP - Yellow Perch

Table 5. Species composition, vertical temperature profile, and depth distribution of fish captured in six vertical gill net sets in the forebay of Anderson Ranch Reservoir, August 20, 1967.

Temperature Data		Vertical Distribution (ft.)	Species Captured			
Depth (ft.)	Temperature (°F.)		Kokanee	Squawfish	Rainbow	Coho
0	69	0 - 12	-	3	-	-
10	68	12 - 25	-	3	-	-
20	68	25 - 37	-	4	-	-
30	62	37 - 50	1	1	-	-
40	58	50 - 62	1	-	1	-
50	53	62 - 75	8	-	2	3
60	50	75 - 87	3	-	1	1
70	50	87 - 100	4	-	-	-
80	49					
90	48					
100	48					
		Totals	17	11	4	4

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Table 6. Species composition, vertical temperature profile, and depth distribution of fish captured in six vertical gill net sets in mid-reservoir near Fall Creek Bay, Anderson Ranch Reservoir, August 21, 1967

Temperature Data		Vertical Distribution (ft.)	Species Captured	
Depth (ft.)	Temperature (°F.)		Kokanee	Squawfish
0	70	0 - 12	-	2
10	70	12 - 25	-	6
20	69	25 - 37	-	3
30	64	37 - 50	-	-
40	58	50 - 62	2	1
50	53	62 - 75	3	-
60	50	75 - 87	7	1
70	50	87 - 100	3	-
80	49			
90	49			
100	48			
		Totals	15	13

Table 7. Species composition, vertical temperature profile and depth distribution of fish captured in six vertical gill net sets in mid-reservoir near Wood Creek Bay, Anderson Ranch Reservoir, August 22, 1967

Temperature Data		Vertical Distribution (ft.)	Species Captured	
Depth (ft.)	Temperature (°F.)		Kokanee	Squawfish
0	70	0 - 12	-	3
10	68	12 - 25	-	-
20	66	25 - 37	1	5
30	62	37 - 50	-	4
40	57	50 - 62	-	1
50	54	62 - 75	5	-
60	54	75 - 87	3	-
70	54	87 - 100	3	-
80	53			
90	52	Totals	12	13
100	52			

Table 8. Species composition, vertical temperature profile, and depth distribution of fish captured in six vertical gill net sets in mid-reservoir above Lime Creek Bay, Anderson Ranch Reservoir, August 23, 1967.

Temperature Data		Vertical Distribution (ft.)	Species Captured			
Depth (ft.)	Temperature (°F.)		Kokanee	Squawfish	CS Sucker	Yellow Perch
0	70	0 - 12	-	5	-	-
10	70	12 - 25	-	7	-	-
20	70	25 - 37	1	7	1	-
30	64	37 - 50	13	8	-	1
40	56	50 - 62	18	1	-	-
50	51	62 - 75	22	4	-	-
60	50	75 - 87	8	1	-	-
70	50	87 - 100	2	6	5	-
80	50					
90	50	Totals	64	39	6	1
100	50					

CS Sucker - Coarsescale sucker

Table 9. Species composition, vertical temperature profile, and depth distribution of fish captured in six vertical gill net sets in mid-reservoir near Wood Creek Bay, Anderson Ranch Reservoir, August 26, 1967

Temperature Data		Vertical Distribution (ft.)	Species Captured		
Depth (ft.)	Temperature (°F.)		Kokanee	Squawfish	Chiselmouth
0	71	0 - 12	-	2	-
10	70	12 - 25	-	4	-
20	70	25 - 37	-	3	-
30	66	37 - 50	-	1	-
40	58	50 - 62	5	1	-
50	52	62 - 75	5	1	-
60	51	75 - 87	1	-	-
70	50	87 - 100	1	-	1
80	50				
90	49				
100	48				
		Totals	12	12	1

Table 10. Species composition, vertical temperature profile, and depth distribution of fish captured in six vertical gill net sets in the forebay of Anderson Ranch Reservoir, August 27, 1967

Temperature Data		Vertical Distribution (ft.)	Species Captured			
Depth (ft.)	Temperature (°F.)		Kokanee	Squawfish	Rainbow	Coho
0	70	0 - 12	-	2	-	-
10	69	12 - 25	-	-	-	-
20	68	25 - 37	1	-	2	-
30	68	37 - 50	9	2	-	-
40	68	50 - 62	3	-	4	-
50	68	62 - 75	7	-	-	1
60	67	75 - 87	7	1	-	1
70	64	87 - 100	1	1	-	-
80	60					
90	57					
100	53					
		Totals	28	6	6	2

Table 11. Species composition, vertical temperature profile, and depth distribution of fish captured in six vertical gill net sets in mid-reservoir near Fall Creek Bay, August 28, 1967

Temperature Data		Vertical Distribution (ft.)	Species Captured			
Depth (ft.)	Temperature (°F.)		Kokanee	Squawfish	Coho	Chiselmouth
0	69	0 - 12	-	3	-	-
10	69	12 - 25	-	3	-	1
20	69	25 - 37	-	2	-	-
30	65	37 - 50	1	-	-	-
40	59	50 - 62	5	-	1	-
50	54	62 - 75	7	-	-	-
60	51	75 - 87	2	-	-	-
70	50	87 - 100	5	-	-	-
80	49					
90	49	Totals	15	8	1	1
100	48					

Table 12. Species composition, vertical temperature profile and depth distribution of fish captured in six vertical gill net sets in mid-reservoir above Lime Creek Bay, Anderson Ranch Reservoir, August 29, 1967

Temperature Data		Vertical Distribution (ft.)	Species Captured			
Depth (ft.)	Temperature (°F.)		Kokanee	Squawfish	CS Sucker	Coho
0	70	0 - 12	-	2	-	-
10	70	12 - 25	-	5	-	-
20	69	25 - 37	-	5	2	-
30	64	37 - 50	1	5	1	-
40	57	50 - 62	4	1	-	1
50	52	62 - 75	3	3	-	-
60	51	75 - 87	1	1	-	1
70	50	87 - 100	1	2	1	-
80	49					
90	49	Totals	10	24	4	2
100	48					

CS Sucker - Coarsescale sucker

Table 13. Numbers of fish found in the lower 100 yards of tributary streams of Anderson Ranch Reservoir treated with rotenone, 1967.

Date	Stream	Species Captured									Totals
		RB	CSS	SCP	MWF	BLS	SQ	SH	DC	Coho	
7/26/67	Evans Creek	30	-	-	1	-	-	-	-	1	32
7/26/67	Wilson Creek	24	-	-	-	-	-	-	-	-	24
7/26/67	Fall Creek	23	5	28	9	-	-	-	-	-	65
7/26/67	Deer Creek	54	1	7	22	-	2	-	3	1	90
7/27/67	Wood Creek	5	-	-	-	-	-	-	-	-	5
7/27/67	Camas Creek	-	-	-	-	-	-	2	1	-	3
7/27/67	Lime Creek*	<u>59</u>	<u>60</u>	<u>23</u>	<u>20</u>	<u>36</u>	<u>10</u>	<u>11</u>	<u>6</u>	<u>2</u>	<u>227</u>
Totals		195	66	58	52	36	12	13	10	4	446
Percent		44	15	13	12	8	3	3	2	<1	100

* Incomplete because fish barrier collapsed causing fish loss.

RB - Rainbow trout
 CSS - Coarcescale sucker
 SCP - Sculpin
 MWF - Mountain whitefish

BLS - Bridgelip
 SQ - Squawfish
 SH - Redside shiner
 DC - Dace

Table 14. Species composition of fish killed in South Fork Boise River prima-cord samples, 1967

Date	Stream	Road miles above Pine	Species Captured										Total
			CSS	SH	CM	RB	MWF	SQ	BLS	DC	Coho	BT	
7/20	South Fork	0	8	17	4	3	2	3	5	-	1	-	43
7/27	South Fork	0	3	3	-	2	2	2	4	2	-	-	18
8/8	South Fork	0	3	22	9	1	-	3	-	-	-	-	38
7/20	South Fork	3	25	-	-	-	-	1	-	-	-	-	26
8/8	South Fork	3	130	-	20	-	-	-	-	-	-	-	150
7/20	South Fork	29	40	-	-	-	-	3	-	-	-	-	43
8/7	South Fork	29	14	-	-	1	1	2	-	-	-	-	18
8/7	South Fork	32	14	-	-	3	4	-	-	-	-	-	21
8/7	South Fork	45	-	-	-	2	-	-	-	-	-	-	2
8/7	Big Smokey Cr.	34	7	-	-	10	2	2	-	-	-	-	21
8/7	Big Smokey Cr.	35	8	-	-	3	2	-	-	-	-	1	14
8/7	Little Smokey Cr.	36	-	1	-	3	4	-	6	-	-	-	14
	Total		252	43	33	28	17	16	15	2	1	1	408
	Percent		62	10	8	7	4	4	4	<1	<1	<1	100

CSS - Coarsescale suckers
 SH - Redside shiner
 CM - Chiselmouth Chub
 RB - Rainbow trout
 MFW - Mountain whitefish

SQ - Squawfish
 BLS - Bridgelip
 DC - Dace
 BT - Brook trout

Age and Growth

Scales from 130 squawfish captured in gill nets were read to estimate age and growth rates, Total lengths of squawfish ranged from 245 millimeters to 356 millimeters, Approximately 90 percent of the squawfish were four or five years old (Table 15),

Average length at annulus formation was 58 and 298 millimeters for age classes II and VI, respectively,

Calculated annual growth for squawfish in the reservoir was approximately 50 millimeters per year, Only slight differences were noted between the growth rates of male and female squawfish (Tables 16 and 17),

Length Frequency Distribution

The total lengths of 986 squawfish captured in experimental gill nets increased between the spring and fall sampling periods from a modal length of 293 millimeters to 323 millimeters (Figure 2), The total length-fork length conversion factor for 120 squawfish was 1,1121. Modal total length of 133 coarsescale suckers gill-netted during the summer of 1967 was 377 millimeters (Figure 3),

Fry and Fingerling Recruitment

Drift net catches indicated that peak numbers of coarsescale sucker fry entered Anderson Ranch Reservoir from the South Fork Boise River in late July (Table 18), Samples taken through a 24 hour period indicated that the major downstream fry movement occurred at night (Figure 4), Large numbers of suckers migrate up the South Fork Boise River in the spring to spawn and the fry captured were undoubtedly the progeny of this spawning migration.

Squawfish fry were not captured in the drift nets indicating that squawfish fry recruitment from the river is not significant,

Two whitefish, three speckled dace, two coarsescale suckers, two reidsided shiners, two chiselmouth, and one sculpin were captured in the fyke net,

Population Control

SCUBA observations on August 3 indicated that squawfish fry had hatched and were concentrated along the reservoir shoreline, The rotenone treatment was completed between August 9 and August 16. Approximately 1,7 parts per million rotenone was

Table 15. Age class composition, total lengths, and calculated growth of squawfish collected at Anderson Ranch Reservoir in gill nets during August of 1967

Age Class	Number of Fish	Percent	Average Total Length (mm)	Range Total Length (mm)	Average Length at Annulus Formation					
					1	2	3	4	5	6
III	7	5	261	245 - 287	69	211	202			
IV	69	53	305	279 - 333	60	107	168	242		
V	48	37	327	295 - 361	54	93	145	212	279	
VI	6	5	340	328 - 356	<u>50</u>	<u>86</u>	<u>127</u>	<u>172</u>	<u>230</u>	<u>298</u>
Average					58	102	159	227	274	298

Table 16. Age class composition, total lengths, and calculated growth of male squawfish collected at Anderson Ranch Reservoir in gill nets during August, 1967

Age Class	Number of Fish	Percent	Average Total Length (mm)	Range Total Length (mm)	Average Length at Annulus Formation				
					1	2	3	4	5
III	5	8	264	245 - 285	73	138	206		
IV	38	58	304	279 - 329	58	102	165	240	
V	22	34	323	295 - 358	<u>54</u>	<u>93</u>	<u>145</u>	<u>208</u>	<u>274</u>
Average					58	102	161	228	274

Table 17. Age class composition, total length, and calculated growth of female squawfish collected at Anderson Ranch Reservoir in experimental gill nets during August, 1967

Age Class	Number of Fish	Percent	Average Total Length (mm)	Range Total Length (mm)	Average Length of Annulus Formation						
					1	2	3	4	5	6	
III	2	3	256	246 - 266	60	119	194				
IV	31	48	308	279 - 333	62	112	172	246			
V	26	40	330	300 - 361	56	92	145	217	284		
VI	6	9	340	328 - 356	<u>50</u>	<u>86</u>	<u>127</u>	<u>172</u>	<u>230</u>	<u>298</u>	
	Average				59	102	158	227	274	298	

Table 18. Coarsescale sucker fry captured between 9:00 a.m. and 4:00 p.m. in drift nets in the South Fork Boise River at its confluence with Anderson Ranch Reservoir

Date	Number of Fry Captured
7/21/67	24
7/31/67	142
8/8/67	111
8/17/67	1

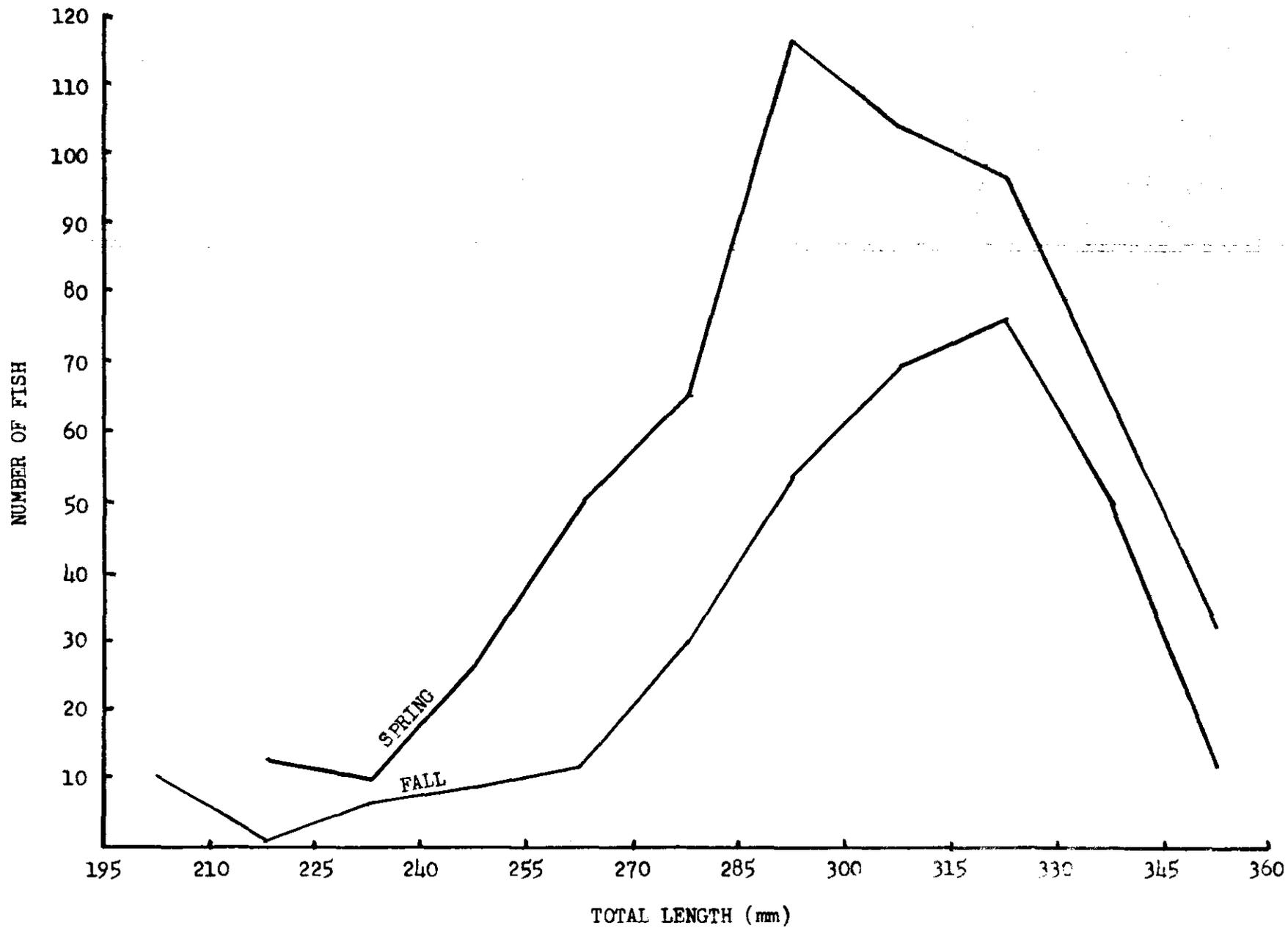


Figure 2. Length frequency distribution of 571 and 325 squawfish taken during the spring and fall respectively in experimental gill sets, Anderson Ranch Reservoir, 1967.

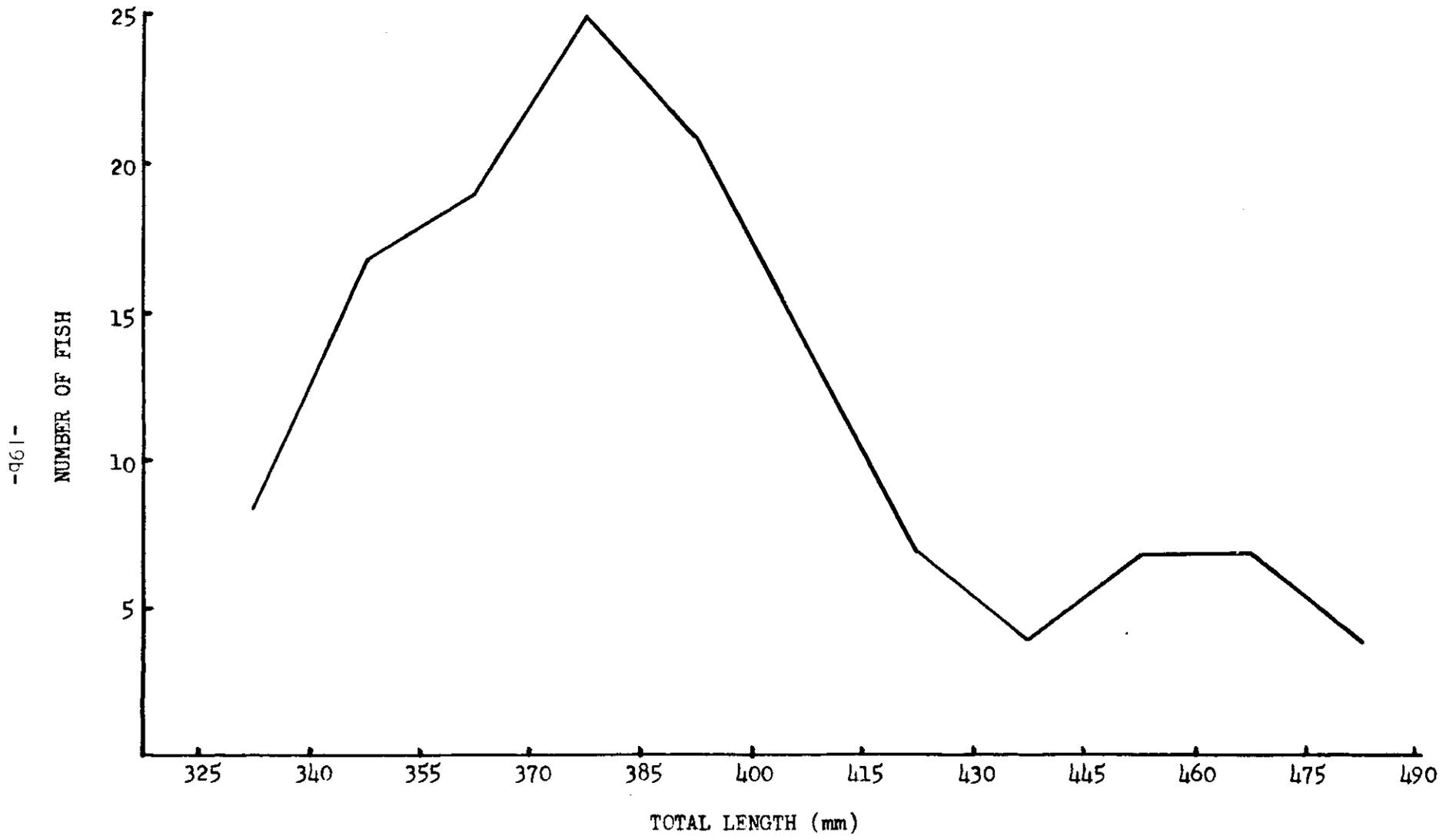


Figure 3. Length frequency distribution of 133 coarcescale suckers taken in gill nets during the summer of 1967 at Anderson Ranch Reservoir.

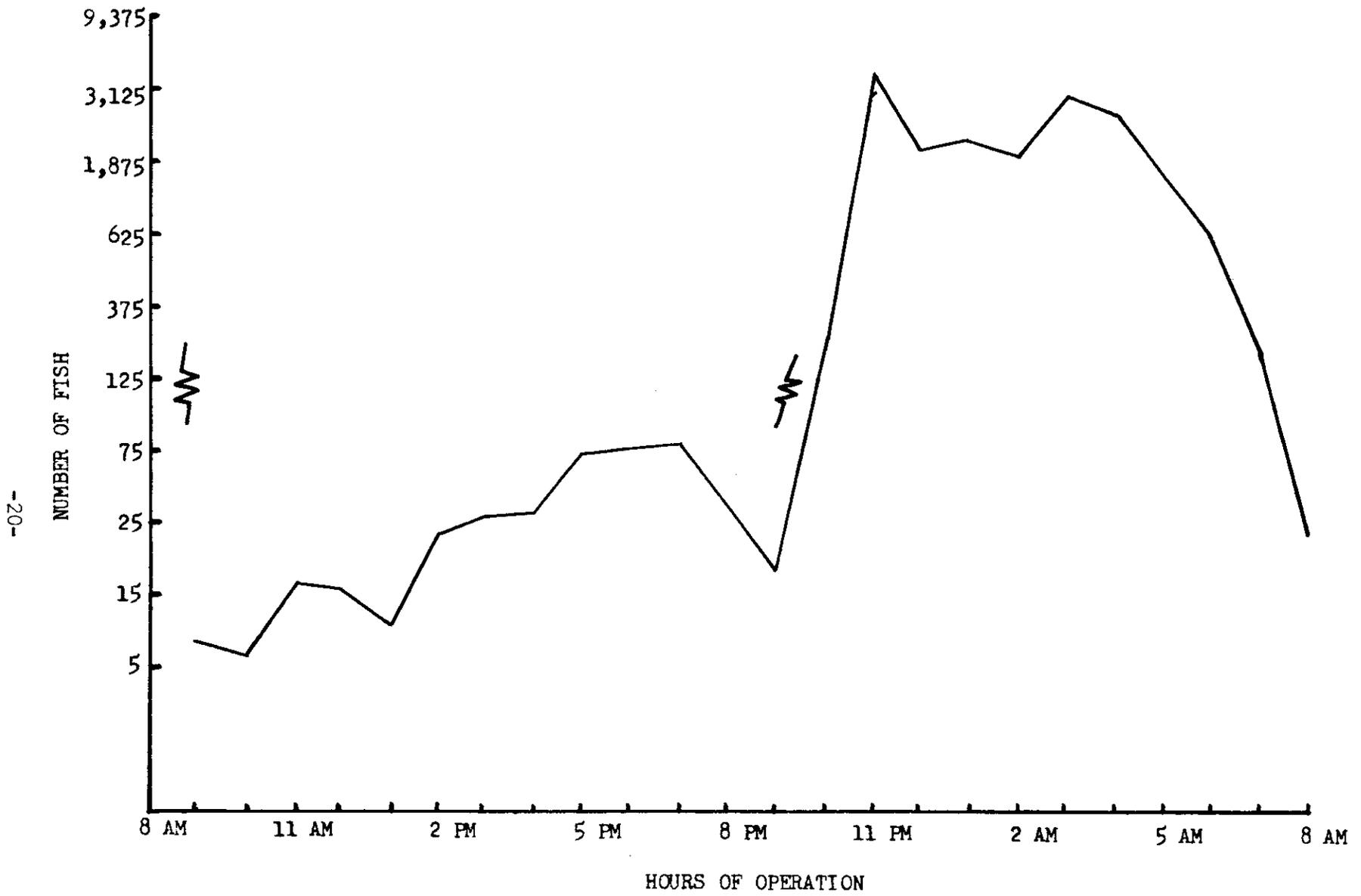


Figure 4. Diurnal trap catches of coarsescale sucker fry in the South Fork Boise River above Anderson Ranch Reservoir, July 30 and 31, 1967.

dispensed along the shoreline cross-section treated,

The Fall Creek Bay shoreline area was treated on August 14, On August 15 a part of the same area was retreated and additional squawfish fry were killed. Well developed fry may have escaped the first treatment on the previous day or were off-shore and moved back in,

Many squawfish fry were taken by explosives on August 8 near Lime Creek Bay and Badger Creek Bay. On August 9 and 10 these two areas were treated with rotenone, On August 11 samples were again taken by explosives in the same area, However, on August 11 squawfish fry could not be found in the treated areas.

Large numbers of squawfish yearlings were also killed by the treatment as well as a limited number of adult suckers, yellow perch, and redbside shiners. Only 30 dead rainbow trout and one coho salmon were seen in a search of the entire shoreline. Prepared by:

John T. Heimer
Fishery Biologist

Job Completion Report

Research Project Statement

State of Idaho

Name: LAKE AND RESERVOIR INVESTIGATIONS

Project No. F-53-R-3

Title: Production of Kokanee and Return of Trout In Anderson Ranch Reservoir

Job Nos. A2 and A4

Period Covered: March 1, 1967 to February 29, 1968

ABSTRACT

Approximately 14,600 and 21,700 catchable-size rainbow trout were planted in Anderson Ranch Reservoir in the spring and in the fall of 1967 respectively. In addition, 208,000 fingerling kokanee salmon and 342,000 fingerling coho salmon were planted during the spring of 1967,

Creel census data collected from July through November indicated an increasing game fish catch rate as the water cooled in the fall.

Angler counts and creel checks were used to estimate total fishing pressure and game fish harvest during October and November, A total of 573 anglers were counted at the reservoir on census days. An estimated 919 anglers fished the reservoir during October and November and average 0,87 fish per hour at 4,4 fish per angler day. During October and November an estimated 4,020 game fish were taken by anglers. The species composition by percent of catch was: Kokanee, 38; coho, 36; rainbow trout, 25; and Dolly Varden trout, 1,

A spawning run of kokanee entered in the South Fork Boise River during August and September. Kokanee were first observed in the river by Department personnel on August 28, Peak numbers of spawners were observed on September 3, 1967,

On November 5 and 26, kokanee eggs dug from redds in Trinity Creek, the major kokanee spawning tributary of the South Fork Boise River, were green and eyed respectively. These eggs were spawned about September 15, 1967,

RECOMMENDATIONS:

An estimate should be made of the total annual catch of game fish from the reservoir to evaluate the rough fish control segment of the project.

OBJECTIVES:

The objectives of this job were to measure survival and return to the creel of game fish planted in Anderson Ranch Reservoir and to determine the magnitude and success of kokanee spawning in tributary streams,

TECHNIQUES USED:

Releases of Rainbow Trout, Kokanee and Coho Salmon

Anderson Ranch Reservoir is annually stocked with rainbow trout, kokanee salmon and (starting in 1967) coho salmon (Table I).

The South Fork Boise River is the major tributary to Anderson Ranch Reservoir (Figure I). Kokanee salmon have been planted in the river about ten miles upstream from the reservoir since 1964, On November 30, 1964, 686,000 kokanee fry were planted in the river. It was felt that survival was poor because of floods during the winter of 1964-1965. Therefore, some 434,720 kokanee fingerling were planted in May 1965. Since 1965, kokanee fingerling have been planted each spring in the river above Pine.

Approximately 168,225 and 174,158 coho salmon were planted in Anderson Ranch Reservoir and the South Fork Boise River, respectively, in April and May 1967, Their average length was 3 inches and the average number per pound was 174, Estimated

Harvest of Game Fish

Angler counts were used to estimate fishing pressure at the reservoir during October and November. These counts were made on two weekend days and one randomly selected weekday per week. The number of anglers counted on the sample weekday was multiplied by five to estimate the total number of weekday fishermen. Two angler counts were made during each census day; the first count started at

10:30 a.m. and the second count started at 2:30 p.m. A description of each fishing party observed during the morning count was recorded to avoid duplicate counts in

the afternoon

Table 1. Rainbow trout, kokanee salmon, and coho salmon releases at Anderson Ranch Reservoir, 1963 - 1967

Year	Rainbow Trout				Kokanee Salmon		Coho Salmon
	Fingerlings		Catchables		Fry	Fingerlings	Fingerlings
	Spring	Fall	Spring	Fall	Fall	Spring	Spring
1963	150,350	0	9,500	0	0	0	0
1964	138,000	0	16,700	0	686,000 ^{1/}	0	0
1965	0	0	18,500	94,500	0	434,720 ^{2/}	0
1966	0	100,000	10,200	0	0	390,000 ^{3/}	0
1967	0	0	14,600	21,700	0	208,000 ^{3/}	342,383

-24-

^{1/} Early spawners

^{2/} Late spawners

^{3/} Early and late spawners

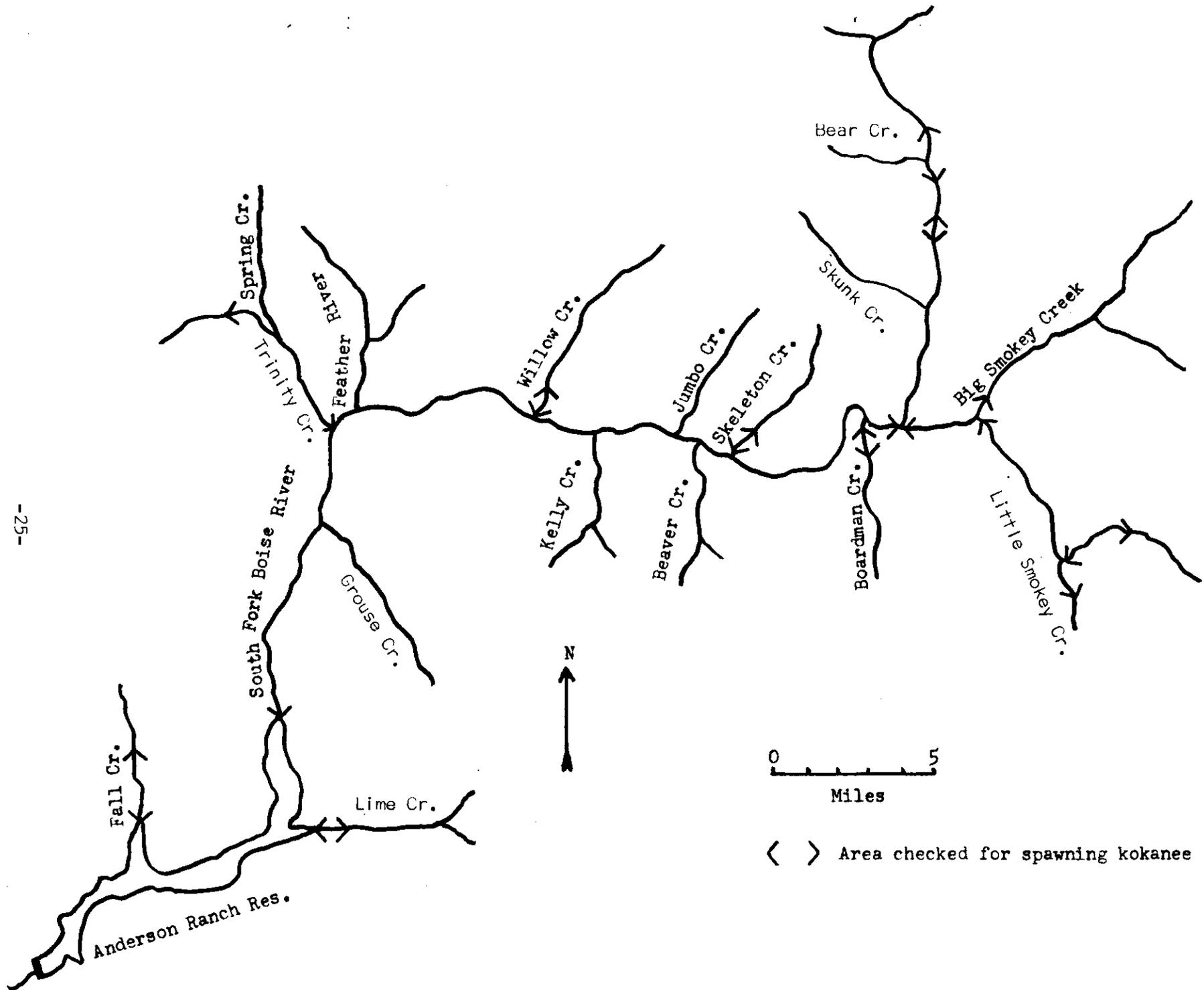


Figure 1. Anderson Ranch Reservoir and the South Fork Boise River Drainage.

After the counts were completed on census days, the census clerk checked anglers at access areas to interview anglers.

Length-Frequency Distribution and Length-Weight Relationship

The length-frequency distribution and condition factors of rainbow trout, kokanee, and coho salmon were computed from measurements of fish caught by anglers during October and November.

Kokanee Spawning Run

Timing

During 1967 the early kokanee spawning run entered the South Fork Boise River on August 28, peaked September 13 and ended October 10. Thirteen bridges over the South Fork Boise River, three bridges over Big Smokey Creek, and one bridge over Little Smokey Creek were used as counting stations to monitor this upstream migration. Each bridge was given a number corresponding to its location in road miles upstream from the Pine bridge. Kokanee counts were made from these seventeen bridges once a week.

Stream Spawning

Smaller tributaries in the drainage were surveyed for spawning kokanee. Accessible streams were surveyed from a vehicle and the less accessible ones on foot. Big Smokey Creek was not surveyed above Big Smokey Guard Station. Temperatures

A recording thermograph was installed at the Pine bridge August 28, 1967 to correlate kokanee movement with temperature. It was removed November 28, 1967.

Embryo Development

Selected kokanee redds were marked in Trinity Creek to facilitate location at a later date, The marked redds were opened on November 5 and 26 to determine the rate of embryonic development of the eggs.

Redd Counts

Redd counts were attempted but were unsuccessful because of superimposition, crowding, and the small size of redds.

FINDINGS

Angling Pressure

During October and November an estimated 269 bank anglers and 650 boat anglers fished the reservoir (Table 2), The largest weekly number of fishermen during the two month period occurred from October 8 to October 14 when 274 anglers fished at the reservoir, The lowest weekly number of fishermen occurred from November 19 to November 25 when 27 people fished at the reservoir,

Approximately 47 percent of the anglers fished on weekdays and 53 percent during the weekends (Table 3),

Game Fish Harvest

An estimated 4,020 game fish were caught during October and November (Table 4), The percentage species composition in the creel was: kokanee salmon, 39; coho salmon, 35; rainbow trout, 25; and Dolly Varden trout, 1. Many additional coho were caught and released because of their small size,

Catch Rates

In October and November, 234 anglers were interviewed, They had fished 1,184 hours and averaged 4,4 fish per angler or 0,87 fish per hour. Boat anglers averaged 0,91 fish per hour and 4,91 fish per angler while bank fishermen averaged 0,51 fish per hour and 1,16 fish per angler,

From July through September spot creel checks were made at the reservoir to determine the catch rate. These checks were not expanded to monthly catch estimates,

As temperatures decreased from July through November the catch rate for game fish increased (Table 5), The catch rate increase was from 0.62 fish per hour in July to 0,96 fish per hour in November,

Length-Frequency Distribution

The length–frequency distributions of 232 rainbow trout, 356 kokanee, and 329 coho caught by fishermen in October and November are given in Figure 2, Modal length of rainbow trout, kokanee, and coho salmon was 327 millimeters, 293 millimeters, and 207 millimeters, respectively.

Table 2. Estimated weekly angling pressure at Anderson Ranch Reservoir during October and November, 1967

Period	Estimated Number of Anglers		Totals
	Bank	Boat	
10/1 - 10/7	64	87	151
10/8 - 10/14	111	163	274
10/15 - 10/21	40	130	170
10/22 - 10/28	3	46	49
10/29 - 11/4	22	93	115
11/5 - 11/11	16	46	62
11/12 - 11/18	11	58	69
11/19 - 11/25	0	27	27
11/26 - 12/1	2	0	2
Totals	269	650	919

Table 3. Number of anglers observed during weekend angler counts and estimated total number of week day anglers, Anderson Ranch Reservoir, 1967.

Month	Number of Anglers		Weekdays	Totals
	Sundays	Saturdays		
October	215	136	331*	682
November	47	91	99*	237
Totals	262	227	430	919
Percent	28	25	47	100

* Estimated

Length-Weight Relationship

Rainbow trout caught by anglers in October and November ranged from 195 millimeters to 378 millimeters in total length and had a condition factor of 1.009 (Figure 3), Kokanee salmon caught during the same time period ranged from 247 millimeters to 409 millimeters in total length and had a condition factor of 1,010 (Figure 4), Coho salmon ranged from 182 millimeters to 252 millimeters in total length and had a condition factor of ,909 (Figure 5),

Kokanee Depth Distribution

Ninety-eight percent of the kokanee captured by vertical gill nets were caught below 37 feet (Table 6) and during this time the average water temperatures at 40 feet and 100 feet were 59°F. and 49 F ,, respectively,

Kokanee Spawning Run

Kokanee were first observed in the South Fork Boise River on August 28, 1967; however, local residents reported that some kokanee were seen on August 25, Peak numbers of kokanee were seen in the river on September 13 when 720 fish were counted (Table 7), On September 25, only 33 kokanee could be seen in the main river while large numbers of kokanee were actively spawning in Little Smokey and Trinity Creeks,

On September 22, 49 kokanee were counted in Fall Creek between the road culvert and the reservoir, a distance of approximately 000 yards, The fish could not ascend this stream because of the culvert,

Mature kokanee were caught in the reservoir during October indicating that a late run of kokanee might appear in the South Fork Boise River, This was expected since 434,720 late run fingerling kokanee were planted in 1965, A weir was installed in the river for egg taking purposes; however, fish were not captured because of debris problems, Twenty-five kokanee were observed above the weir on October 21 and approximately 100 kokanee were observed spawning in the South Fork in warm spring water from Grouse Creek, Possibly more late run kokanee were in the drainage than were observed, because their light coloration made them difficult to see and to distinguish from whitefish which were schooling at the same time,

Table 4. Estimated game fish harvest at Anderson Ranch Reservoir during October and November, 1967

Month	Total Estimated Anglers	Fish/ Angler	Species Composition of Catch (%)				Estimated Catch				
			Kokanee	Coho	Rainbow trout	Dolly Varden	Kokanee	Coho	Rainbow trout	Dolly Varden	Totals
October	682	4.4	43	35	21	1	1,290	1,050	630	30	3,000
November	237	4.3	26	37	35	2	265	377	357	21	1,020
Totals	919	4.4	39	35	25	1	1,555	1,427	987	51	4,020

Table 5. Game fish catch rates, Anderson Ranch Reservoir, 1967

Month	Number of anglers checked	Hours fished	Fish per angler	Fish per hour
July	34	110	2.00	.62
August	47	114	1.62	.67
September	13	85	5.31	.81
October	157	839	4.45	.83
November	77	345	4.29	.96
Totals	328	1,493	3.78	.83

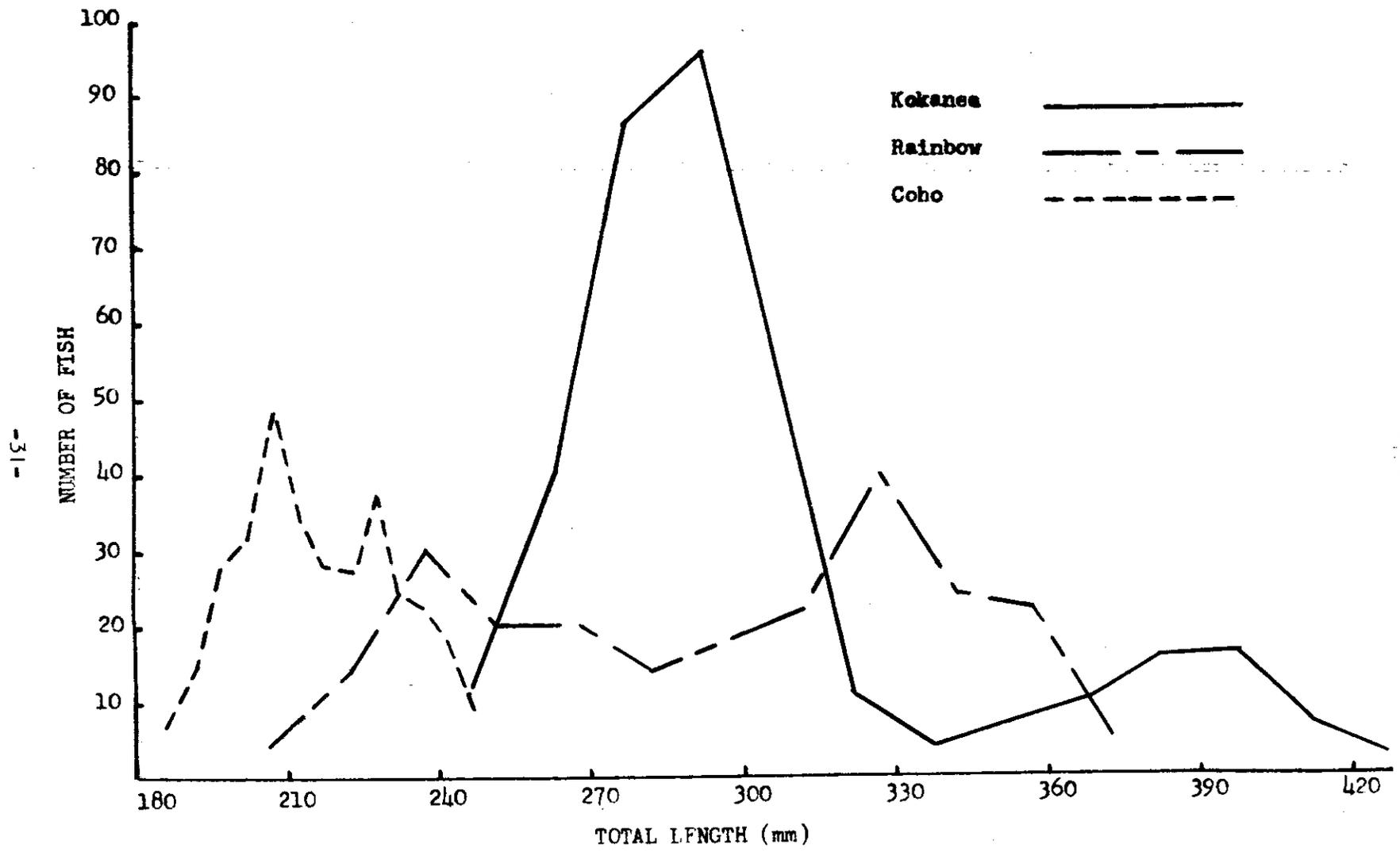


Figure 2. Length frequency distribution of 329 coho salmon, 232 rainbow trout, and 356 kokanee salmon caught by fishermen at Anderson Ranch Reservoir in October and November, 1967

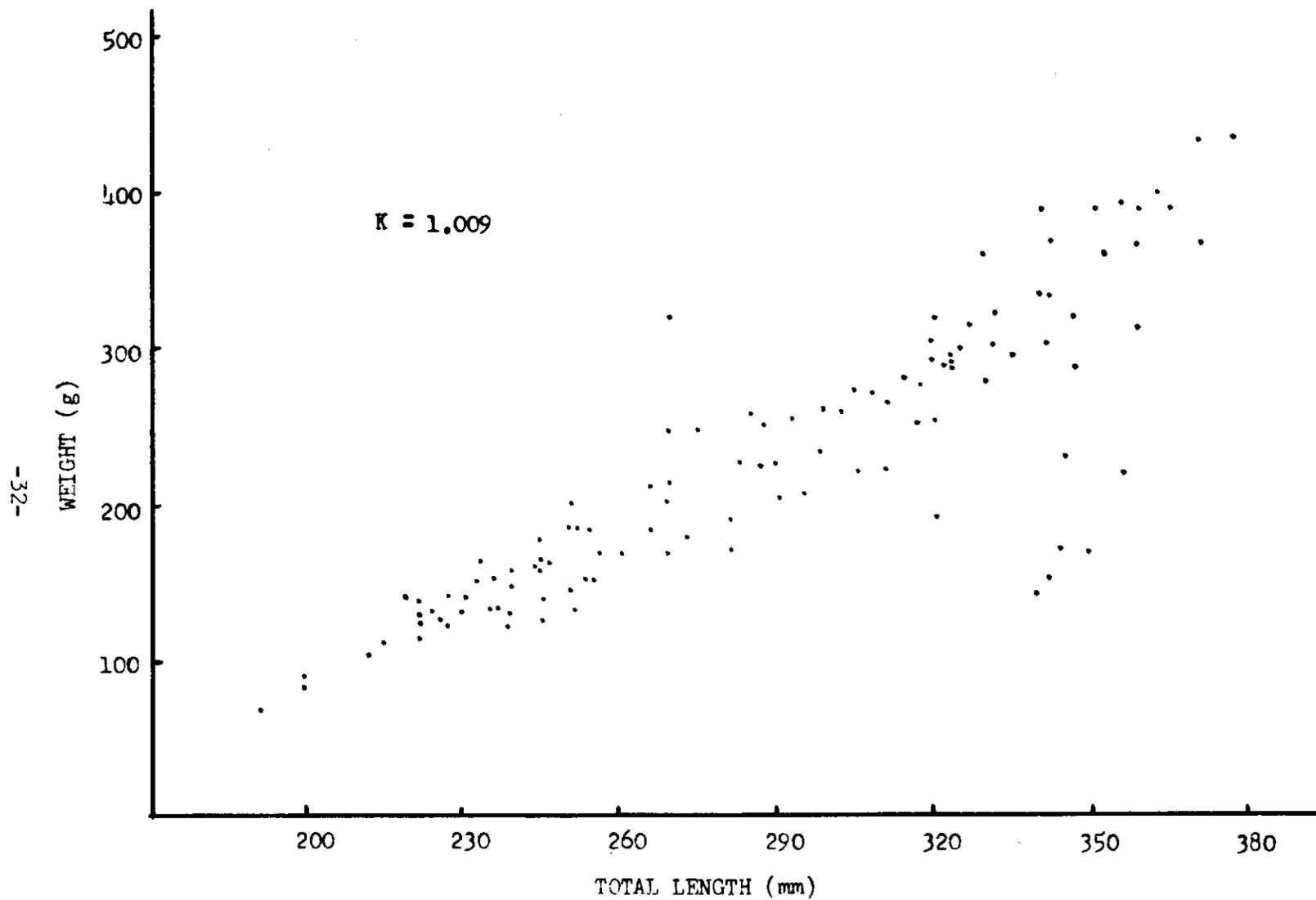


Figure 3. Length-weight relationship and condition factor (k) of rainbow trout caught by fishermen at Anderson Ranch Reservoir in October and November of 1967.

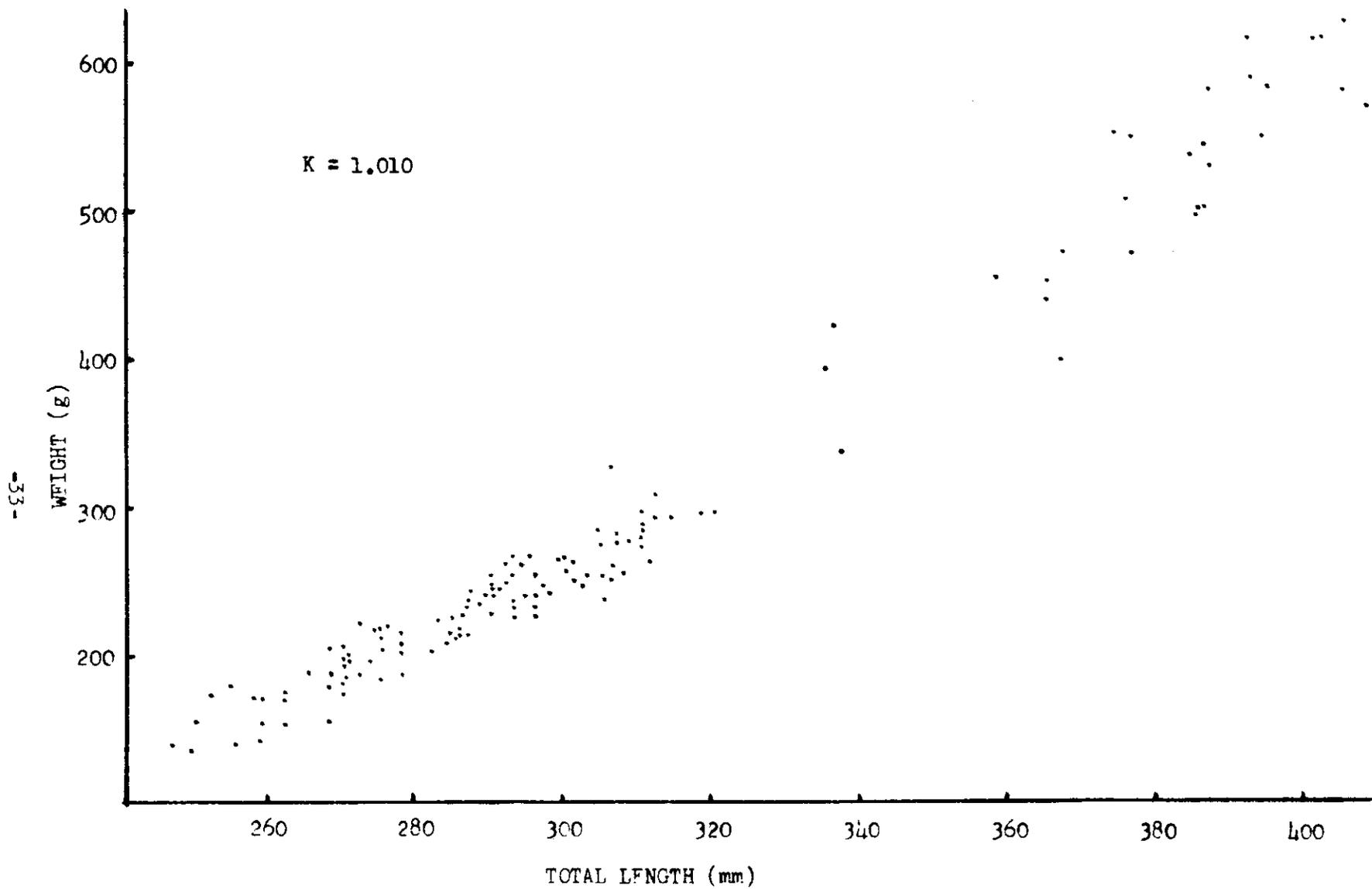


Figure 4. Length-weight relationship and condition factor (K) of kokanee salmon caught by fishermen at Anderson Ranch Reservoir in October and November of 1967.

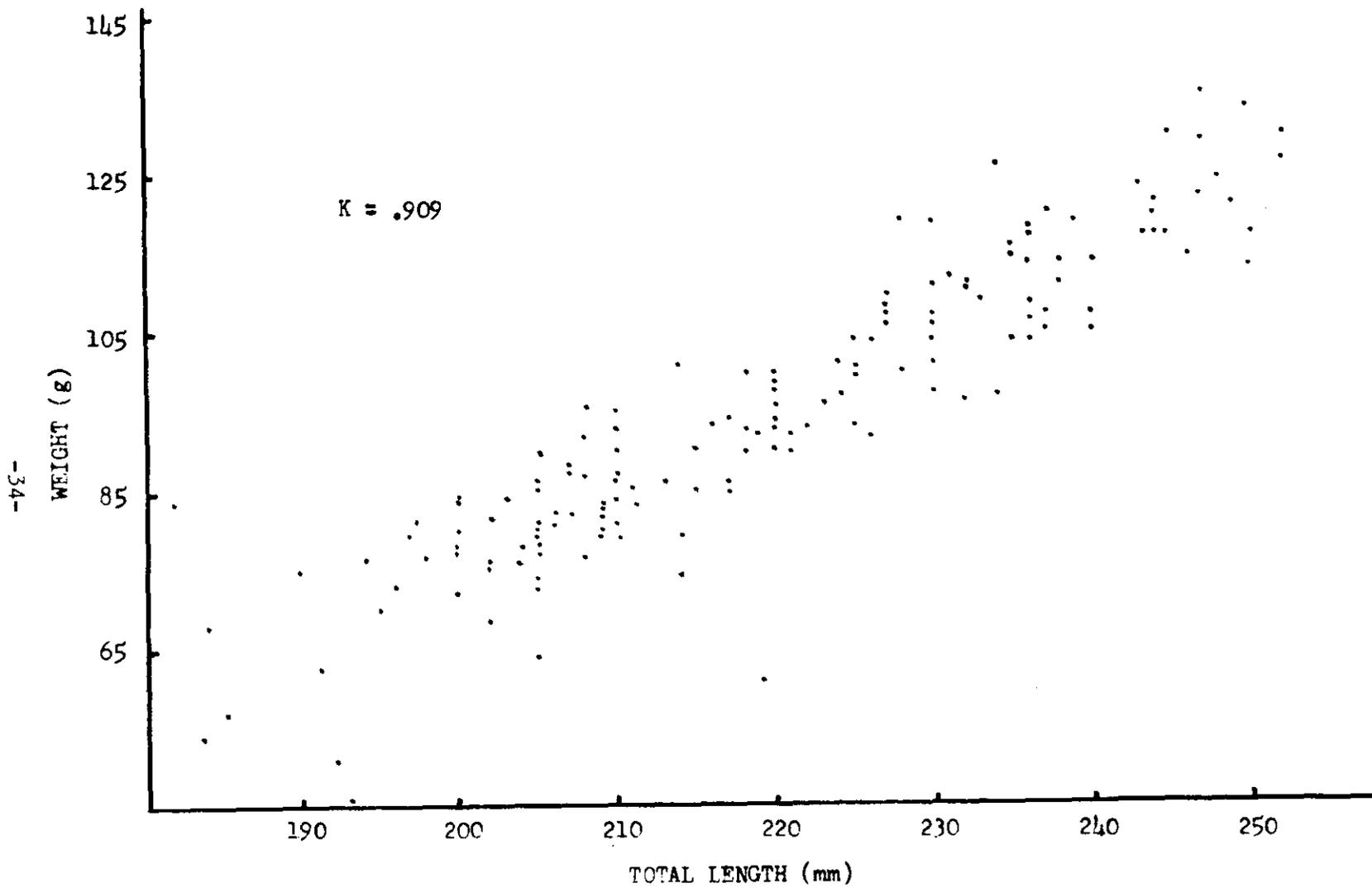


Figure 5. Length-weight relationship and condition factor (k) of coho salmon caught by fishermen at Anderson Ranch Reservoir in October and November of 1967.

Table 6. Vertical distribution of kokanee in gill nets and temperature profile, Anderson Ranch Reservoir, August 20 - 29, 1967.

Depth (Ft.)	Temperature Data		Vertical Distribution (Ft.)	Kokanee Captured
	Temperature Range (°F.)	Average Temperature (°F.)		
0	69 - 71	70	0 - 12	0
10	68 - 70	69	12 - 25	0
20	68 - 70	69	25 - 37	3
30	62 - 68	64	37 - 50	25
40	56 - 68	59	50 - 62	38
50	51 - 68	54	62 - 75	60
60	50 - 67	53	75 - 87	32
70	50 - 64	52	87 - 100	20
80	49 - 60	51	Total	178
90	48 - 57	50		
100	48 - 53	49		

Table 7. Kokanee counts at 17 selected stations in the South Fork of the Boise River above Anderson Ranch Reservoir.

Date	Location of Stations (Road miles above Pine)																Total	
	0	2	4	10	12	18	21	24	31	33	34	36	38	43	46	39		44
8/30/67	0	20	34	2	58	0	0	18	0	0	0	0	0	0	0	0	0	132
9/6/67	2	33	23	3	275*	16	2	325*	0	2	0	3	1	0	0	0	0	685
9/13/67	2	23	12	29	425*	13	0	210	0	1	1	3	1	0	0	0	0	720
9/20/67	0	3	1	2	150	0	0	15	0	0	0	0	0	0	0	0	0	171
9/27/67	0	0	2	1	30	0	0	0	0	0	0	0	0	0	0	0	0	33
Totals	4	79	72	37	938	29	2	568	0	3	1	6	2	0	0	0	0	1,741

*Estimated

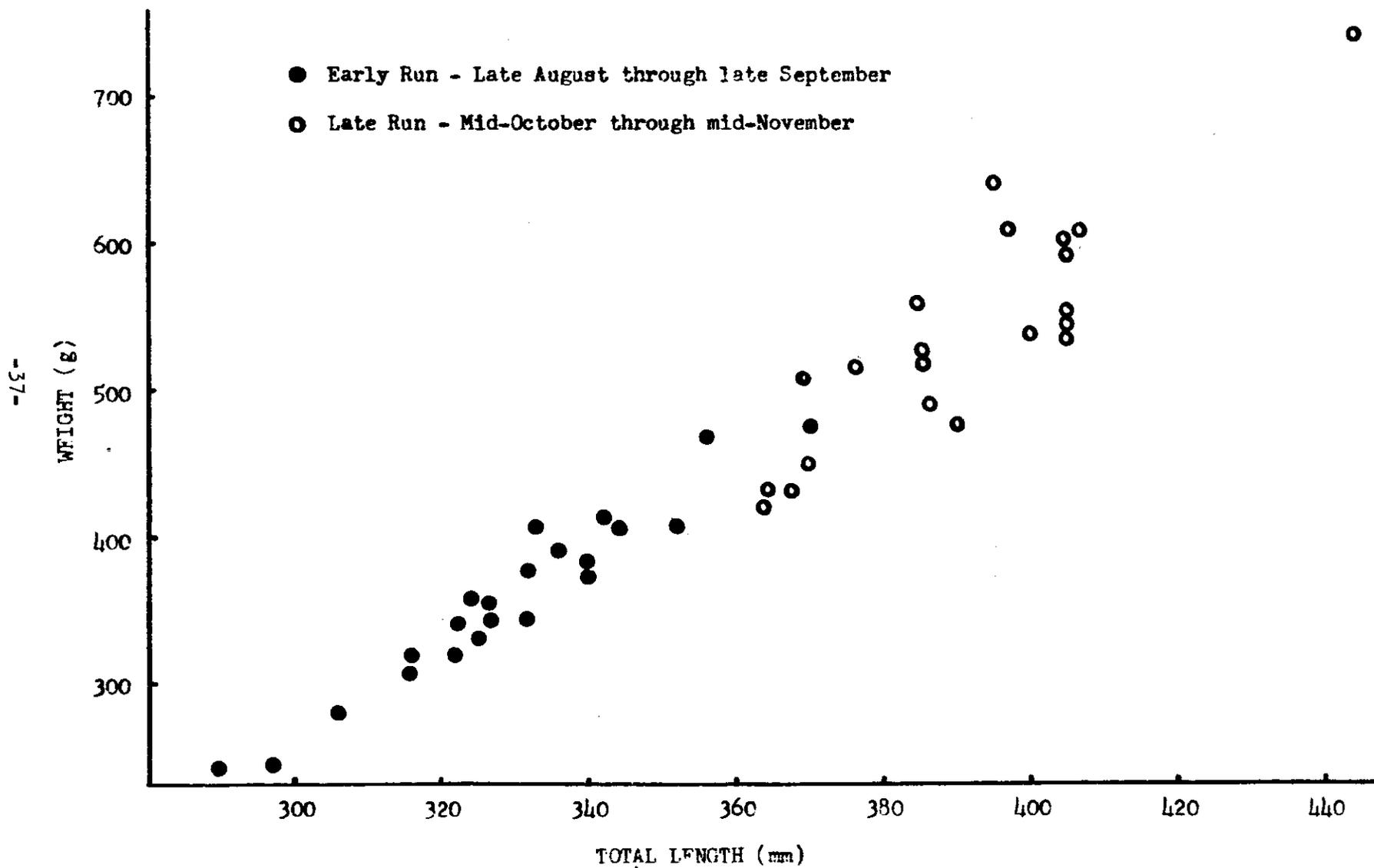


Figure 6. Length-weight relationship of early and late run kokanee salmon in the South Fork of the Boise River, 1967.

Table 8. Stream temperatures of the South Fork of the Boise River near Pine, 1967, (^oF).

Period	Maximum	Minimum	Average
8/28 - 8/31	72	61	66
9/1/ - 9/5	69	60	65
9/6 - 9/10	67	58	62
9/11 - 9/15	62	53	57
9/16 - 9/20	64	54	59
9/21 - 9/25	65	55	60
9/26 - 9/30	63	55	59
10/1 - 10/5	53	49	51
10/6 - 10/10	56	48	52
10/11 - 10/15	53	46	50
10/16 - 10/20	50	43	47
10/21 - 10/25	48	44	46
10/26 - 10/31	47	41	44
11/1 - 11/5	44	39	41
11/6 - 11/10	42	36	39
11/11 - 11/15	45	42	44
11/16 - 11/20	44	40	42
11/21 - 11/25	41	38	39
11/26 - 11/28	37	34	35

Late run kokanee were larger than early run (Figure 6), averaging 390 milli-meters total length and 533 grams compared to early run kokanee averages of 329 millimeters and 355 grams,

Spawning Locations

Kokanee were observed in the South Fork Boise River 43 miles above the reservoir, and In Little Smokey Creek 44 miles above the reservoir.

Although many kokanee were observed in the river, little spawning actually occurred there. Kokanee were observed spawning near the mouth of Beaver Creek,

The bulk of the observed kokanee spawning occurred in Trinity Creek in areas where pea-size gravel was available, It was estimated that between 3,000 and 6,000 kokanee spawned in Trinity Creek from Spring Creek down to the South Fork Boise River,

Minor spawning activity took piece in Little Smokey Creek, Kokanee were not observed in Lime, Willow, Skeleton, and Boardman Creeks,

Temperatures

The mean-maximum river temperature ranged from 72°F. to 62°F. between August 28 and September 30 when the early run kokanee were in the river and the mean-minimum river temperature ranged from 61°F0 to 53°F, (Table 8),

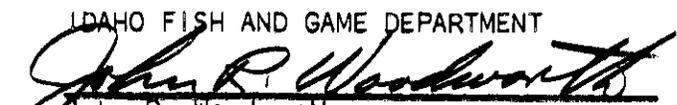
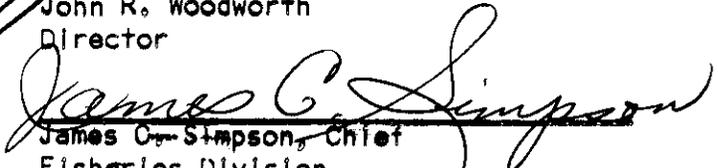
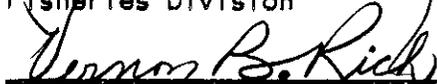
Embryo Development

Thirty-five green kokanee eggs were dug from a redd in Trinity Creek on November 5, On November 26 eyed eggs were collected. The eggs sampled on the above dates were spawned approximately September 15, 1967.

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