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STATE OF ALASKA

William A. Egan, Governor

ANNUAL REPORT OF PROGRESS, 1965 - 1966

FEDERAL AID IN FISH RESTORATION PROJECT F-5-R-7

SPORT FISH INVESTIGATIONS OF ALASKA

ALASKA DEPARTMENT OF FISH AND GAME
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INTRODUCTION

This report of progress consists of Job Segment Reports conducted under the State of Alaska Federal Aid in Fish Restoration Project F-5-R-7, "Sport Fish Investigations of Alaska."

The project during this report period is composed of 18 separate studies. Some are specific to certain areas, species or fisheries, while others deal with a common need for information. Each job has been developed to meet the needs of various aspects of the State's recreational fishery resource. Seven jobs are designed to pursue the cataloging and inventory of the numerous State waters. These jobs, which are of a continuing nature, will eventually index the potential recreational fisheries. Four jobs are directed toward specific sport fish studies. These include specialized efforts toward the anadromous Dolly Varden of Southeastern Alaska, the silver salmon in Resurrection Bay, the king salmon stocks on the Lower Kenai Peninsula, the king salmon stocks in Upper Cook Inlet, and the Arctic grayling of the Tanana River system.

The statewide access program is developing rapidly. Our efforts in investigating existing and potential recreational sites and access has resulted in favorable action being taken on our proposals and recommendations submitted to the land management agencies at both the State and Federal levels.

The remaining jobs included a specialized creel census effort in Southeastern, an egg-take program designed to establish indigenous egg-take sources, and evaluation of the Fire Lake system.

Three special reports have been completed from past studies on the Dolly Varden study. These appear in the Department's "Research Report" series and are a direct result of the Federal Aid In Fish Restoration Program. To date, the following reports have been published: Research Report No. 3, "Some Migratory Habits of the Anadromous Dolly Varden Salvelinus malma (Walbaum) in Southeastern Alaska," 1965, Robert H. Armstrong; Research Report No. 4, "Annotated Bibliography on the Dolly Varden Char," 1965, Robert H. Armstrong; and Research Report No. 5, "Age and Growth of Anadromous Dolly Varden Char Salvelinus malma (Walbaum), in Eva Creek, Baranof Island, Southeastern Alaska," 1966, David W. Heiser.

The material contained in this progress report is often fragmentary in nature. The findings may not be conclusive and the interpretations contained herein are subject to re-evaluation as the work progresses.

RESEARCH PROJECT SEGMENT

STATE: ALASKA

Name: Sport Fish Investigations of Alaska.

Project No.: F-5-R-7

Job No.: 14-A

Title: Inventory and Cataloging of Sport Fish and Sport Fish Waters of the Copper River and Prince William Sound Drainage, and the Upper Susitna River.

Period Covered: April 1, 1965 to March 15, 1966.

ABSTRACT

Inventory and cataloging studies were instigated at the project area by Van Wyhe (1960, 1961, 1962) and continued by Williams (1963, 1964). The present report is a continuation and expansion of these prior studies.

Fifty-five lakes and 24 streams were investigated on the basis of their present and future sport fishing potential, and their respective capacities to produce or sustain sport fishing through management applications.

Fecundity studies were instigated on grayling, Thymallus arcticus, in the Tolsona Lake drainage and on lake trout, Salvelinus namaycush, in the Lake Louise-Susitna Lake drainage. Experimental egg takes were made during early May for grayling and during mid-October for lake trout. Approximately 1,127,000 grayling eggs and 130,000 lake trout eggs were obtained. SCUBA gear was employed in making observations on the spawning behavior of lake trout.

The subsistance salmon fishery in the Upper Copper River was observed for the fifth consecutive year. Compared with prior years, a marked increase in the number of permits issued this year was recorded. The estimated catch remained substantially the same, and no significant difference in the species composition of the catch was noted.

The commercial, winter whitefish fishery was monitored at Crosswind Lake. A total of 3,247 whitefish was taken. Biological data obtained were restricted to scale samples, weights and lengths.

Assistance was provided access biologists in selecting and assessing sites for withdrawal. Recommendations are made for study and acquisitions of future potential sites.

Recommendations are included for management of specific waters and development of selected remote areas for sport fishing.

RECOMMENDATIONS

In consideration of the findings obtained during 1965-66 the following recommendations are made:

1. Every effort should be made to complete the inventory and cataloging of all lakes and streams along the road systems.

2. Grayling spawning investigations should continue at Moose and Tolsona Lakes to further evaluate this source for a permanent site.

3. Lake trout investigations should be continued. Sampling should continue at other sites where practicable.

4. A sport fish evaluation of the Gulkana River should be initiated. This is a long-term project and will take several summers to complete.

5. The collection of whitefish data should be continued and expanded to secure additional ecological data.

6. More effort should be put forth on creel census and the measure of fishermen utilization. This phase should include the military recreational camps in an effort to secure usable fish harvest data. Also, fishermen counts should be made and a system adopted utilizing volunteer reporting by guides and bush pilots who fly fishermen into remote lakes.

7. The program of winter dissolved-oxygen determinations should be continued. The program is starting to show results and it should be expanded.

8. Effort should be directed toward increasing the utilization of the fisheries during the winter months as many people are not aware of the possibilities of winter angling nor of the methods which are most successful.

OBJECTIVES

To continue the inventory and cataloging of lakes and streams in the Copper River, Prince William Sound and Upper Susitna River drainages.

To evaluate the present and potential use of fishing waters in this area.

To investigate those fisheries which may have potential as egg-taking sites for trout, char, and grayling.

To secure eggs from trout, char, and grayling where possible and practicable.

To determine trends of fish populations in the more exploited waters and to formulate management plans for these fisheries.

To evaluate multiple water use development projects for the proper protection of the sport fish resources.

To evaluate the effects of limited commercial fishing activities on whitefish populations in this area.

To maintain a check on the harvest of fish by fish wheels, dip nets, and other forms of subsistence fishing gear.

TECHNIQUES USED

Fish populations were sampled with 125-foot gill nets with five stretch mesh sizes ranging from 1 inch to 3-1/2 inches, a 150-foot 2-inch stretched mesh gill net, fyke traps, and beach seines. All gill nets were of nylon construction and rigged to fish on the bottom.

Winter oxygen determinations were made using a Hach colorimeter. Temperatures and soundings were taken with a battery-powered electronic thermometer.

The plastic impression method was used for mounting all scales for age analysis.

Grayling were trapped with a standard "V" type upstream trap and held in conventional live cars for egg-taking purposes.

All fish lengths taken were fork length and are in inches and tenths of inches.

FINDINGS

The areas encompassed by this report include the drainages of the Copper River, Prince William Sound, and the upper Susitna River. The Copper River and upper Susitna River make up an estimated area of 24,000 square miles. The annual runoff from the Copper River drainage alone is estimated at 24,000,000 acre feet.

The Copper River area comprises a vast complex of lakes and streams which support, or have the potential for supporting, sport fish populations. Most of the waters in this area are not adjacent to a road system and therefore are not readily available to the average angler.

To provide angling for the greatest number of fishermen, emphasis was placed on those waters adjacent to access roads (Van Wyhe 1961, 1962; Williams 1964, 1965). The present project continues these prior studies.

Limited surveys are conducted on fly-in waters that are, or may become, important to anglers.

The sport fish species in the report area consist primarily of grayling, Thymallus arcticus (Cope); lake trout, Salvelinus namaycush (Walbaum); and rainbow trout, Salmo gairdneri (Richardson). Some experimental plants of silver salmon, Oncorhynchus kisutch (Walbaum), have been successful. The Dolly Varden, Salvelinus malma (Walbaum); cutthroat trout, Salmo clarki (Richardson); pink salmon, Oncorhynchus gorbuscha (Walbaum); chum salmon, Oncorhynchus keta (Walbaum); and king salmon, Oncorhynchus tshawytscha (Walbaum) are also present in many of the waters of this area. Burbot, Lota lota (Linnaeus); round whitefish, Prosopium cylindraceum (Pallas); and lake whitefish, Coregonus clupeaformis (Mitchell) are also present but are not taken in any great numbers by sport fishermen. Whitefish are taken primarily by subsistence and commercial fishermen.

Cataloging and Inventory

Test Netting:

Test netting was conducted on 55 lakes in the study area (Table 1). Twenty-seven of these lakes had not been previously surveyed. A complete record of findings for all waters surveyed is on file at the Glennallen district office, Anchorage regional office and Juneau headquarters office.

Four of the new lakes checked were on the Denali Highway. Three were found to contain good populations of lake trout, grayling, and whitefish. These lakes are all close to the road system and have been marked with roadside signs. The fourth new lake on the Denali Highway was found unable to support game fish species due to below minimum winter dissolved-oxygen levels.

Two new lakes on the Lake Louise Road were surveyed to complete the investigations in that area. George Lake and Forgotten Lake were found to support good populations of grayling. George Lake is approximately a 1/4-mile walk from the road and is utilized heavily by anglers staying at the Lake Louise military recreation camp.

Two new lakes on the Nabesna Road, Little Twin Lake and Kettle Lake, were surveyed. Little Twin Lake has populations of lake trout and grayling; Kettle Lake supports a small sucker population and will be stocked with a game fish species in the near future on an experimental basis.

Fifteen of the new lakes investigated were in the Prince William Sound area. Generally, the lakes were biologically unproductive; about one-half of the lakes checked were very deep, oligotrophic waters. Fish species sampled included Dolly Varden, cutthroat trout, red salmon and chum salmon. No immediate management is planned for these waters since fishing pressure is practically non-existent. The adjacent salt water offers more desirable angling to the fishermen. However, as time and personnel permit, the survey of the fresh waters in Prince William Sound will be continued.

Gergie Lake and Mirror Lake, Glenn Highway, were test netted for survival of respective 1961 plants of rainbow trout and silver salmon. The rainbow trout in Gergie Lake had reached a fork length of 15.5 inches while Mirror Lake silver salmon did not survive. January oxygen determinations in Mirror Lake showed 2.8 ppm at a depth of six feet. While grayling are present in the lake, the winter conditions are apparently below minimum dissolved-oxygen requirements for silver salmon.

TABLE 1 - Test Net Summaries, 1965.

Name	Number of Fish	Species[1]	Length Range[2]	Mean Length	Frequency[3]	Percent Composition
Tanada Lake	8	RS	Not Measured		0.15	14.0
	5	LT	9.8 - 27.0	21.0	0.09	8.0
	6	BB	14.0 - 36.0	18.0	0.12	10.0
	23	WF	7.3 - 16.2	12.6	0.45	39.0
	17	GR	12.2 - 16.4	12.5	0.33	29.0
Sarani Lake	95	WF	8.5 - 14.6	10.6	1.38	95.0
	3	LNS	9.8 - 16.4	14.0	0.04	2.5
	3	GR	7.8 - 11.8	10.1	0.04	2.5
Tex Smith Lake	4	RB	6.8 - 7.4	7.1	0.29	100.0
Tolsona Lake	39	GR	7.6 - 15.7	12.4	2.30	69.0
	7	SS	14.0 - 19.0	17.3	0.41	12.0
	11	LNS	6.7 - 16.2	12.7	0.64	19.0
Two Mile Lake	9	GR	7.6 - 9.8	8.4	0.19	50.0
	9	RB	7.2 - 8.8	7.9	0.19	50.0
Seven Mile Lake	52	LT	11.3 - 18.7	15.0	1.30	100.0
Octopus Lake	1	LT	6.6	19.0	0.05	3.0
	30	WF	6.6 - 16.8	12.8	1.50	88.0
	3	GR	8.5 - 9.6	9.0	0.15	9.0
Teardrop Lake	11	GR	7.9 - 10.4	9.3	0.46	50.0
	10	WF	14.1 - 19.3	15.4	0.42	45.0
	1	BB	Not Measured		0.04	5.0

TABLE 1 (Cont.) - Test Net Summaries, 1965.

Name	Number of Fish	Species [1]	Length Range [2]	Mean Length	Frequency [3]	Percent Composition
Ten Mile Lake	8	LT	13.6 -		1.00	32.0
	17	WF	8.8 - 16.0	13.0	2.12	68.0
16.8 Mile Lake	10	GR	9.0 - 14.0	12.0	0.21	42.0
	14	LT	10.8 - 19.7	13.8	0.29	58.0
17.0 Mile Lake	3	GR	10.7 - 14.8	12.8	0.17	100.0
Klutina Lake	41	RS			10.25	100.0
Kettle Lake	11	LNS	5.5 - 13.0	8.9	0.37	100.0
Little Twin Lake	18	GR	7.0 - 15.5	12.1	0.45	90.0
	1	LT	22.5		0.03	5.0
	1	BB	22.5		0.03	5.0
Long Lake	95	GR	7.0 - 14.5	12.7	1.70	98.0
	2	BB	11.5 - 13.0	12.3	0.04	2.0
Lost Cabin Lake	91	GR	8.5 - 11.8	9.7	4.12	84.0
	17	LNS	7.0 - 14.5	12.1	0.77	16.0
Mae West Lake	52	GR	7.0 - 14.3	11.2	3.06	70.0
	22	LNS	7.4 - 11.7	9.9	1.29	30.0
Meiers Lake	99	GR	6.7 - 17.2	13.3	1.92	98.0
	2	BB	15.6 - 21.0	18.3	0.04	2.0
Moose Lake	54	GR	7.7 - 14.7	12.4	3.09	94.0
	2	LNS	7.2 - 13.3	10.3	0.12	3.0
	2	SS	17.6 - 20.7	19.2	0.12	3.0

TABLE 1 (Cont.) - Test Net Summaries, 1965.

Name	Number of Fish	Species [1]	Length Range [2]	Mean Length	Frequency [3]	Percent Composition
Nita Lake	7	LNS	8.0 - 17.9	13.1	0.18	50.0
	5	WF	8.6 - 13.1	10.7	0.13	36.0
	1	GR	10.0		0.03	7.0
	1	BB	11.4		0.03	7.0
One Mile Lake	11	DV	8.8 - 16.6	13.1	0.23	26.0
	30	GR	7.4 - 13.6	10.9	0.66	72.0
	1	RB	8.9		0.02	2.0
18.3 Mile Lake		No Catch				
29.2 Mile Lake		No Catch				
36.0 Mile Lake	1	GR	11.2		0.04	7.0
	4	WF	15.4 - 16.8	16.0	0.17	29.0
	9	LT	11.4 - 23.3	15.7	0.40	64.0
46.9 Mile Lake	23	GR	9.2 - 15.4	12.2	1.44	100.0
74.0 Mile Lake (Swamp Buggy Lake)		No Catch				
Charlie Lake	36	RS			0.75	75.0
	9	DV	4.0 - 15.0	8.4	0.19	19.0
	3	CS	30.0 - 33.0	31.7	0.07	6.0
Esther Lake	4	DV	15.0 - 17.1	16.0	0.05	100.0
Pass Lake	5	DV	7.3 - 12.5	19.4	0.14	100.0

TABLE 1 (Cont.) - Test Net Summaries, 1965.

Name	Number of Fish	Species 1/	Length Range 2/	Mean Length	Frequency 3/	Percent Composition
Golden Lake		No Catch				
Coghill Lake		No Catch. Nets set before entry of anadromous fishes.				
Eyak Lake	2	CT		11.75	0.08	18.0
	2	DV	10.5 - 15.8	13.10	0.08	18.0
	7	RS				64.0
Ewan Lake	1	DV	7.0		0.06	100.0
Blue Lake		No Catch				
Jackpot Lake #2		No Catch				
Canoe Pass Lake #1	11	CT	7.2 - 10.0	8.3	0.41	100.0
Canoe Pass Lake #2	3	CT	8.3 - 10.0	9.2	0.13	100.0
Big Twin Lake	77	GR	7.4 - 14.8	12.1	1.75	96.0
	3	BB	14.4 - 16.2	15.3	0.07	4.0
Boulder Lake	14	LT	7.3 - 18.8	13.1	0.83	94.0
	1	GR	17.0		0.06	6.0
Thirteen Mile Lake		No Catch				
Three Mile Lake	4	RB	8.2 - 9.8	9.0	0.08	6.0
	64	GR	7.1 - 8.6	7.9	1.33	94.0

TABLE 1 (Cont.) - Test Net Summaries, 1965.

Name	Number of Fish	Species [1]	Length Range [2]	Mean Length	Frequency [3]	Percent Composition
Forgotten Lake	19	GR	6.5 - 14.0	11.6	0.86	90.0
	2	BB	8.0 - 13.0	10.5	0.09	10.0
Fish Lake	108	WF	6.7 - 13.8	10.9	6.00	98.0
	1	BB	12.5	0.	0.06	1.0
	1	LNS	22.0		0.06	1.0
George Lake	64	GR	6.1 - 16.8	10.8	2.80	96.0
	2	LNS	13.7 - 14.3	14.0	0.09	4.0
Gergie Lake	12	LNS	10.1 - 21.1	18.1	0.63	27.0
	14	RB	10.0 - 15.5	13.9	0.74	30.0
	20	GR	8.5 - 12.7	9.9	1.05	43.0
Gunsight Lake	18	GR	10.3 - 13.5	11.3	No fishing time recorded	100.0
Hot Dog Lake	9	GR	6.3 - 6.9	6.6	1.8	100.0
June Lake	15	WF	7.0 - 10.5	8.4	0.36	80.0
	1	BB	11.0		0.02	5.0
	1	GR	8.0		0.02	5.0
	1	LNS	7.5		0.02	5.0
	1	SS	7.6		0.02	5.0
Mirror Lake	31	GR	8.5 - 15.0	13.7	0.69	100.0

TABLE 1 (Cont.) - Test Net Summaries, 1965.

Name	Number of Fish	Species [1]	Length Range [2]	Mean Length	Frequency [3]	Percent Composition
Milton Lake	11	CT	6.5 - 10.2	8.0	0.46	73.0
	4	DV	9.3 - 13.4	10.6	0.17	27.0
Knowles Lake	2	CT	11.3 - 12.5	11.9	0.08	67.0
	1	RS		15.2	0.04	33.0
Gravina Lake	3	CT	11.1 - 11.6	11.3	0.12	75.0
	1	DV	8.5 -	8.5	0.04	25.0
Nuchek Lake	3	CT	8.3 - 10.7	9.0	0.13	37.0
	5	DV	7.0 - 7.6	7.4	0.21	63.0
Crosswind Lake [4]	95	WF	8.2 - 17.4	13.0	1.09	96.0
	2	LNS			0.02	2.0
	1	LT	17.3		0.01	1.0
	1	BB	21.6		0.01	1.0
Burnt Lake [4]	1	WF	9.3		0.05	100.0

[1] RS - Red Salmon
GR - Grayling
CS - Chum Salmon
RB - Rainbow
LNS - Longnose Sucker
LT - Lake Trout
DV - Dolly Varden
BB - Burbot
WF - Whitefish
SS - Silver Salmon
CT - Cutthroat Trout

[2] Measurements taken in inches of fork length.

[3] Frequency is the number of fish per net hour.

[4] Test netted in winter.

A population check of Moose Lake, Mile 170 Glenn Highway, revealed that grayling were holding up well in spite of increased fishing pressure. The net sampling frequency for grayling was 3.09 as compared to 2.80 in 1964, and the mean size was three inches longer for grayling taken during 1965, compared to fish sampled in 1964. Gill netting and creel census indicated that silver salmon numbers have declined since 1964 because no silver salmon were stocked after 1962 and no natural reproduction takes place.

During 1964 and 1965, four gill nets were set in Nita Lake and in June Lake. In spite of annual stockings of rainbow and silver salmon since 1961, only one silver salmon and no rainbow trout were taken. For reasons not immediately apparent, these two species have not established themselves in these two lakes. Population sampling will be conducted again in 1966 and, unless the results are improved, the stocking of rainbow trout and silver salmon will be discontinued.

Meiers Lake, Mile 172 Richardson Highway, was test netted for the first time during 1965. The lake was found to contain an excellent population of grayling averaging 13.3 inches. The lake is adjacent to the highway and readily accessible.

Winter Oxygen Determinations:

Winter oxygen determinations were conducted on fourteen lakes (Table 2). Determinations have been made during three consecutive winters in an effort to (1) determine if winter conditions in certain barren lakes are such that they will support a fish population; (2) set up a criteria, based on dissolved oxygen content of a lake, for the survival or overwinter of various species of fish; (3) determine the rate of oxygen depletion through the winter on a given lake; and (4) determine the influence of snow and ice thickness on oxygen content.

Dissolved oxygen determinations from Junction Lake compare favorably with those taken from Tolsona Lake. Tolsona Lake supports a good population of grayling and some rainbow and silver salmon. Junction Lake is barren at this time. Previously, it was planned to stock Junction Lake with grayling. However, on the basis of winter oxygen determinations, an experimental plant of rainbow trout is recommended.

There has been local interest expressed to stock Kenny Lake. During the last three winters the highest dissolved-oxygen concentration sampled in Kenny Lake was 3.0 ppm and the lowest was 0.7 ppm. Based on this data it is recommended that no stocking of trout be made.

June Lake has consistently high dissolved-oxygen concentrations during the winter months. However, fish population checks made with gill nets have shown low numbers of grayling, whitefish and silver salmon. This would indicate that the limiting factor is not winter dissolved-oxygen concentrations. The situation is similar in Tex Smith Lake which has a high dissolved-oxygen content during the winter but has an apparent low survival of stocked rainbow trout.

TABLE 2 - Winter Oxygen Determinations from Waters in the Copper River Drainage

Date	Lake	Depth of Sample	PPM Oxygen	Max. Depth of Lake	Fish Present*	Ice Thickness
3/18/65	Tex Smith	5 feet	9.0	25 feet	RB	33 inches
1/31/66	Tex Smith	6 feet	7.8	25 feet	RB	17 inches
1/31/66	Tex Smith	10 feet	7.8	25 feet	RB	17 inches
3/23/65	Mae West	5 feet	1.2	9 feet	GR	33 inches
	Mae West	5 feet	5.6	9 feet	GR	20 inches
3/23/65	Arizona	6 feet	2.6	19 feet	None	33 inches
2/11/66	Junction	6 feet	5.5	19 feet	None	19 inches
2/11/66	Junction	10 feet	7.3	19 feet	None	19 inches
3/ 7/66	Junction	6 feet	6.0	19 feet	None	27 inches
3/ 7/66	Junction	10 feet	5.0	19 feet	None	27 inches
3/ 7/66	Caribou	6 feet	4.8	25 feet	GR,BB,SS	24 inches
3/ 7/66	Caribou	10 feet	2.1	25 feet	GR,BB,SS	24 inches
2/11/66	Crater	7 feet	8.3	17 feet	RB	24 inches
2/11/66	Crater	10 feet	8.3	17 feet	RB	24 inches
3/ 7/66	Crater	6 feet	6.4	17 feet	RB	28 inches
3/ 7/66	Crater	10 feet	7.0	17 feet	RB	28 inches
2/ 4/66	Burnt	7 feet	7.5	35 feet	WF,GR,SS	22 inches
2/ 4/66	Burnt	12 feet	7.8	35 feet	WF,GR,SS	22 inches
1/31/66	Tolsona	6 feet	5.0	14 feet	GR,RB,SS	27 inches
1/31/66	Tolsona	7 feet	4.5	14 feet	GR,RB,SS	27 inches
3/ 3/66	Tolsona	7 feet	5.0	14 feet	GR,RB,SS	28 inches
3/ 3/66	Tolsona	7 feet	5.5	14 feet	GR,RB,SS	31 inches **

TABLE 2 (Cont.) - Winter Oxygen Determinations from Waters in the Copper River Drainage.

Date	Lake	Depth of Sample	PPM Oxygen	Max. Depth of Lake	Fish Present	Ice Thickness
3/ 1/66	Kenny	6 feet	0.7	10 feet	None	27 inches
3/ 1/66	Kenny	9 feet	0.0	10 feet	None	27 inches
3/ 1/66	Pippin	6 feet	1.6	14 feet	None	31 inches
3/ 1/66	Pippin	8 feet	3.0	14 feet	None	31 inches
1/31/66	Moose	6 feet	7.5	30 feet	GR,RB,SS	24 inches
1/31/66	Moose	10 feet	7.8	30 feet	GR,RB,SS	24 inches
3/ 3/66	Moose	6 feet	7.0	30 feet	GR,RB,SS	28 inches
3/ 3/66	Moose	10 feet	1.7	30 feet	GR,RB,SS	28 inches
3/11/66	Dick	6 feet	9.8	32 feet	GR	30 inches
3/11/66	Dick	15 feet	3.6	32 feet	GR	30 inches
3/11/66	Nita	6 feet	4.2	45 feet	GR,SS	28 inches
3/11/66	June	6 feet	7.9	20 feet	GR,SS	24 inches
3/11/66	June	15 feet	3.5	20 feet	GR,SS	24 inches

*GR - Grayling
RB - Rainbow Trout
SS - Silver Salmon
BB - Burbot
WF - Whitefish

**Sample taken adjacent to area where six acres of lake surface had been cleared of snow for two weeks prior to sampling date.

Pippin Lake is considered marginal for grayling. The highest winter dissolved-oxygen sample taken was in 1965 with 3.6 ppm indicated. Samples taken in 1966 showed 3.0 ppm of oxygen. Dissolved-oxygen determinations in Mae West Lake are as low as 1.2 ppm, but test netting shows good grayling populations present. Pippin Lake will be experimentally stocked with grayling during 1966.

Oxygen determinations made in Tolsona Lake indicate the value of having snow cleared off the ice. During February of 1966, approximately six acres of the lake surface was cleared of snow for a local snowmobile derby. Dissolved oxygen determinations taken two to three weeks later showed more oxygen at seven feet than was found at five feet a month earlier in 1965. In the area where this snow clearing was conducted the ice was three inches thicker and the dissolved oxygen was 0.5 ppm higher than in other portions of the lake. These findings are only preliminary and additional tests will be conducted during the winter of 1966 to corroborate this.

Fly-In Lake Surveys:

Although the majority of the effort is concentrated on roadside waters, selected fly-in areas are investigated. Each year finds more anglers willing to go to the expense and time necessary to fly into some of the larger lakes to obtain almost virgin fishing conditions. It is therefore necessary that a limited amount of effort be spent each year investigating the more remote fisheries and that biological data be collected for future management and public access recommendations.

Tanada Lake, located on the north slope of the Wrangell Mountains, was surveyed in late July. This lake is approximately six miles long and a mile wide at its greatest width. A maximum depth of 180 feet was located. Limited shoal area is present.

Species of fish collected from Tanada Lake included lake trout, round whitefish, burbot, grayling, and red salmon. The latter species is found in large numbers during the summer months. Few lake trout were taken during the investigations. Grayling were found to be in good numbers and of a desireable size. Tanada Lake is about a ten-minute flight from the Nabesna Road and is not fished heavily at this time. There is one commercial boat livery located on Tanada Lake. The fishery is capable of greater utilization than is now present.

Fish Lake has an estimated surface area of 2,500 acres and is located in the West Fork of the Gulkana River Drainage. The maximum depth is 18 feet. Fish Lake contains large numbers of lake whitefish and supports grayling, lake trout, and burbot. It has been reported that red salmon were found in the lake during the summer, but no specimens were collected during this investigation. The lake is not especially attractive to the sport fisherman although whitefish can be taken readily with flies. If commercial fishing for whitefish ever becomes economically feasible in this area, Fish Lake will assume a more important role.

Boulder Lake, part of the Maclaren River drainage, is twenty minutes' flying time from Summit Lake on the Richardson Highway. Boulder Lake has an estimated surface area of 1,500 acres and a maximum depth of 120 feet. Almost 75 percent of the lake is less than 25 feet deep. A single gill net set took 14 lake trout and 1 grayling. The largest lake trout was 18.8 inches. This lake reputedly produces trophy lake trout fishing although it does not give the appearance of being a productive fishery. The water is extremely clear and is devoid of submergent vegetation. With the exception of a few grayling, no forage species of fish are available for the lake trout.

Stomach content checks of the lake trout revealed the principal food to be snails; two fish had taken voles. The lake is located at an altitude of 3,800 feet and the growing season and angling season are quite short. Consideration is being given to the introduction of whitefish to aid feed and growth conditions for lake trout.

Hot Dog Lake is located about fifteen minutes' flying time east of Gulkana Airfield. The lake has no permanent inlets or outlets. The only species of fish present are stunted grayling; the largest taken by gill net was 6.9 inches. There is excellent spawning gravel present in the lake. With a maximum depth of 34 feet the introduction of predatory species such as lake trout would prove feasible. However, present fishing pressure does not warrant any intensive management.

Gulkana River Drainage Survey:

A five-day float trip was made from Crosswind Lake to Sourdough Creek via Dog Creek, Fish Creek, Fish Lake, West Fork of the Gulkana River, and the Gulkana River during July. A preliminary survey of the sport fish potential of this area was made. Unfortunately, seasonal rains made the West Fork of the Gulkana River high and muddy and the only fish taken were grayling and whitefish.

Dog Creek, the outlet of Crosswind Lake, supports a summer population of whitefish, grayling, lake trout and burbot. Dog creek flows through several small, unnamed lakes between Crosswind and Fish Lakes. These small bodies of water offer excellent grayling fishing.

Fish Creek is a small, short creek connecting Fish Lake with the West Fork of the Gulkana River. Grayling and whitefish were present in abundant numbers. At the time the float trip was made, king salmon were present in the Gulkana River and could be taken by rod and reel. Because of their advanced spawning condition these fish were not desireable for food but were being taken and released by anglers. Grayling fishing in the Gulkana River is excellent.

This float trip should have considerable appeal to the public. The scenery is superb and the water conditions are not hazardous. The trip can easily be made in three days.

Stream Surveys:

Preliminary stream surveys were conducted on 24 streams along the highway system (Table 3). Information was gathered concerning flows, cover, spawning, food, accessibility, barriers, pollution, and species of fish present.

TABLE 3 - Streams Surveyed in 1965.

Glenn Highway	Richardson Highway
Tolsona Creek	Yetna River
Mae West Creek	Worthington Creek
Little Nelchina River	Willow Creek
Gunsight Creek	Tsaina Creek
Cache Creek	Tonsina River
	Tiekel River
Tok Cutoff	Squirrel Creek
Fish Creek	Stewart Creek
	Rock Creek
Chitna Road	Ptarmigan Creek
Liberty Falls Creek	Little Tonsina River
Five Mile Creek	Fish Creek
Chitina Creek	Cascade Creek
	Boulder Creek
	Gulkana River

Information obtained on streams is also entered in a separate stream catalog (Table 4). The purpose of this catalog is to serve as a quick reference for biological and public information purposes. Because of the great number of streams in the Copper, Susitna, and Prince William Sound drainages the catalog will not be completed for many years. However, the value of this reference will increase each year as more information is collected. The catalog is designed according to its place in relationship to other streams in the drainage. The streams are listed in chronological order starting from the mouth of the Copper River and going upstream. Streams which are indented are tributaries of the preceding stream listed in the catalog.

Grayling Investigations:

Investigations of grayling spawning activities in the Copper River Basin began in late April. Several creeks including Moose, Dry, Bear, Bessie, Sourdough, Poplar Grove and Our were investigated. The ice in these streams was breaking up, but water temperatures did not rise above 33°F. until the second week in May.

TABLE 4 - Copper River Drainage Stream Catalog Outline.

Stream	Species*	Remarks
1. Copper River (Section 3)	RS,KS,SS,LP,GR,SH,WF,BB,DV	Sport fishing poor - silty
29. Tazlina River	RS,KS,GR,WF,DV	Sport fishing poor - silty
A. _____**		
B. Moose Creek	GR,WF,LNS	Access Mile 186. Good sport fishing
C. Hudson Creek	BB,WF	Not suitable. Too small
D. Nickel Creek		
E. Durham Creek		
F. Tolsona Creek	GR,WF	Access Mile 173. Good sport fishing
a. Bessie Creek	GR	Spawning site. Tributary to Tolsona Lake
1. Our Creek	GR	Spawning site. Tributary to Tolsona Lake
G. _____		
H. _____		
I. Kaina Creek	DV,KS,RS	Tributary to Tazlina Lake
J. Mendeltna River	GR,RS,KS	Access Mile 153. Good sport fishing Tributary to Tazlina Lake

Typical page from stream catalog for Copper River Drainage

*RS - Red Salmon, KS - King Salmon, SS - Silver Salmon, LP - Lamprey, GR - Grayling, SH - Steelhead, WF - Whitefish, BB - Burbot, DV - Dolly Varden.

**Denotes stream shown on map but no name.

A fyke trap was installed in Moose Creek near Glennallen. The trap did not prove successful due to high water. Only 15 grayling were taken in 2 days.

A "V" trap was installed in Poplar Grove for two days but did not capture any fish. The trap was effective in blocking the entire creek, but the cold water temperatures apparently inhibited any grayling movement.

On May 13, Bessie Creek, between Moose and Tolsona Lakes, Mile 170 Glenn Highway, was investigated. Bessie Creek averages four feet wide and one foot deep. The water temperature was 42°F. and there were approximately 300 mature grayling in the small, 300-yard-long stream. Six fish were captured by hook and line, examined, and found gravid. A "V" type trap was installed and 550 grayling were captured in 8 hours. The following day 835 grayling had been taken and were held in live cars. Sorting and stripping was started immediately. Two hundred sixty-four females and 282 males were spawned. The eggs were allowed to water harden and were then placed in one-gallon jars and sealed under water. The jars were then packed in ice chests, with ice and snow, for delivery to the Fire Lake Hatchery. Because of the large number of eggs taken, there were insufficient jars available. A ten-gallon plastic trash can was used to carry the surplus eggs. The can was half-filled with water and snow and the lid securely fastened. According to hatchery personnel these eggs arrived in good condition. The eggs were in transit two hours. This method is not recommended except in an emergency.

According to estimates made at the Fire Lake Hatchery, the total grayling egg shipment was 1,127,000 eggs for an average of 4,269 eggs per female. The 289 unspawned fish were kept in the holding pens and trapping was continued. By the evening of May 14, a total of 1,600 additional grayling had been collected. At that time a message was received from the hatchery that their hatching capacity was exhausted. The fish were released and the operation terminated.

The spawned grayling averaged 12.2 inches fork length and ranged from 9.8 to 15.0 inches.

The total grayling run in Bessie Creek was estimated to have been in excess of 3,000 fish. Tolsona Lake is readily accessible by automobile and is fished heavily. Moose Lake is joined to Tolsona Lake by Bessie Creek. Moose Lake has an inlet, Our Creek, which has an annual spawning run of grayling estimated to be as large as Bessie Creek. A combination of these two creeks may well serve the Department as a permanent egg-taking site for grayling without impairing the quality of the grayling fishery in either Moose or Tolsona Lake.

Lake Trout Investigations

On September 1, investigations of the lake trout in Susitna Lake were initiated. During the investigations gill nets and fyke traps were employed. Periodically, temperature data were collected. SCUBA

gear was used to observe spawning areas and to check traps. Captured lake trout were measured and tagged. Scale samples were taken and maturation data were collected.

Two types of gill nets were used for collecting fish; a standard 125-foot variable mesh, monofilament sinking type, and a 150-foot, one-inch bar mesh ("tooth mesh") nylon sinking net. Nets and traps were set almost every day from September 1 until 25. During this period 175 lake trout, an estimated 3,500 whitefish, and 50 burbot were captured. Ninety of the lake trout were males, 60 were females and 25 were classified as sex unknown.

All lake trout that appeared to be mature were held in a net live-car which was six feet long, four feet wide, and six feet deep. Weights were fastened to the lower corners so that the top of the net was flush with the surface of the water. Fifteen lake trout were lost over the top of the live-car until an adequate cover was devised. It was found that the fish became excited and nervous when the live-car was approached. A cover placed over the pen seemed to reduce the unnecessary agitation.

When over 50 lake trout were obtained, it was necessary to retain some of them in a live-car constructed of wood and chicken wire. The live-car was submerged in 11 feet of water. The lake trout in the live-car survived in good condition. The high survival rate was probably due to the fact that they were not disturbed.

The first ripe lake trout were taken in the nets on September 18. After that date all lake trout taken were gravid or immature. Two egg-takes were made when it was apparent that the females were in ripe condition. Seventeen females were spawned. One hundred and thirty-thousand lake trout eggs were delivered to the Fire Lake Hatchery averaging over 7,600 eggs per female. The females used in egg-taking operations ranged from 27.5 to 39.0 inches fork length and averaged 31.5 inches. Some of the females were almost half spent when taken from the nets.

Several females, which had not been stripped of eggs, were released at the completion of the project due to a shortage of good, ripe males. It was found that after the males were held for some time the amount of available milt had diminished. It was necessary to use several of the male lake trout more than once.

Fifty-nine of the lake trout were tagged with Peterson disc tags for future identification and study. The remainder were not marked because of (1) net mortality, (2) loss over the top of the live-car, and (3) some of the lake trout were in a weakened condition and it was not deemed advisable to expose these individuals to additional handling.

Water temperature data were taken five times during the investigations, (Table 5). Based on gill netting and temperature data it appears that the lake trout ripened at about the same time as the fall over-turn occurred. The first ripe female lake trout was taken on September 18. This coincides closely with the time the

TABLE 5 - Water Temperature Data, Susitna Lake, 1965.

Depth	Temperature in degrees Fahrenheit				
	Sept. 3	Sept. 11	Sept. 15	Sept. 18	Sept. 25
Surface	54.8	55	52	52	49
5 feet	54.2		52		
10 feet	54.0	53.8	52	51	49
15 feet	52.8		52		
20 feet	52.6	53	52	51.5	49
25 feet	52.4		52		
30 feet	52.4	53	52 Bottom	50	49
35 feet	52.4			50 Bottom	
40 feet	52.4	53			49
45 feet	52.3				
50 feet	52.2	52.8			49
55 feet	52.0				
60 feet	50.9	52			49
65 feet	48.1				
70 feet	45.9	52			48 Bottom
75 feet	44.1 Bottom				
80 feet		49.2			
85 feet					
90 feet		46			
95 feet					
100 feet		46 Bottom			

overturn was detected on September 15. Scale samples were taken from 131 lake trout, impressed in plastic, and analyzed for age (Table 6). No conclusions were reached concerning the age of maturity as the sample did not include enough of the smaller, younger fish. The two smallest female lake trout tagged were 19.5 inches fork length. One female was mature while the second one was not. Males as small as 17.8 inches fork length were found to be mature.

Based on general observations, practically all sampled lake trout over 22 inches fork length were mature. Sixteen mature females, which died as a result of gill net injury, were examined. It was found that six would have spawned this year while the remaining ten did not contain gravid ovaries. The 1:2 sex ratio is similar to that found by investigations in Great Bear Lake (Miller and Kennedy, 1948), and during lake trout transplanting operations in Interior Alaska (Metsker 1963). The sample from Susitna Lake, however, is considered too small to be conclusive.

It became apparent that lake trout suffered less net mortality when taken in the one-inch bar mesh net than in the variable mesh nets. This is attributed to the relatively small size of the openings in the "tooth mesh" net which tended to capture more of the fish by the teeth rather than around the mouth and gills as was the case in the larger meshes of the variable nets. It should be pointed out that the one-inch bar mesh net did not catch any more lake trout than the variable mesh nets, but it did take substantially more whitefish. As many as 300 whitefish were taken in overnight sets of the one 150-foot, 1-inch mesh net.

A hoop trap was used during the project but did not prove successful in capturing lake trout. This was due primarily to inadequate wings and leads. This trap was successful in taking good numbers of whitefish and burbot. It is probable that burbot were attracted into the trap by whitefish previously captured. Observations made with SCUBA gear indicated that the burbot were not especially timid in the presence of a swimmer and were engrossed with the task of consuming the whitefish with whom they were trapped. If alterations can be made which would make the fyke a more efficient trap it would be an excellent tool. One of the primary advantages of this type of trap is the fact that it is not necessary to remove the fish immediately after they are caught to insure survival.

SCUBA activities were confined to cursory examinations of shallow bars where lake trout had been taken with nets and for setting and checking the fyke trap. Very few lake trout were observed and no definite spawning activities were seen. Visibility was generally good and the bottom could be observed quite well. Several potential spawning areas were located and examined. Observations were limited by a shortage of time and personnel. It did become apparent that SCUBA gear can contribute to ecological and behavioral studies of lake trout as well as to other types of investigations. One of the obvious conclusions of this lake trout investigation was that a considerable amount

TABLE 6 - Age Determinations of Lake Trout, Susitna Lake, 1965.*

Age Class	Sample Size	Average Fork Length in Inches	Length Range Fork Length In Inches
IV	1	9.9	9.9
V	4	13.7	11.6 - 14.9
VI	8	16.2	13.3 - 17.8
VII	10	18.0	14.6 - 22.5
VIII	11	19.4	17.8 - 21.0
IX	12	22.9	17.4 - 28.5
X	16	25.3	20.0 - 30.5
XI	10	29.3	26.0 - 34.0
XII	19	29.9	25.0 - 32.5
XIII	16	30.4	25.5 - 37.5
XIV	12	31.3	26.8 - 33.5
XV	2	33.6	31.1 - 36.0
XVI	4	33.7	32.0 - 36.8
XVII	2	37.0	35.0 - 39.0
XVIII	2	32.5	32.5
XIX	1	34.0	34.0
XX	1	36.2	36.2

*Scales for these determinations were collected during September.
(N = 131)

of gill netting and trapping is required in order to secure adequate numbers of fish for an egg take, age and growth study, and/or tagging operations. Because of the nature of the lake trout they can be found spawning in a great many places throughout the lake. From data collected it appears that any concentrated efforts can be forestalled until the middle of September, or at least until water temperatures indicate that the maturation of the lake trout is approaching. New and improved equipment will be prepared for the next season and will include a new type live-car, better fyke trap leads, more intensive SCUBA operations, and faster, larger boats to facilitate transporting adult fish to the holding pens.

Subsistence Fishing Studies

The number of subsistence permits issued in the Upper Copper River again increased in 1965 (Table 7). The number of permits issued in 1965 represents a 245 percent increase since 1961. The average catch remained nearly the same as in 1964. The estimated total catch was 20,625 salmon. There is a definite change occurring in the type of gear used in subsistence fishing. From 1964 to 1965 there was a decrease of 27 percent (188) in the number of fish wheel permits issued. The number of people depending upon fish taken from fish wheels is decreasing as well as the need for dried fish to feed dog teams. The corresponding increase in dip net subsistence fishermen is a reflection of the growing number of people who regard dip netting for salmon as a recreation and not as a means of sustaining livelihood.

Whitefish:

For several years lake and round whitefish have been taken during the winter by gill net for subsistence and commercial purposes from such lakes as Crosswind, Susitna, Tyone, Fish and Lake Louise. The total take for any given year most likely never exceeded 2,000 fish.

During 1965, a single commercial whitefish fisherman operated at Crosswind Lake. His take for the 1964-65 winter amounted to 3,247 (Williams, 1965). While this is not a great number of fish it does show that the whitefish can be taken in large numbers if there is a sufficient demand for them. If a good market is established for whitefish taken in this area we can expect an increase in commercial fishing activities.

To prepare for such an eventuality it is necessary to secure ecological data about the whitefish. Since 1964, data collections have been made on lake whitefish including fork lengths and scale samples. A series of length measurements were taken from the catch of the commercial fishermen at Crosswind Lake during the winter of 1964-65 (Williams, 1965). Through the winter of 1965-66 another series of measurements and scale samples was taken from gill netting activities at Crosswind Lake. Table 8 shows age-length data for lake whitefish sampled. Examination of the gonads revealed that all female fish over 11 inches fork length had eggs and would probably spawn the following fall.

TABLE 7 - Subsistence Permits and Catch in the Upper Copper River, 1961 through 1964.

	1961	1962	1963	1964	1965
Number of permits issued*	326	448	624	994	1,125
Number of catch records returned**	200	420	344	682	729
Percent catch records returned	62	94	55	68.6	64.8
Number of salmon recorded on catch records	15,991	16,273	15,200	12,743	13,452
Average number of salmon taken per person	80	38.7	44.2	18.7	18.5
Percent of red salmon in catch	96	93	93	94	94.9
Percent of king salmon in catch	2	5	3	5.5	4.7
Percent of silver salmon in catch	2	2	4	.5	.4
Estimated total salmon catch	24,075	15,984	25,580	18,550	20,625

*For 1965 this data includes 10.2 percent fish wheel permits, 87.3 percent dip net permits and 2.5 percent dip net/fish wheel permits.

**Each year permits are returned unused. These are not used in computing the average and estimated catch.

TABLE 8 - Age and Lengths of lake Whitefish from Crosswind Lake Commercial Fishery, 1966.*

Age Class	Sample Size	Average Length Fork Length (Inches)	Length Range Fork Length (Inches)
III	1	8.2	8.2
IV	10	10.9	9.8 - 12.0
V	19	12.3	10.0 - 13.6
VI	29	13.0	10.3 - 14.4
VII	25	13.7	12.6 - 15.3
VIII	8	14.6	13.0 - 16.5
IX	3	16.5	14.9 - 17.4
TOTAL	95		

* Collected February 17 and 18, 1966.

Figure 1 shows a comparison of the catch from the variable mesh experimental gill nets and the nets used by the commercial fisherman. As illustrated, large numbers of whitefish do not enter the catch until attaining 11.5 inches fork length, or after maturity. The graph also demonstrates that the variable mesh nets do not adequately sample the smaller fish. At the time that the variable mesh nets were used, observations were made adjacent to the nets using a "darkhouse." This is simply a small (5-foot by 5-foot) house, set over a hole in the ice, which omits daylight. Visibility was excellent and large numbers of whitefish from five to nine inches could be seen; however, very few this size were taken in the gill nets.

There is a significant drop in the catch of whitefish after they reach a fork length of about 13.5 inches and age VII. This might indicate a high, natural mortality. Figure 1 also indicates that maturation and spawning occurs prior to the time significant numbers of fish enter the net fishery.

Figure 2 is presented to illustrate that there is a significantly greater difference in length (between July and February fish) in the younger age classes.

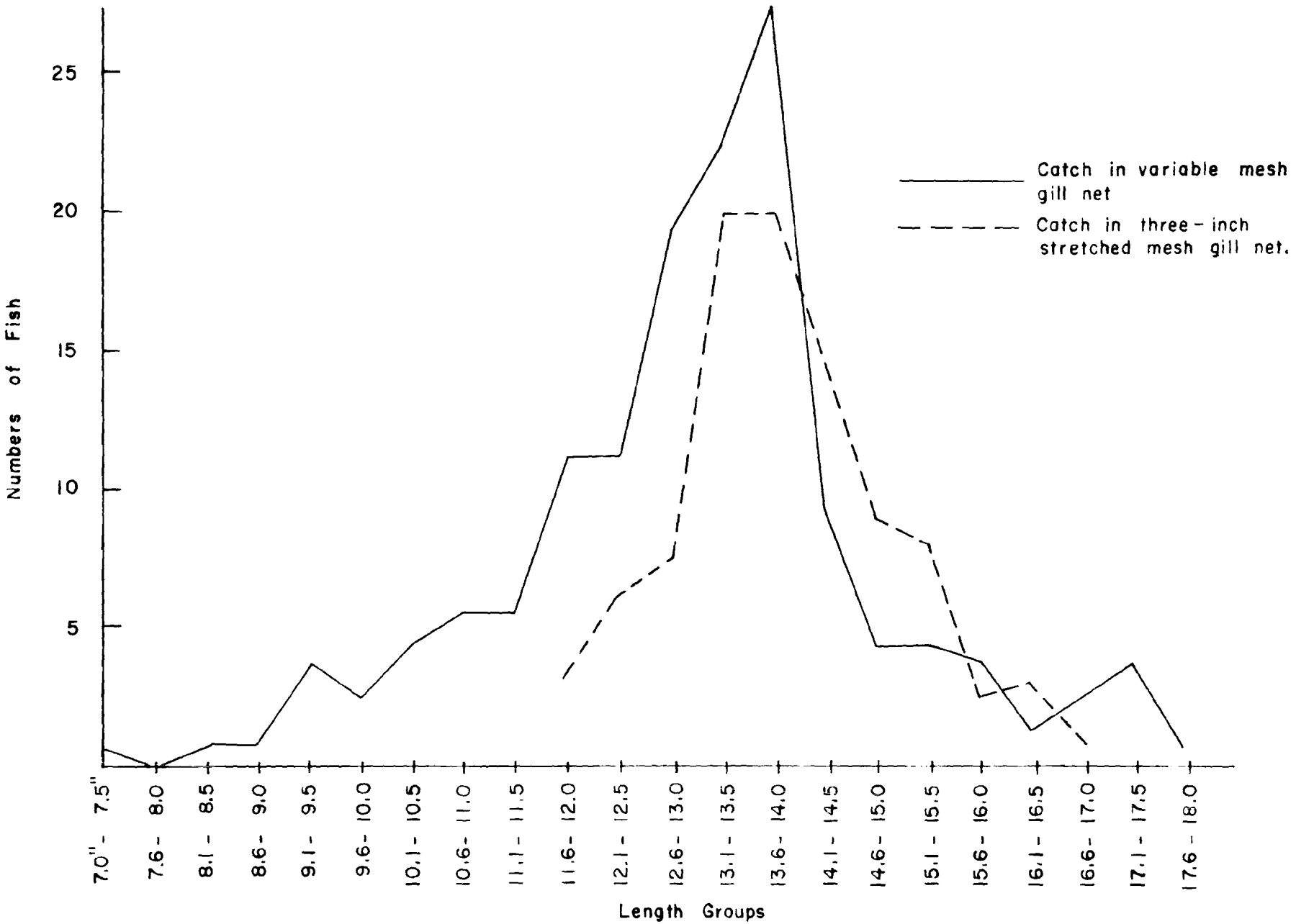
The majority of the net catch consisted of age classes, VI, VII and VIII. The samples used in the comparisons were small but are believed significant. Additional samples will be taken to substantiate these suppositions in future studies.

Multiple Use and Road Construction Projects Investigations:

During the report year, various investigations were conducted to determine the effects of road and bridge construction on the existing fisheries. Areas checked include the Nabesna Road bridge construction, Klutina River dredging, Richardson Highway construction near Valdez, road construction on the Chitina Road, road construction in the vicinity of Tex Smith Lake, dike construction near Gakona, and culvert placement on Trail Creek near Eureka. Situations involving construction of roads and bridges by the Alaska Department of Highways were investigated and recommendations made to mitigate fish losses. In all cases the Department of Fish and Game recommendations were given careful consideration.

The Bureau of Land Management is considering the withdrawal of approximately 3,500,000 acres of public lands for recreation purposes. These lands include portions of the Susitna, Nelchina, Copper, and Gulkana River drainages. Two days of aerial survey work were carried out in conjunction with the access biologist. Aerial inspection of 245 lakes was made during these flights. Because of the vast number of lakes in this area it was impossible to survey, much less aerially survey, each one at this time. Preliminary recommendations were made for classification of these lakes.

Figure 1. Comparison of numbers and size of lake whitefish taken in three-inch stretched mesh gill net and one-inch to four-inch variable mesh gill nets, Crosswind Lake 1965-1966.



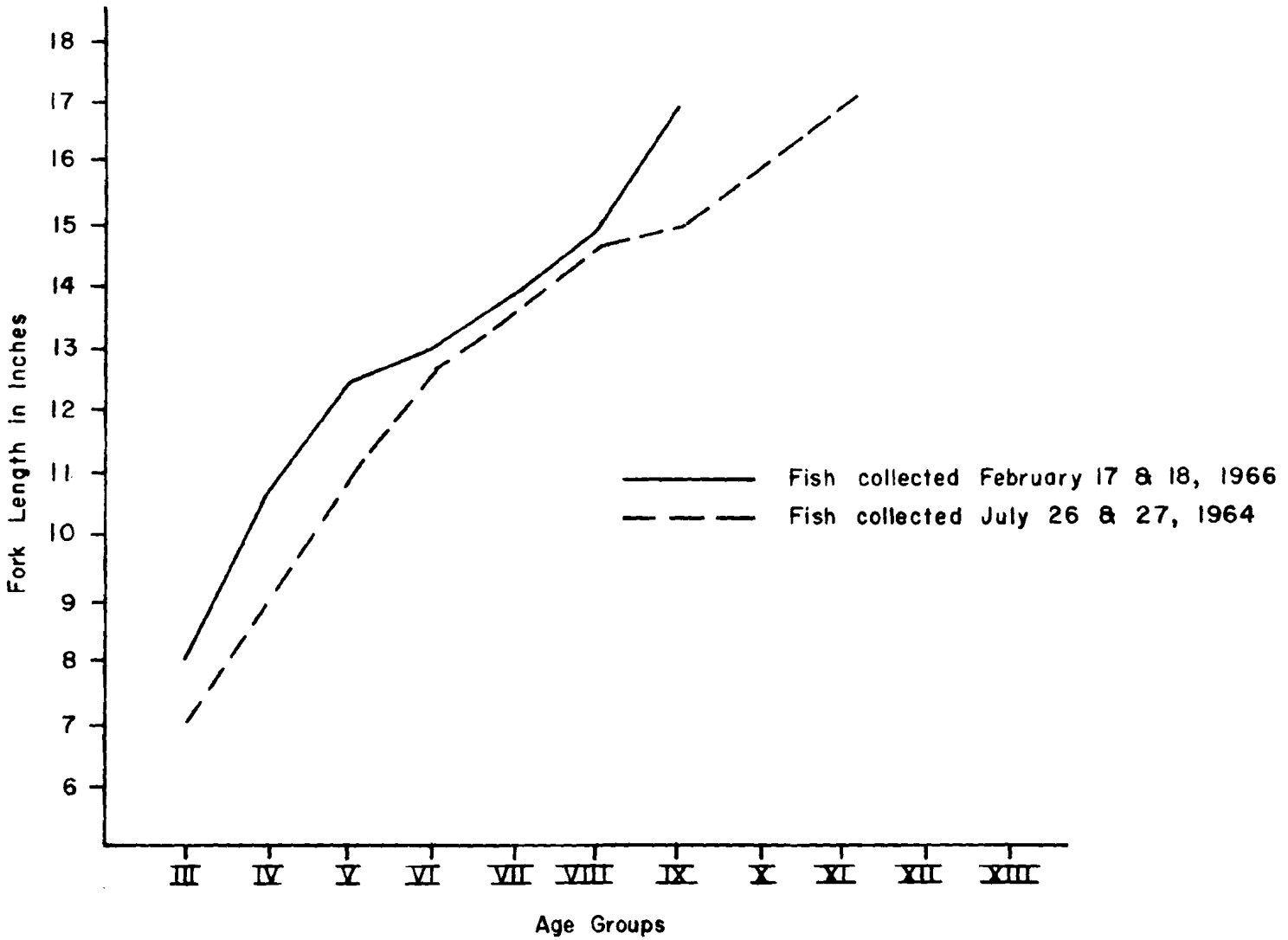


Figure 2. A Comparison of Mean Length of the Various Age Classes of Lake Whitefish in Crosswind Lake, 1964 and 1966.

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Date: April 1, 1966.

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Amount of Dissolved Oxygen is Indicated by a Colorimeter Device.