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STATE OF ALASKA

William A. Egan, Governor

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FEDERAL AID IN FISH RESTORATION PROJECT F-5-R-6

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 from the State of Alaska Federal Aid in Fish Restoration Project F-5-R-6, "Sport Fish Investigations of Alaska."

The project during this report period is composed of 23 separate studies designed to evaluate the various aspects of the State's recreational fishery resources. Of these, eight jobs are designed to pursue the cataloging and inventory of the numerous State waters in an attempt to index the potential recreational fisheries. Four jobs are designed for collection of specific sport fisheries creel census while the remainder of the jobs are more specific in nature. These include independent studies on king salmon, silver salmon, grayling, Dolly Varden, a statewide access evaluation program and an egg take program.

A report concerning the residual effects of toxaphene accumulates the findings of a three-year study. The report presented here terminates this segment and is a final report. The information gathered from the combined studies will provide the necessary background data for a better understanding of local management problems and will assist in the development of future investigational studies.

The subject matter contained within these reports is often fragmentary in nature. The findings may not be conclusive and the interpretations contained therein are subject to re-evaluation as the work progresses.

JOB COMPLETION REPORT

RESEARCH PROJECT SEGMENT

STATE: ALASKA Name: Sport Fish Investigations of Alaska.

Project No: F-5-R-6 Title: Inventory and Cataloging of the Sport Fish and Sport Fish Waters of Southwest Alaska.

Job No: 6-A

Period Covered: July 1, 1964 to March 31, 1965.

ABSTRACT

Survey mapping was continued on Kodiak Island lakes, with seven lakes mapped for surface area and depth contours completed on ten lakes.

Extensive lake observations were compiled and 28 lake survey cards were completed. A brief summary of changes resulting from the March 27 land subsidence and seismic sea waves is included for ten lakes previously under study in the area.

A lake productivity comparison study was begun using trout growth comparison, plankton analysis and water hardness data as productivity indicators. Little correlation was observed between these three methods. Late winter dissolved oxygen and pH levels were also taken. One lake was found deficient in oxygen, and two lakes had levels marginal for trout survival.

Dolly Varden spawning populations were investigated in the Buskin Lake system.

RECOMMENDATIONS

Surface and depth contour maps should be made for four lakes to complete mapping for all waters currently being stocked. Additional maps can then be made for new lakes as they come under study.

Lake survey cards are particularly needed for several fly-in lakes which are becoming popular for trout fishing.

Larger samples of trout from the 1963 plants should be taken and examined for growth differences. The productivity

study should be expanded to include a bottom sampling program. Mid-summer pH and hardness values need to be taken for comparison with winter values, and winter oxygen samples repeated as necessary on marginal lakes.

A tag recovery program to delineate intra-system populations and extent of migration outside the Buskin Lake system should be considered for the Dolly Varden investigations.

OBJECTIVES

1. To conduct lake and stream surveys and evaluate the extent, the potential and the current use of the waters readily available to the area's anglers.

2. To investigate the sources for providing a supply of trout, char, and salmon eggs for experimental hatching and rearing and to conduct pilot egg takes if practicable.

3. To determine the relative need for future management investigations and to direct the course of such studies.

TECHNIQUES USED

Standard lake survey techniques were used in surface and volumetric mapping. This mapping involved the use of an alidade, plane table, stadia rod, and fathometer mounted on a small pram. Maps were produced on 24-inch by 30-inch drafting film, and areas were calculated by use of a compensating polar planimeter.

Water samples were taken at mid-depth with a Kemmerer water sampler. Dissolved oxygen samples were fixed in the field using Hach powder pillows (Hach Chemical Company - Water analysis Procedures, Volume 8) and titrated in the laboratory with Hach stable PAO solution. Water hardness and pH tests were also conducted in the lab. Hardness tests utilized Hach UniVer I powder pillows and HexaVer Standard Solution to determine calcium carbonate in the presence of iron and copper interference. The Hach colorimeter method with a pH 6.5 calibration buffer solution was used for pH determinations.

Plankton sampling (Figure 2) was done with a 1/2-meter diameter No. 20 nylon net. Vertical hauls were made from near-bottom to surface in the deepest part of the lake.

FIGURE 1 - Predation of a 14.6-inch Silver Salmon on Planted Trout.

FIGURE 2 - Plankton Sampling in Starbird Lake.

The samples were fixed in formalin and stored in two-ounce specimen jars. Prior to being read, the sample volume was measured in a calibrated flask, and 1 cc. Foerst piston pipette was used to take a random sample. This sample was then placed in a Sedgwick-Rafter counting chamber and read under a zoom dissecting microscope. Magnification (ranging from 15 to 60 power) was adjusted to include random fields with volumes of .15 to .01 ml., depending on the size of the organism being counted. Three to ten fields were read per sample for each type of organism, and counts were calculated in organisms per square meter of lake surface area.

Gill net samples were made using 125-foot sinking nets with monofilament mesh ranging from 3/4 to 2 inches square measure. Fish were measured (snout to tail fork) and weighed on a triple-beam balance after being soaked in water and drained on paper towelling.

Fecundity was calculated from the weight of 100 eggs compared to the total egg weight removed from both skeins.

FINDINGS

Beginning in 1961, the Kodiak sport fish investigations program has centered largely upon investigation of local lakes that lie along or adjacent to the road system. (See State of Alaska Dingell-Johnson Reports, Volumes 3 and 4). Plants of rainbow trout, Arctic grayling, and silver salmon have been made in these small oligotrophic lakes since 1953. Trout growth has been generally poor, but the stocked fish have contributed significantly to the sport fishery, and natural spawning populations have been established in at least four lakes. Arctic grayling plants in four lakes have been unsuccessful, with a small population established in only one lake. Silver salmon plants have produced a less desirable fish from the standpoint of growth and predation on future plants (Figure 1). Past investigations have initiated studies which include mapping and sounding of these lakes to determine surface areas and water volumes. This data is vital in evaluating past stocking levels and in planning for future stocking densities in local lakes.

During this reporting period, surface area mapping was done for seven lakes, and depth contouring was completed for ten lakes in the area. This data is included in Table 1 along with lake mapping data from previous years.

Lake cataloging was continued and 28 lake survey cards were completed. These cards are on file at the Department's

TABLE 1. - Summary of Lake Surveys and Soundings in the Kodiak Area

Lake Name	Catalog No.	Surface Acres	Year Surveyed	Acre feet of water		Max. Depth in feet
Ambercrombie	SC#12	18.7	(1962)	242	(1962)	25
Island	SC#13	45.4	(1957)	513	(1964)	30
Dark	SC#14	15.2	(1957)	118	(1964)	15
Lilly	SC#15	15.6	(1957)	-		-
Tanignak	WI#61	29.7	(1957)	-		-
Cascade	AL#1	16.4	(1964)	250	(1964)	35
Ft. Greeley	-	5.8	(1964)	34	(1964)	21
Arrowhead	B#17	3.0	(1962)	-		-
Margaret	B#35	7.9	(1962)	104	(1962)	24
Genevieve	B#18	47.1	(1962)	1134	(1962)	50
Louise	B#19	39.8	(1958)	724	(1964)	45
Jack	B#20	4.7	(1956)	-		8
Lee	B#21	14.3	(1956)	111	(1956)	17
Cicely	B#23	5.6	(1957)	30	(1964)	11
Aurel	B#24	15.2	(1963)	127	(1964)	19
Caroline	B#25	6.6	(1957)	67	(1964)	22
Dragonfly	CP#31	4.7	(1962)	33	(1964)	12
Snag	CP#29	4.9	(1964)	29	(1964)	13
Horseshoe	CP#34	4.8	(1957)	-		-
Starbird	BP#40	12.4	(1956)	181	(1956)	29
Chiniak	CC#41	180.2	(1958)	795	(1958)	12
Neptune	CC#43	28.1	(1964)	-		-
Uranus	CC#44	9.2	(1964)	-		12
Saturn	CC#45	11.7	(1964)	-		12
Jupiter	CC#46	17.5	(1964)	-		15
-	NC#54	7.5	(1962)	-		-
-	NC#55	9.9	(1962)	-		-

Juneau and Kodiak offices. Observations for two lakes (Cascade and Jupiter) that were of particular interest are shown in Table 2. Listed in Table 3 is a summary of changes in ten lakes previously under study that have been altered by seismic waves and land subsidence due to March 27, 1964 earthquake. More detailed observations for these ten lakes, and other lakes and streams in the area, may be found in the Department's earthquake interim report "Post-Earthquake Fisheries Evaluation."

The producitivity comparison study was originally undertaken to demonstrate growth (length and weight) comparisons for brood stock rainbow trout plants (of 100, 200 and 300 fry per surface acre) in ten local lakes from time of planting in September 1963 until time of sampling in June 1964. These fish could not be taken in repeated seine hauls, and passed through the smallest mesh of the experimental gill nets. Therefore, only the trout from the 1962 brood year, as shown in Table 4,were used for growth comparison. When compared with the 12.6-inch trout of the same age from Jupiter Lake, it is evident that growth is poor in all of these lakes. With the small sample size of five to eight fish per lake, length and weight differences are not significant.

During plankton analysis, cladoceran abundance was compared in the more popular lakes along the road system. Here striking differences occur in the abundance of cladocerans among lakes, with Dragonfly and Snag Lakes having a much lower cladoceran abundance than the Bell's Flats lakes. In other lakes (Figure 4) where plankton hauls were taken during the course of the summer, it is interesting to note the exceptional Daphnia abundance in Island Lake. This lake, surrounded by homes and a trailer court, receives considerable septic tank effluent, which may be a factor in this apparent higher productivity.

Water chemistry analysis, shown in Table 5, was made in February 1965 when winter ice cover was much thicker and over a longer period than normal for the Kodiak area. Low oxygen levels in Snag, Dragonfly, and Beaver Lakes may be attributed to the shallow nature of these lakes and lack of water inflow during the winter. No meaningful interpretation can be made from the water hardness data except to note that all values are low.

Extensive observations were made in the Buskin River system throughout the months of October and November to help determine the location and extent of Dolly Varden spawning

TABLE 2. - Selected Lake Survey Observations

Name	Cascade (AL#1)	Jupiter (CC#46)
Location	East side of Anton Larsen Bay	Cape Chiniak-First Hidden Lake
Acreage	16.4 (250 acre feet)	17.5
Max. depth	35 feet	15 feet
Altitude	450 feet	450 feet
Inlets	Spring fed. One tributary from small beaver pond.	Entirely spring fed.
Outlet	Flows east 1/3 mile over falls to Anton Larsen Bay.	Flows over series of falls to sea by Sequel Point.
Barriers	Small dam at outlet, 200 ft. falls on outlet stream.	Series of high impassable falls to ocean.
Use	Public	Public
Facilities	None	None
Native fish	Stickleback	Stickleback
Introduced species	36,000 rainbow in 1953 20,000 " " 1954	12,000 rainbow in 1953 7,500 " " 1956 5,000 " " 1957 6,000 " " 1958 5,000 " " 1959 7,560 silvers in 1962 1,830 " " 1963
Spawning grounds	None observed and early plants have not reproduced.	Reproductions from early trout plants. Upper 200 yds. of outlet may be used.
Fishing history	Produced good fishing during 1959-1963 period	Good fishing but little utilized.
Watershed	Slopes of alder with grass and spruce patches.	Slopes of thick spruce and salmonberry cover.

TABLE 2 (Cont.) - Selected Lake Survey Observations

Name	Cascade (AL#1)	Jupiter (CC#46)
Remarks	4 hr. gill net (9/64) caught no fish. Very heavy stickleback population. Lake would benefit from rehabilitation.	18 hr. gill net (9/64) caught 4 rainbow 17.3 to 12.6 inches. Males dark and female had developing and retained eggs. Feeding on water beetles, stonefly, dragonfly larvae.
Accessibility	Trail starts SE corner Anton Larsen Bay. Best to reach trail start via small boat from road.	Trail starts at blazed spruce 1 mile from Sequel Point. Trail leads 3/4 mile to lake, continues to Saturn Lake.

TABLE 3. - Summary of Earthquake Damaged Lakes Previously Under Study

Name	Damage
Ambercrombie (SC#12)	The outlet spit is being eroded and high tides periodically enter the lake. It will probably be lost in the near future.
Long (WI#62)	The lake received a temporary influx of salt water. It has now cleared and no long-term damage should remain.
Elephant (WI#63)	The lake received a temporary influx of salt water and is endangered during high tides. This lake will probably become unsuitable for future plants.
Unnamed (LI#72)	High tides enter and the lake will probably be lost.
Starbird (BP#40)	The lake received a heavy influx of salt water which is remaining in the lake, causing permanent stratification with severe oxygen deficiency in the lower strata. Natural restoration of this lake may take several years.
Pony (CC#42)	The lake was a tidal lagoon during most of the summer, but the outlet was rebuild by late September. Complete reclamation may be of a long-term nature.
Chiniak (CC#41)	High tides now enter this lake. It will probably remain unsuited for future plants.
Rose Tead (P#56)	The lake receives salt water on tides above eight feet. Although the spawning areas are little damaged, the lake may be lost as a trout and sockeye salmon rearing area.
Twin (NC#53)	The larger lake is now a tidal lagoon, and the smaller lake is drained.
Barry (NC#50)	High tides now enter the lake. It will probably remain unsuited for future plants.

TABLE 4. - Trout Growth Study in Kodiak Area Lakes

Lake Name	1962 Plant fry/acre	1963 Plant fry/acre	Growth of 1962 Brood Year by June 1964		
			Mean Length	Mean Weight	Mean Scale Circulii Counts
Jack	181	201	6.7"	56g.	13+13+0
Lee	95	102	7.2"	67g.	13+13+1
Cicely	NS*	270	6.8"	60g.	16+12+0
Aurel	NS*	98	6.4"	53g.	15+11+0
Caroline	NS*	105	6.8"	62g.	15+13+0
Dragonfly	936	317	6.8"	58g.	15+13+0
Snag	898	306	6.4"	56g.	13+13+0
Horseshoe	354	105	7.0"	71g.	14+14+1

* From natural spawning of unknown magnitude

TABLE 5. - Lake Water Analysis - Mid-Depth During February 1965

Lake Name	Catalog number	Dissolved Oxygen in ppm.	pH	Total Hardness as ppm. $CaCO_3$	Inches of ice + snow cover
Island	SC#13	9.9	6.3	24	22+3
Beaver	SC#16	5.5	6.1	24	24+3
Ft. Greeley	-	11.5	5.9	20	18+4
Buskin (outlet)	-	-	6.7	16	18+3
Margaret	B#35	11.9	6.5	26	26+3
Genevieve	B#18	13.1	6.6	20	24+2
Louise	B#19	12.5	6.4	20	24+2
Jack	B#20	12.1	6.1	22	24+3
Lee	B#21	9.4	6.0	12	22+2
Cicely	B#23	7.3	6.1	24	18+6
Aurel	B#24	12.2	6.3	20	24+6
Caroline	B#25	14.0	6.4	22	24+4
Dragonfly	CP#31	5.3	5.8	22	24+4
Snag	CP#29	2.1	5.8	28	24+4
Horseshoe	CP#34	8.0	6.2	26	24+6

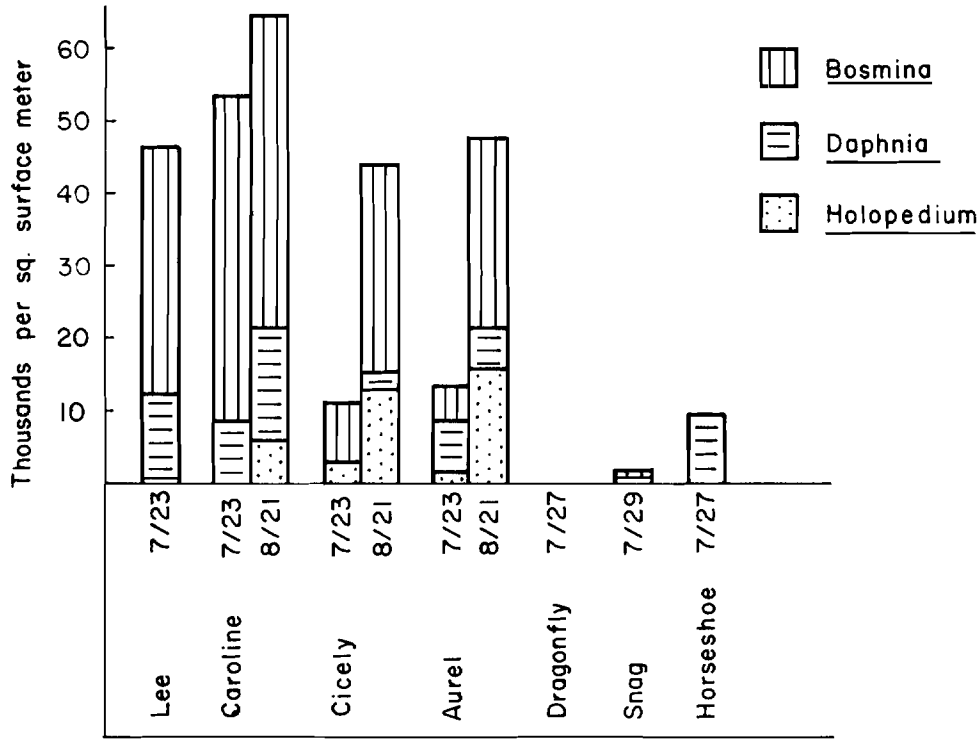

Figure 3
Cladoceran Abundance in Study Lakes

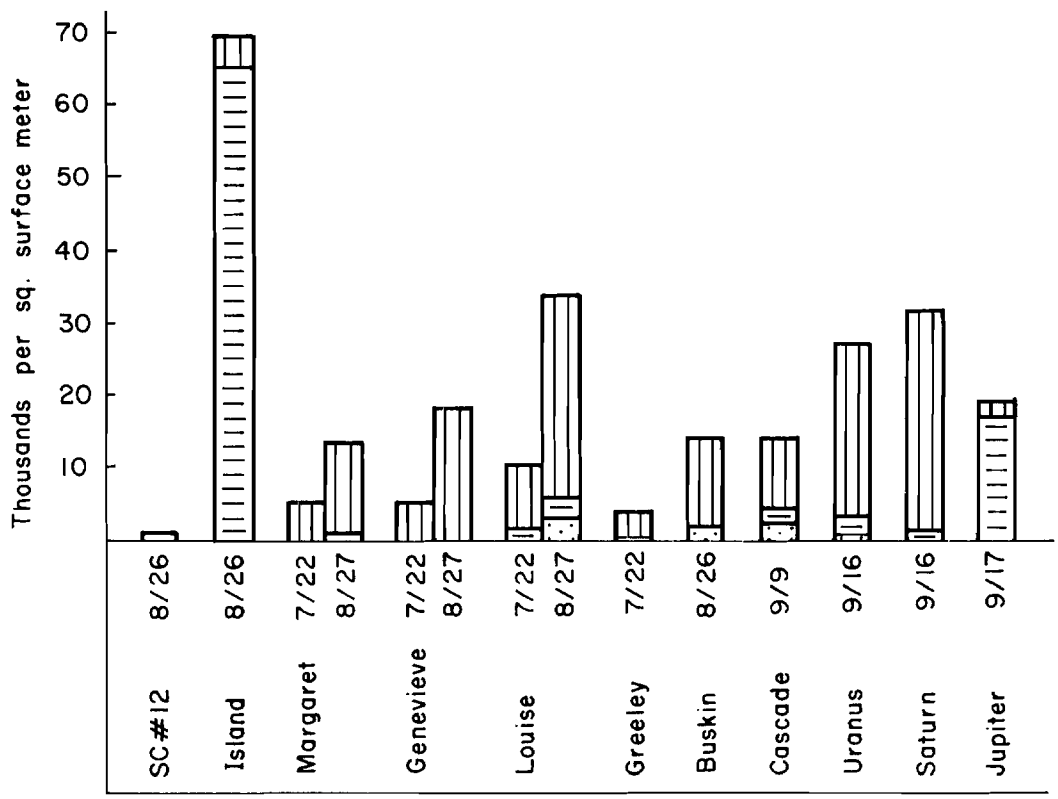

Figure 4
Cladoceran Abundance in Other Kodiak Lakes

populations. These observations showed that despite a population of several thousand Dollys observed in the upper Buskin and later in tributaries above Buskin Lake, the number actually spawning is very small, and probably consists of less than 500 fish. Sexually developed Dolly Varden were observed in only two streams: Spring Creek, a small but important salmon spawning creek above Buskin Lake and Bunker Creek, a small tributary to the upper Buskin River. During this study, 13,000 Dolly eggs were taken for hatchery incubation from 12 females ranging in size from 10 to 18 inches. Most of these females appeared to have undergone some natural spawning just prior to capture. One female 17.5 inches long, accidentally killed prior to spawning, contained 3,520 eggs. No spawning Dolly Varden were observed on the extensive sockeye salmon beach spawning areas along the western shore of the lake.

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