



**U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration**

Auke Bay Fisheries Laboratory
P.O. Box 155
Auke Bay, Alaska 99821

October 11, 1977

Mr. Richard Marriott
Sport Fish Division
Alaska Department of Fish and Game
210 Ferry Way
Juneau, Alaska 99801

Dear Dick:

Enclosed please find a summary of the results of Auke Lake sockeye salmon research conducted by the National Marine Fisheries Service and its predecessor agency since 1961. I am preparing a more comprehensive manuscript on Auke Lake sockeye research results which will be completed toward the end of the year. I hope this summary will be sufficiently informative and assist you in the management of Auke Lake sockeye.

This year's sockeye spawning escapement to Auke Lake was the largest recorded since 1961. The strength of the return came from 6-year old fish (Age 2.3) from the 1971 brood year. It will be interesting to watch the freshwater production of this brood year.

Significant contributions to the understanding of the dynamics of Auke Lake sockeye will be realized if we can maintain a basic research effort during the next 2 or 3 years. I believe it is critical that smolt and adult enumeration be maintained through 1980 or 1981 to determine the smolt production from the 1977 brood year. This date would provide some notion of the spawner-smolt production relationship for Auke Lake sockeye as well as strengthening future management decisions.

Possibly, some form of a cooperative arrangement can be developed to maintain this research. I would appreciate your thoughts on this.

Sincerely,

A handwritten signature in cursive script, appearing to read "Bob Dewey".

Robert D. Dewey, Jr.
Fishery Research Biologist

Enclosure

A SUMMARY OF AUKE LAKE SOCKEYE
SALMON RESEARCH RESULTS AND THEIR
RESOURCE MANAGEMENT IMPLICATION.

By
Robert D. Dewey, Jr.
Fishery Research Biologist

October 4, 1977

INTRODUCTION

Biological investigation of Auke Lake sockeye salmon began in 1961 and has continued on a more-or-less annual basis to the present. Prior to 1973, studies focused on adult enumeration, spawning ground surveys, and monitoring the spring smolt emigration. A limnological investigation of Auke Lake (Hoopes, 1963) and a Master's Thesis (Bucaria, 1968) on lacustrine growth of juvenile sockeye are exceptions. Unfortunately, data for the years prior to 1973 lacks continuity, thus making meaningful analysis impractical. Data for the period 1961 to 1972 has been summarized by Taylor and Bailey (1972). Biological data compiled since 1973 will provide much of the information contained in this summary.

ADULT ESCAPEMENTS

Adult sockeye salmon escapements to the Auke Lake system have been enumerated annually since 1963. Escapements during this 15-year period have ranged from 4,314 to 16,432 spawners. The mean escapement for the period is 7,939 spawners.

Sex ratios in the escapements have fluctuated moderately with the exception of 1974 when a 3.4 male: 1 female imbalance occurred. The mean sex ratio for the 1963-1977 period is 1.02 males to 1 female.

Fecundity samples were taken to determine the female length-fecundity relationship for most escapements. The mean fecundity for females during the period is 3,360 eggs and the resulting mean potential egg deposition (PED) for the 1963 through 1977 escapements is 14,155,706 eggs. Available data is summarized in Table 1.

Scale analysis has determined that 5- and 6-year old adults predominate in the escapements. Approximately 50 percent of the returning females and 40 percent of the returning males are 6 years old (Age 2.3). Fish of Ages 1.3 and 2.2 occur in significant numbers. A summary of the age structure of the escapements for years when more than 150 spawners were sampled for age determination is presented in Table 2.

Table 2.--Age class distribution of Auke Lake sockeye salmon in the 1963-1977 spawning escapements. Years with sample sizes less than 150 fish were omitted.

Age Class	Sex	N	Mean (%)	S.D. (%)	Range
1.1	Males	11	1.2	2.3	0-06.6
	Females	1	1.2		
1.2	Males	163	9.8	16.0	0-35.8
	Females	139	8.5	16.6	0-47.9
1.3	Males	187	14.4	15.6	0-48.0
	Females	292	18.9	20.1	0-62.6
2.1	Males	130	8.8	12.1	0-50.0
	Females	1	0.4		
2.2	Males	238	19.9	18.5	0-54.5
	Females	191	13.5	9.4	0-24.3
2.3	Males	575	39.4	18.6	0-34.0
	Females	679	52.3	22.9	0-75.0
2.4	Males	1			
	Females	0	0	0	0
3.1	Males	12	0.8	1.0	0-02.3
	Females	0	0	0	0
3.2	Males	28	1.7	2.7	0-08.2
	Females	18	1.0	2.2	0-06.3
3.3	Males	56	4.0	6.5	0-17.7
	Females	90	5.6	8.5	0-24.8

Table 3.--Auke Lake sockeye spawner-fry recruitment and smolt production data summary for the 1971-1975 brood years.

Brood year	Spawning escapement	Spawners per hectare	Potential egg deposition	Fry recruited ^{b/}	Smolt production		Total smolts	Survival	
					I+	II+ III+		P.E.D. to smolt (%)	fry to smolt (%)
1971	7,673	166.8	10,464,248	1,177,227	(8,947) ^{c/}	(17,618) ^{c/}	(31,471) ^{c/}	0.34	2.3 ^d
1972	9,162	199.2	15,640,814	1,759,592	(8,798) ^{c/}	45,965	54,697	0.35	3.11
1973	8,262	179.6	17,822,280	1,988,132	8,539	36,060	44,929	0.25	2.26
1974	4,314	93.8	2,824,140	300,840	3,451	1,721	[5,172] ^{d/}	[0.19]	[1.72]
1975	11,461	249.15	18,291,880	2,057,837	6,799				

a/ Surface area of Auke Lake is 46 hectares.

b/ Based on potential egg deposition to fry survival of 11.25 percent.

c/ Estimated values based on regression relationship of known recruited fry-to-smolt survival by age class.

d/ Incomplete estimates of total smolt production.

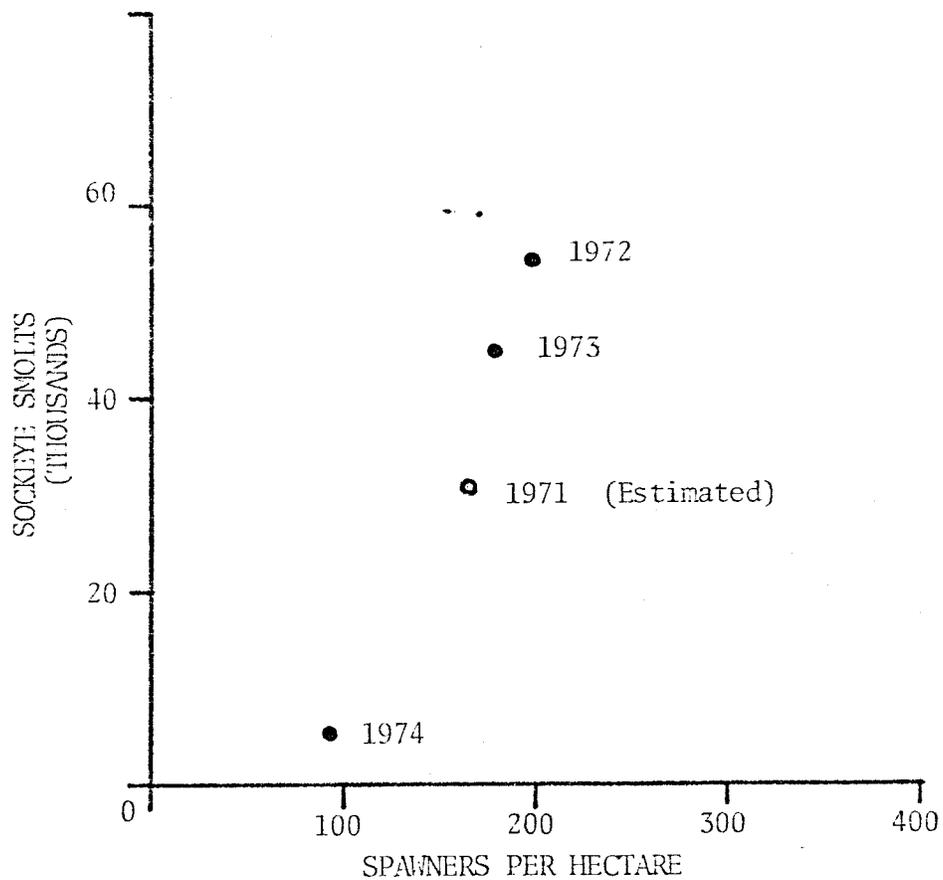


Figure 1 Auke Lake sockeye salmon spawner-total smolt production relationship for the brood years 1971 through 1974.