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BRISTOL BAY DATA REPORT NO. 68

1978

ALAGNAK (BRANCH) RIVER SOCKEYE SALMON SPAWNING GROUND SURVEYS

BY

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Anchorage, Alaska

January, 1979

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CONTENTS

Page No.

Text

INTRODUCTION..... 1

METHODS..... 2

RESULTS..... 2

Bibliography..... 4

Figures

Figure 1. Alagnak River System..... 5

Tables

Table 1. Escapement of sockeye salmon in the Naknek-Kvichak district by river system, Bristol Bay, 1959-78..... 6

Table 2. Sockeye salmon escapement estimates in the Alagnak River system, 1978..... 7

Table 3. Age composition of sockeye salmon escapements in the Alagnak River system, 1978..... 8

Table 4. Aerial survey estimates of sockeye salmon spawning in the Alagnak River system, 1978..... 9

INTRODUCTION

The Alagnak River system provides important spawning and rearing habitat for sockeye salmon, Oncorhynchus nerka. Salmon resources of this system support valuable commercial, subsistence and recreational fisheries in Bristol Bay's Naknek-Kvichak district. The importance of the Alagnak River relative to other major rivers in this district is illustrated in Table 1. Escapements to this river have sometimes exceeded that of the Naknek and Kvichak systems and have ranged from 0.7 to 22.1 percent of the total district escapement. When escapements are combined with commercial harvests the total annual returns of sockeye salmon to this system have averaged around 460,000 fish since 1959 which amounts to 5.3 percent of the district total.

Since the Alagnak River fish are intermixed with other major stocks in the commercial fishery, migrate through the fishery at the same time and are normally less abundant than these other stocks, the management of the fishery for achievement of optimum escapement goals specifically for this system is not possible. Despite this difficulty the monitoring of annual variations in abundance and age composition of runs of salmon to this system are important to the overall management of all stocks for sustained production.

The Alagnak system contains four major lakes (Figure 1). Kukaklek and Battle Lakes are drained by the Alagnak River while Nonvianuk and Kuklik Lakes drain into the Nonvianuk River. The main Alagnak River is formed by the confluence of these two rivers. It lies south of the Kvichak River and north of the Naknek River system. The Alagnak River ultimately joins the Kvichak River near the village of Levelock and then flows into Kvichak Bay on the northwest side of the Alaska Peninsula.

Aerial surveys of this system have been conducted intermittently since 1944 (Bill, 1977). Escapement estimates using counting towers on the main river are also available for 1957-76. The tower counting program was terminated after 1976 due to a lack of adequate funding. Aerial spawning ground surveys have been conducted since 1977 to determine the magnitude and distribution of sockeye salmon escapements in the Alagnak system.

METHODS

Aerial survey methods in 1978 were comparable to those used in the past (Bill, 1977). In the absence of a tower enumeration program again this year, aerial counts were intended to provide an estimate of the total escapement into the system.

Fish are normally most visible on the spawning grounds near the peak of spawning so surveys were scheduled during this period. Estimates were made of the total number of live (spawning, migrating and schooling) and dead fish for all known spawning areas throughout the system.

Following these aerial counts an effort was then made to collect otolith samples from the important spawning areas to determine the age composition of these fish.

RESULTS

Two surveys were flown in 1978 on August 17 and 28 with the first survey being conducted under optimum weather and visibility conditions (Table 4). Since the season's only system wide survey was conducted on August 17 and the visibility was the best at this time the counts from this survey were used in estimating the total spawning escapement. Two surveyors making independent observations recorded estimates of the

number of live and dead fish for all known spawning areas throughout the system. Although there was considerable variability between the two surveyor's estimates of individual sections the combined system counts are within 20,000 fish of each other. The authors counts were used in generating the combined system estimate. Escapements for the major spawning areas are listed in Table 2.

The survey on August 17 also revealed that most of the spawning was confined to four major river and stream systems (Nanuktuk Creek, the Spectacle-Moraine-Funnel Creek system, Kulik River and Battle River). Fortunately all four of these areas are readily accessible by float plane and otolith samples were collected from each location. Between 150-200 otoliths were collected from each stream. Since the time of spawning is earlier on the Nanuktuk and Spectacle Creek systems adequate numbers of dead fish were available at the time of the initial survey and so samples were collected from these sites on August 18. Battle and Kulik Rivers are a week to ten days later so collection of otoliths from these two areas was delayed until August 30 and 31. The system wide age composition was then based on the age structure of the four sample sites weighted by their relative numbers of spawners (Table 3).

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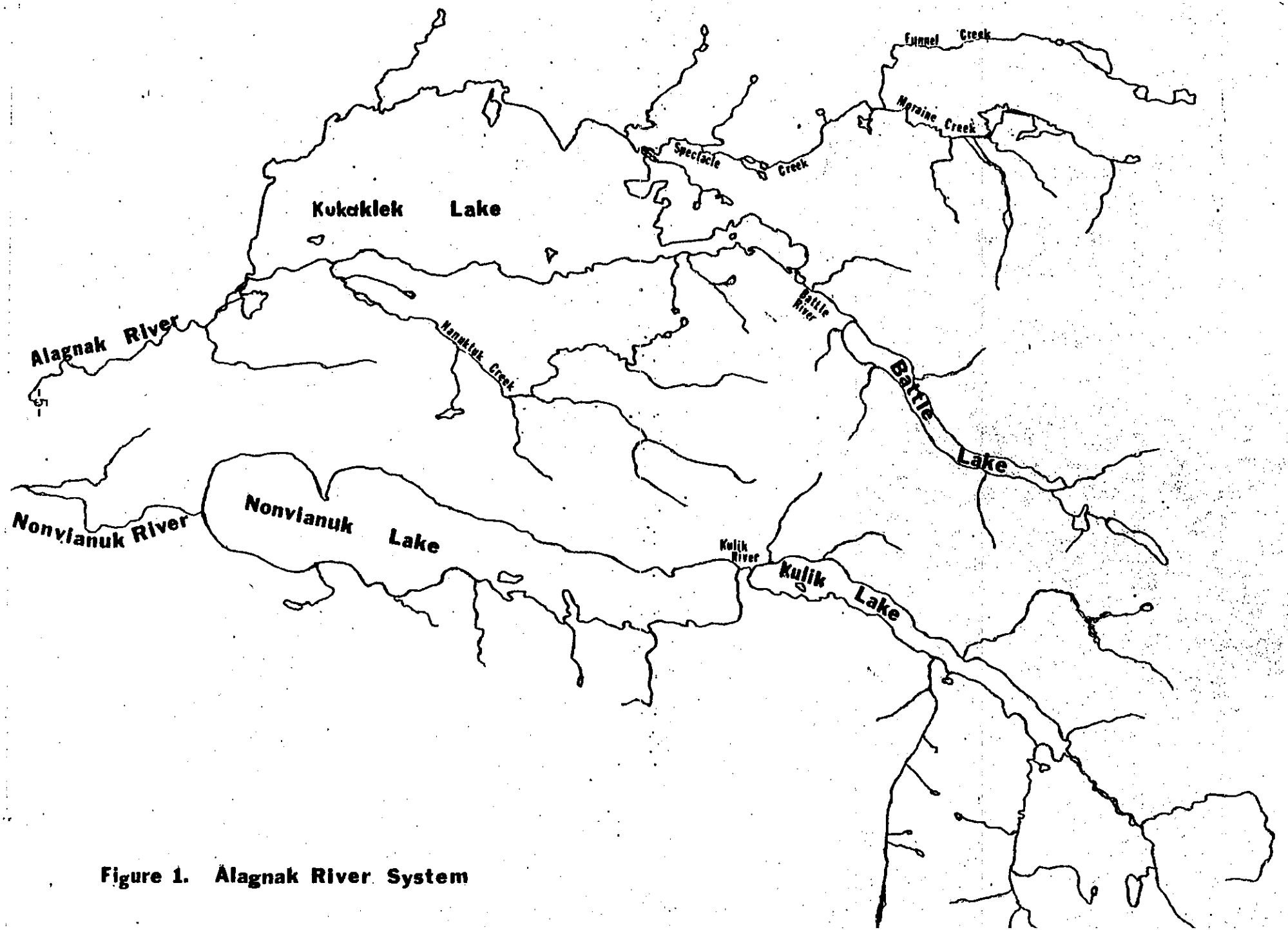

Figure 1. Alagnak River System

Table 1. Escapement of sockeye salmon in the Naknek-Kvichak district by river system, Bristol Bay, 1959-78.

Year	Escapement by River System 1/ Kvichak	Naknek	Alagnak	Total	Alagnak Contributi (% of tota
1959	680,000	2,231,807	825,431	3,737,238	22.1
60	14,630,000	828,381	1,240,530	16,698,911	7.4
61	3,705,849	351,078	90,036	4,146,963	2.2
62	2,580,884	723,066	90,630	3,394,580	2.7
63	338,760	905,358	203,304	1,447,422	14.0
1964	957,120	1,349,604	248,700	2,555,424	9.7
65	24,325,926	717,798	175,020	25,218,744	0.7
66	3,775,184	1,016,445	174,336	4,965,965	3.5
67	3,216,208	755,640	202,626	4,174,474	4.9
68	2,557,440	1,023,222	193,872	3,774,534	5.1
1969	8,394,204	1,331,202	182,490	9,907,896	1.8
70	13,935,306	732,502	177,060	14,844,868	1.2
71	2,387,392	935,754	187,302	3,510,448	5.3
72	1,009,962	586,518	151,188	1,747,668	8.7
73	226,554	356,676	35,280	618,510	5.7
1974	4,433,844	1,241,058	214,848	5,889,750	3.6
75	13,140,450	2,026,686	100,480	15,267,616	0.7
76	1,965,282	1,320,750	81,822	3,367,854	2.4
77	1,341,144	1,085,856	100,000	2,527,000	4.0
78	4,149,288	813,378	229,400	5,192,066	4.4
20-Yr. Total	107,750,797	20,332,779	4,904,355	132,987,931	
1959-68 Total	56,767,371	9,902,399	3,444,485	70,114,255	
1969-78 Total	50,983,426	10,430,380	1,459,870	62,873,676	
20-Yr. Average	5,387,540	1,016,639	245,218	6,649,397	5.5
1959-68 Average	5,676,737	990,240	344,449	7,011,426	7.2
1969-78 Average	5,098,343	1,043,038	145,987	6,287,368	3.8

1/ Tower count 1959-78 except aerial count in 1977-78 for the Alagnak River only.

Table 2. Sockeye salmon escapement estimates in the Alagnak River system, 1978.[1/]

Location	Number of Fish	Percent of System Total
Nonvianuk River	700	0.3
Nonvianuk Lake		
South Beach	250	
North Beach	3,125	
Total	3,375	1.5
Kulik River	115,100	50.2
Kulik Lake		
South Beach	200	
North Beach	0	
Total	200	0.1
Alagnak River	(not surveyed)	-
Kukaklek Lake		
South Beach	425	
North Beach	700	
Total	1,125	0.5
Nanuktuk Creek	42,000	18.3
Battle River	14,800	6.4
Battle Lake		
South Beach	0	
North Beach	0	
Total	0	0
Spectacle Creek	31,700	13.8
Funnel Creek	17,000	7.4
Moraine Creek	3,400	1.5
Totals	229,400	100.0

1/ Based on most reasonable peak aerial survey counts conducted between 8/17 and 8/28.

Table 3. Age composition of sockeye salmon escapement in the Alagnak River system, 1978. 1/

Age Class	Nanuktuk Cr. No. of Samples	Nanuktuk Cr. %	Spectacle Cr. No. of Samples	Spectacle Cr. %	Kulik River No. of Samples	Kulik River %	Battle River No. of Samples	Battle River %	Total System 2/ Escapement Estimate	Total System 2/ Weighted Mean Proportion (%)
3_2	25	15.3	15	9.1	5	2.6	3	1.6	14,681	6.4
4_2	94	57.3	110	67.1	143	74.9	16	8.8	150,028	65.4
4_3	9	5.5	6	3.6	0	0	0	0	4,359	1.9
5_2	21	12.8	27	16.5	35	18.3	123	67.6	46,109	20.1
5_3	12	7.3	6	3.7	4	2.1	17	9.4	8,947	3.9
6_3	3	1.8	0	0	3	1.6	23	12.6	4,588	2.0
7_4	0	0	0	0	1	0.5	0	0	688	0.3
Totals	164	100.0	164	100.0	191	100.0	182	100.0	229,400	100.0

1/ Determined from 701 otolith samples collected from four major spawning areas representing almost 98% of the system wide escapement estimate of 229,400: Nanuktuk Creek (42,000), Spectacle-Funnel-Moraine Creeks complex (52,100), Kulik River (115,100) and Battle River (14,800).

2/ Based on the proportion of each age class from the four sampling locations weighted by their respective escapement sizes. This weighted age composition was then applied to the total system escapement estimate of 229,400.

Table 4. Aerial survey estimates of sockeye salmon spawning in the Alagnak River system, 1978.

Location	(Date, Surveyor)	Number of Fish				Remarks
		Live	Dead	Schooled	Total	
Nonvianuk River	(8/17, Randall)	0	0	700	700	
	(8/17, Bill)	0	0	1,075	1,075	
Nonvianuk Lake						
South Beach	(8/17, Randall)	250	0	0	250	
	(8/17, Bill)	100	0	0	100	
North Beach	(8/17, Randall)	3,025	100	0	3,125	
	(8/17, Bill)	5,175	3,325	0	8,500	
Kulik River	(8/17, Randall)	15,000	100	100,000	115,100	Early; most schooled off river mouth
	(8/17, Bill)	13,175	0	81,675	94,850	
	(8/28, Bill)	26,000	12,500	60,000	98,500	15% dead
Kulik Lake						
South Beach	(8/17, Randall)	0	0	200	200	
	(8/17, Bill)	0	0	250	250	
North Beach	(8/17, Randall)	0	0	0	0	
	(8/17, Bill)	0	0	0	0	
Alagnak River						not surveyed
Kukaklek Lake						
South Beach	(8/17, Randall)	425	0	0	425	
	(8/17, Bill)	40	0	0	40	
North Beach	(8/17, Randall)	700	0	0	700	
	(8/17, Bill)	875	0	0	875	
Nanuktuk Creek	(8/17, Randall)	34,000	5,000	3,000	42,000	Peak spawning
	(8/17, Bill)	16,175	4,675	13,325	34,175	

continued

Table 4. (continued)

Location	(Date, Surveyor)	Number of Fish				Remarks
		Live	Dead	Schooled	Total	
Battle River	(8/17, Randall)	11,900	0	2,900	14,800	Early
	(8/17, Bill)	13,175	1,175	0	14,350	
	(8/28, Bill)	7,825	no count	0	incomplete	Late; 70% dead
Battle Lake						
South Beach	(8/17, Randall)	0	0	0	0	Survey incomplete
	(8/17, Bill)	0	0	50	50	
North Beach	(8/17, Randall)	0	0	0	0	
	(8/17, Bill)	0	0	0	0	
Spectacle Creek	(8/17, Randall)	27,500	3,200	1,000	31,700	
	(8/17, Bill)	39,325	3,325	0	42,650	
Funnel Creek	(8/17, Randall)	13,700	3,300	0	17,000	Past peak
	(8/17, Bill)	9,000	1,675	0	10,675	
Moraine Creek	(8/17, Randall)	2,500	400	500	3,400	
	(8/17, Bill)	1,675	500	0	2,175	