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1979
ALAGNAK (BRANCH) RIVER SOCKEYE SALMON
SPAWNING GROUND SURVEYS

BY

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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 exceeded that of the Naknek and Kvichak systems in 1959 and have ranged from 0.7 to 14.0 percent of the total district escapement during the last 20 years. When escapements are combined with commercial harvests the total annual returns of sockeye salmon to this system have averaged around 388,000 fish since 1960 which amounts to 3.1 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 Kulik 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 1979 were comparable to those used in the past (Randall, 1979). 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 just prior to or during 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

Surveys were scheduled about two weeks earlier than normal this year to coincide with an earlier peak of spawning in some streams. The surface drainage streams (Nanuktuk, Funnel, Moraine, and Spectacle Creeks) are always earlier than the larger rivers interconnecting the lakes (Kulik and Battle Rivers). The unusual timing this year was limited mainly to the surface streams while the interconnecting rivers

were about normal. Two surveys were flown in 1979 on August 3 and 11 with the first survey being conducted under optimum weather and visibility conditions (Table 4). The earlier survey covered the entire system with the exception of upper Battle and Kulik Lakes and some of the beach areas of the two main lakes. Two surveyors making independent observations recorded estimates of the number of live and dead fish for all known spawning areas throughout the system. The second flight involved a single surveyor and although survey conditions were not optimum at this time as much of the system as possible was covered and included some spawning areas not included on the first flight. Conditions and resulting visibility varied considerably between surveys and spawning areas so counts for each tributary were treated separately in deriving a final escapement estimate. Final estimates were based on: 1) single counts in instances where only one estimate was made, 2) on the average of the peak counts made by the two surveyors during either of the flights or, 3) on the single most reasonable count made during either of the surveys.

The estimate of 6,100 for the Battle Lake beaches, for instance, was from a single count made on the August 11 survey whereas the Kulik River estimate of 49,500 is the average of both counts on the August 3 flight and the Nanuktuk Creek estimate of 58,000 is the single most reasonable count made during the August 3 survey. Escapements for the major spawning areas are listed in Table 2.

Both surveys 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 160-200 otoliths were collected from each stream. Since the timing of spawning was so

much earlier in Nanuktuk and Spectacle Creeks, adequate numbers of dead fish were not available throughout the system at the same time this year until late in August. Otoliths were collected from four major spawning areas between September 2 and 5. 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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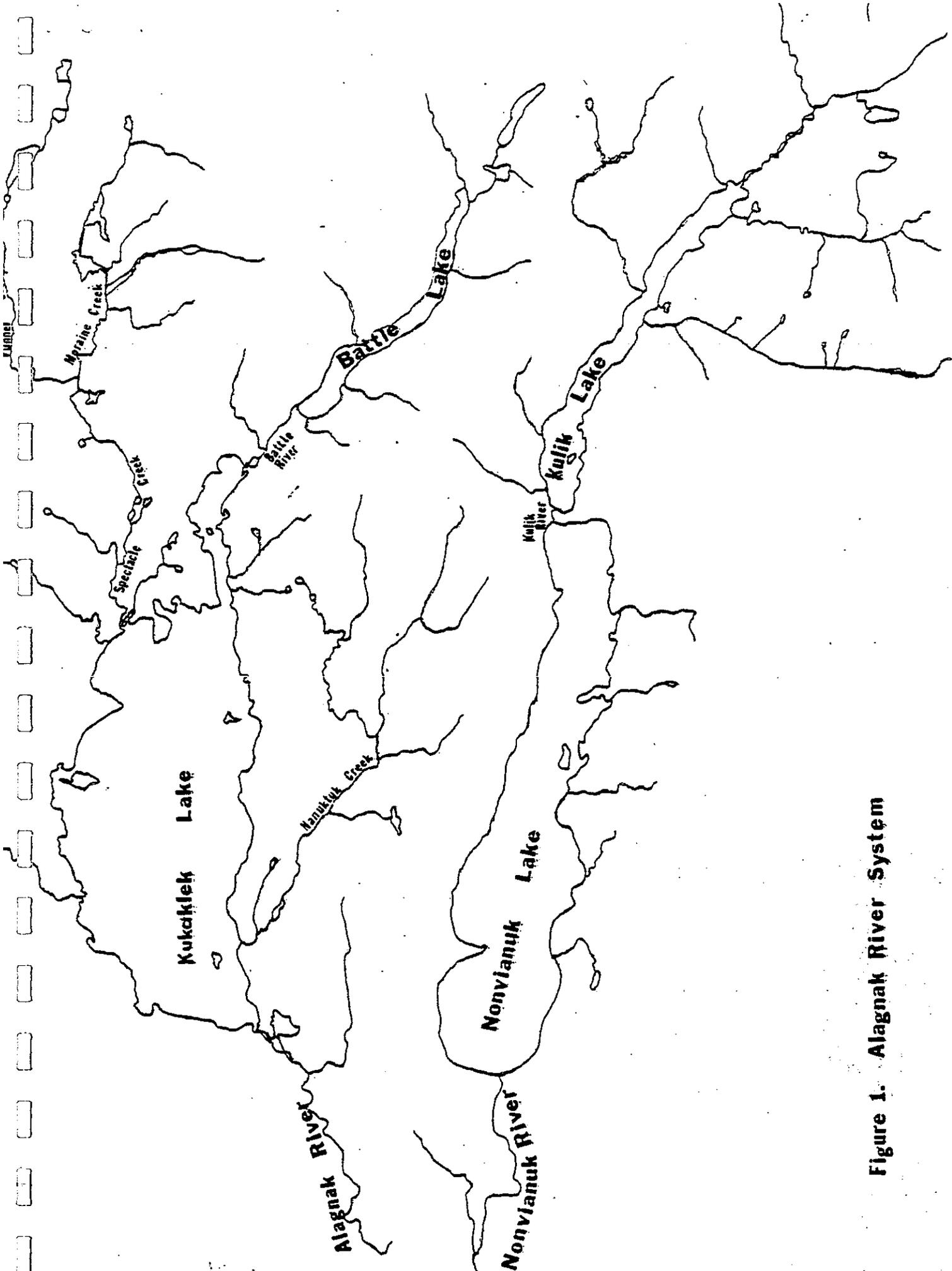


Figure 1. Alagnak River System

Table 1. Escapement of sockeye salmon in the Naknek-Kvichak district by river system, Bristol Bay, 1960-79.

Year	Escapement by River System ^{1/}			Total	Alagnak Contribution (% of total)
	Kvichak	Naknek	Alagnak		
1960	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
64	957,120	1,349,604	248,700	2,555,424	9.7
1965	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
69	8,394,204	1,331,202	182,490	9,907,896	1.8
1970	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
74	4,433,844	1,241,058	214,848	5,889,750	3.6
1975	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
79	11,218,434	925,362	294,200	12,437,996	2.4
20-Yr. Total	118,289,231	19,026,334	4,373,124	141,688,689	
1960-69 Total	64,481,575	9,001,794	2,801,544	76,284,913	
1970-79 Total	53,807,656	10,024,540	1,571,580	65,403,776	
20-Average	5,914,462	951,317	218,656	7,084,434	4.5
1960-69 Average	6,448,158	900,179	280,154	7,628,491	5.2
1970-79 Average	5,380,766	1,002,454	157,158	6,540,378	3.8

^{1/} Tower count 1960-79 except aerial count in 1977-79 for the Alagnak River only.

Table 2. Sockeye salmon escapement estimates in the Alagnak River system, 1979. ^{1/}

Location	Number of Fish	Percent of System Total
Nonvianuk River	800	0.3
Nonvianuk Lake		
South Beach	(not surveyed)	
North Beach	2,600	
Total	2,600	0.9
Kulik River	49,500	16.8
Kulik Lake		
South Beach	200	
North Beach	100	
Total	300	0.1
Alagnak River	24,000	8.2
Kukaklek Lake		
South Beach	14,900	
North Beach	1,700	
Total	16,600	5.6
Nanuktuk Creek	58,000	19.7
Battle River	97,500	33.1
Battle Lake		
South Beach	3,800	
North Beach	2,300	
Total	6,100	2.1
Spectacle Creek	28,300	9.6
Funnel Creek	10,500	3.6
Moraine Creek	0	0
TOTALS	294,200	100.0

^{1/} Based on the mean of both surveyor's counts from 8/3 or the most reasonable count from all surveys conducted between 8/3 and 8/11.

Table 3. Age composition of sockeye salmon escapement in the Alagnak River system, 1979. ^{1/}

Age Class	Nanuktuk Cr.		Spectacle Cr.		Kulik River		Battle River		Total System	
	No. of Samples	%	Escapement Estimate	Weighted Mean Proportion (%)						
3 ₂	0	0	1	0.6	86	43.0	0	0	25,890	8.8
4 ₂	65	40.9	99	59.3	111	55.5	180	99.0	205,940	70.0
5 ₃	89	56.0	54	32.3	0	0	1	0.5	55,015	18.7
5 ₂	5	3.1	11	6.6	3	1.5	1	0.5	6,767	2.3
6 ₃	0	0	2	1.2	0	0	0	0	588	0.2
TOTALS	159	100.0	167	100.0	200	100.0	182	100.0	294,200	100.0

^{1/} Determined from 745 otoliths (only 708 were legible) collected from four major spawning areas representing almost 83% of the system wide escapement of 294,200: Nanuktuk Creek (58,000), Spectacle-Funnel-Moraine Creeks complex (38,800), Kulik River (49,500), and Battle River (97,500).

^{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 294,200.

Table 4. Aerial survey estimates of sockeye salmon spawning in the Alagnak River system, 1979.

Location	(Date, Surveyor)	Number of Fish			Total	Remarks
		Spawning	Dead	Schooled		
Nonvianuk River	(8/3, Randa11)	0	0	800	800	Near lake outlet; lower river not surveyed
Nonvianuk Lake						
South Beach	(8/3, Randa11)	500	0	2,100	2,600	
North Beach	(8/11, Bill)	560	0	1,800	2,360	Not surveyed
Kulik River	(8/3, Randa11)	2,000	0	45,000	47,000	Early; most schooled off river mouth
	(8/3, Bill)	0	0	52,000	52,000	
	(8/11, Bill)	3,600	100	22,000	25,700	
Kulik Lake						
South Beach	(8/11, Bill)	0	0	200	200	Upper end not surveyed
North Beach	(8/11, Bill)	100	0	0	100	Upper end not surveyed
Alagnak River	(8/3, Randa11)	0	0	40,000	40,000	Near outlet of Kukaklek Lake; lower river not surveyed.
Kukaklek Lake						
South Beach	(8/3, Randa11)	0	0	0	0	
	(8/3, Bill)	0	0	0	0	
	(8/11, Bill)	0	0	14,900	14,900	
North Beach	(8/11, Bill)	400	0	1,300	1,700	

(Continued)

Table 4. (Continued)

Location	(Date, Surveyor)	Number of Fish			Total	Remarks
		Spawning	Dead	Schooled		
Nanuktuk Creek	(8/3, Randall)	23,000	0	35,000	58,000	Early; most milling near mouth of creek
	(8/3, Bill)	15,900	0	2,000	17,900	Low count
	(8/11, Bill)	25,000	2,500	20,000	47,500	Peak of spawning
Battle River	(8/3, Randall)	6,000	0	100,000	106,000	Early; most milling off river mouth
	(8/3, Bill)	0	0	89,000	89,000	
Battle Lake South Beach	(8/11, Bill)	14,000	700	40,000	54,700	Upper end not surveyed
	(8/11, Bill)	0	0	3,800	3,800	
Battle Lake North Beach	(8/11, Bill)	1,600	0	700	2,300	Upper end not surveyed
	(8/11, Bill)	0	0	0	0	
Spectacle Creek	(8/3, Randall)	22,000	0	15,000	37,000	Early
	(8/3, Bill)	18,300	0	1,300	19,600	Early
	(8/11, Bill)	9,500	500	8,800	18,800	
Funnel Creek	(8/3, Randall)	13,000	0	2,000	15,000	Near peak
	(8/3, Bill)	6,000	0	0	6,000	
Moraine Creek	(8/3, Randall)	0	0	0	0	Few fish; counts included in Funnel Creek estimate
	(8/3, Bill)	0	0	0	0	