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ABSTRACT

This paper presents the basic biological statistics collected from the catch and escapement of red salmon runs in the Nushagak District of Bristol Bay, Alaska, for the years 1946-59. Tables of preliminary computations showing relationships between the adult escapement and the returning run and between the seaward migration of juveniles and the returning run are also given.

INTRODUCTION

In 1946, under the direction of William F. Thompson, the Fisheries Research Institute began a study of the red salmon *(Oncorhynchus nerka)* runs in the Nushagak District, Bristol Bay, Alaska. Fluctuations in population levels were of primary concern. Consequently, statistics relating each year's spawning escapement to numbers and age composition of progeny returning in subsequent years were needed. We learned in the first year of the study that the gill net fishery was selective on age, sex, and size and therefore made plans to obtain accurate statistics of numbers, sex ratio, and age composition of the runs by sampling both the escapement and the commercial catch. A sampling system was organized by Thompson in 1946 and is still used in the Bristol Bay area.

In this report, we present the basic statistics collected from the catch and escapement from 1946 to 1959 and the computations which show relationships between the adult escapement and the returning run, between the seaward migration of juveniles and the adult run, and other pertinent data.

A thorough understanding of these relationships is of great importance to the fishing industry of Bristol Bay in establishing a basis for reliable advance predictions of the numbers of salmon returning each year to the fishery. The information in this paper also provides complete and detailed information on a particular salmon stock, which will be useful to scientists attempting to understand annual fluctuations in any stock of salmon.

Information presented in this report is in tabular and graphical form. Copies of the original data are stored with the Fisheries Research Institute, College of Fisheries, University of Washington.

COLLECTION AND ANALYSIS OF DATA

From the Catch

The nature of the red salmon fishery in Nushagak Bay determined the sampling scheme used. Normally, several canneries operate in this bay, but since fishing boats from each cannery usually cover the same fishing grounds, sampling was conducted from only one cannery in any particular year, with a few exceptions. Three main sampling locations were used: Alaska Packers Association cannery at Clarks Point, Pacific American Fisheries cannery at Dillingham, and the former Libby, McNeil and Libby cannery at Ekuk.

Most of the catch is taken by drift gill nets. During the days of sailboats, which prevailed through 1952, fishermen operated in subareas within the Bay, but inasmuch as no separation is made in catch statistics between the subareas, the entire Nushagak Bay has been dealt with as a unit. Once a day, or more often when fishing was good, the catches were delivered either to stationary scows or to roving power scows. On high tide these catches were brought into the cannery, where samples were taken.

The elementary unit in this fishery is the delivery from one fishboat. But, since boatloads were mixed aboard the receiving scow, a sample was taken from the scow load as a whole. Fish for the sample were collected from the conveyer belt in a random fashion.

A standard sample consisted of about 250 fish, of which the first 100 males and 100 females were measured, whenever available. The sex ratio was determined from the entire sample. The overall sex ratio for a fishing period was determined from all the sex ratios observed in the period. Also, scale samples were taken from the first 20 males and 20 females in each sample. Lengths were measured from mideye to fork of tail. In 1946, the first year of sampling, measurements were taken with a steel tape. In subsequent years, measurements were taken with several types of measuring machines developed by W. F. Thompson. The latter method gave linear measurements recorded directly on tape or cards.

In addition to the drift gill net fishery, there was also a set gill net fishery, which gained more importance during the later years. This fishery was conducted primarily at Ekuk Beach, Igushik Beach, Clarks Point, Combine Flat, Coffee Point, and, in former years, Ralph Slough (fig. 1). The usual sampling procedure was to obtain a sample regularly from the Igushik Beach fishery and one sample from one other set net area, usually Ekuk Beach or Combine Flat. Samples from the set net fishery were treated in the same manner as those from the drift net fishery.

With the advent of power boats in 1953, fishermen were not restricted to deliver their catches to specific stationary receiving stations or to wait for a power scow to come by to pick up their catches. They were free to deliver to any company scow. This resulted in considerably more mixing on the scows of fish from all areas. Consequently, a sample from a scow became more representative of the entire catch.

Ordinarily, sampling was continued with the same intensity during the entire fishing season. Occasionally, sampling was suspended during the last fishing period of the season, when the catches dwindled to only a fraction of the catches from peak periods. The extent of sampling done each year is given in table 1.

Normally, there were eight or nine fishing periods during the red salmon season in Nushagak Bay. The periods were not all of the same duration. During each period, all measurements taken were combined into one common unweighted length frequency distribution for each sex. The same was done for the sex ratios. Since the total catch made in each period was known, the number of males and females caught could be easily calculated. The seasonal length frequency curve was obtained by weighting the length frequency curve for each period by the catch made in each period.

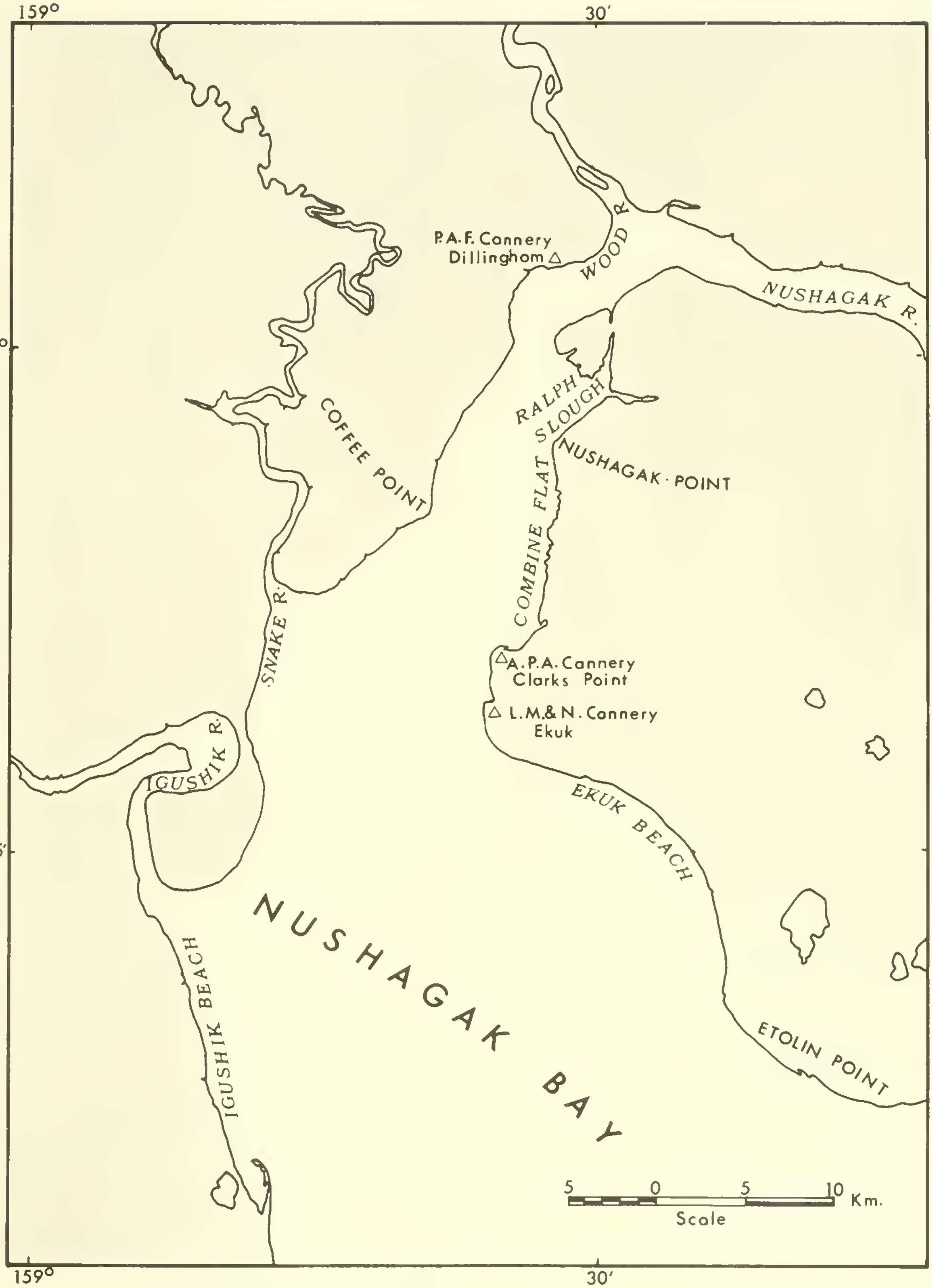


Figure 1.--Nushagak Bay, showing canneries at which red salmon samples were taken and locations of set gill net fisheries

Table 1.--Nushagak District red salmon catch and escapement sampling effort, 1946-59

Year	Commercial catch						Escapement	
	Samples	Fish measured		Scale samples taken		Sex ratio samples	Fish measured	
		Male	Female	Male	Female		Male	Female
	Number	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*	*Number*
1946	74	3,736	2,277	339	400	74	521	1,017
1947	54	2,399	2,626	554	561	44	3,640	5,089
1948	52	2,831	3,246	510	510	51	3,155	3,375
1949	39	1,719	2,450	335	347	35	435	765
1950	40	2,580	2,435	706	706	17	1,621	2,041
1951	23	1,843	2,235	356	356	13	2,973	3,137
1952	19	1,067	1,098	369	367	19	2,218	3,185
1953	11	1,018	1,510	280	280	10	3,246	3,459
1954	24	1,751	1,563	480	480	24	3,645	4,033
1955	30	1,731	1,945	591	597	30	3,447	3,691
1956	34	2,096	2,081	460	460	34	3,126	4,576
1957	37	2,320	2,933	799	805	37	2,600	3,358
1958	52	3,716	4,350	970	970	52	4,715	5,876
1959	26	2,372	2,141	412	409	25	4,598	4,656

The following data were punched on IBM cards:

1. The total catch of the season.

2. The total catch of each fishing period.

3. The combined unweighted sex ratios taken in each fishing period.

4. The combined unweighted length frequency curves of both males and females from each fishing period.

5. The percentage age composition determined for each period.

In order to facilitate calculation with these data, a program was written for the IBM 709 computer whereby the following information could be obtained directly:

1. Unweighted, weighted, and cumulative weighted length frequency curves for the entire season by sex.

2. Number of males and females caught in each fishing period and in the entire season.

3. Number of fish caught within each age group.

Basically, spawning ground measurements were treated in the same way. Consequently, the same IBM program was applied to the spawning ground measurements. Finally, the commercial catch and the escapement data were combined into a weighted length frequency curve for the entire run by sex, the sex ratio for the entire run, and the number of fish of each sex for each age group.

Certain deviations from the methods described for treating the basic data became necessary at times. For example, for two fishing periods the catch was known only by weeks, and the weighting had to be done on a weekly basis. At other times no sample was taken from one particular fishing period, and the catch for the period in question was combined with that of the previous or following period. Frequency distributions obtained applied to the combined periods.

Total catch figures (table 2) for the years 1946-50 are those given in the unpublished Annual Reports for Bristol Bay, U.S. Fish and Wildlife Service,[1] and those for 1951-59 are taken from Simpson (1960). At times the seasonal catches given in the Management Agent's reports differ from the seasonal catches obtained by combining the catches from all fishing periods. This discrepancy is no doubt partly due to the fact that catch data by fishing periods frequently were assembled in the field and included chum salmon, which inflated the catch figures. But no correction was made for chum salmon in calculating the weighting factors for the length frequency curves.

From the Spawning Escapement

Escapement magnitude.--The spawning grounds used by red salmon in the Nushagak watershed are found in three major and two minor areas. The Wood River system was the dominant production area during the period under study, followed in order of importance by the Igushik River system (Lakes Ualik and Amanka), and the Nuyakuk River system (Lakes Tikchik, Nuyakuk, and Chauekuktuli). The two minor areas were Snake River (Nunavaugaluk Lake) and the main Nushagak River including the tributary Mulchatna and Kokwok Rivers (fig. 2).

Escapements to these areas during the period 1946-52 were estimated by combined aerial and ground surveys (table 2). The surveys in 1946 and 1947 were made to determine the time and place of the major red salmon spawning. After 1947, the surveys were directed toward more quantitative methods. Ground survey estimates were largely replaced by aerial survey methods. Beginning in 1953 the escapement to the Wood River lakes was determined more precisely by enumeration from towers on Wood River. Daily estimates of Wood River red salmon escapements, 1953-59, are listed in table 3. Towers for counting salmon were also established by the Bureau

[1] On file, Bureau of Commercial Fisheries Biological Laboratory, Auke Bay, Alaska.

Table 2.--Catch[1] of red salmon in Nushahak District and escapement[2] by river system, 1946-59

Year	Catch	Escapement by river system						Estimated total run	Ratio--Catch escapement	
		Wood	Snake	Igushik	Nuyakuk	Nushagak-Mulchatna	Total			
	Number	Number	Number	Number	Number	Number	Number	Number	Percent	
1946	2,028,144	3,717,000	70,000	500,000	432,000	-	4,719,000	6,747,144	30.0	70.0
1947	2,767,287	1,782,000	50,000	350,000	325,000	-	2,507,000	5,274,287	52.5	47.5
1948	2,805,798	1,483,250	5,000	300,000	303,000	-	2,091,250	4,897,048	57.3	42.7
1949	800,123	101,025	3,000	20,000	14,000	-	138,025	938,148	85.3	14.7
1950	1,212,091	451,600	4,000	75,000	42,000	-	572,600	1,784,691	67.9	32.1
1951	436,950	457,600	3,000	40,000	39,000	-	539,600	976,550	44.7	55.3
1952	698,071	226,800	4,000	150,000	38,000	15,000	433,800	1,131,871	61.7	38.3
1953	449,339	515,542	4,000	100,000	189,000	20,000	828,542	1,277,881	35.2	64.8
1954	315,357	570,624	4,000	80,000	29,000	8,000	691,624	1,006,981	31.3	68.7
1955	1,054,977	1,382,755	30,000	500,000	16,000	5,000	1,933,755	2,988,732	35.3	64.7
1956	1,263,186	773,101	4,000	400,000	30,000	5,000	1,212,101	2,475,287	51.0	49.0
1957	491,497	288,727	3,000	130,000	67,000	10,000	498,727	990,224	49.6	50.4
1958	1,092,156	960,455	9,000	107,478	196,000	5,000	1,277,933	2,370,089	46.1	53.9
1959	1,719,687	2,209,266	139,950	643,808	48,861	-	3,041,885	4,761,572	36.1	63.9

[1] Sources of catch statistics:
1946-50: Annual reports for Bristol Bay, U.S. Fish and Wildlife Service, on file at Biological Laboratory, Auke Bay.
1951-59: Simpson (1960).

[2] Sources of escapement statistics:
1946-57: John R. Gilbert. 1958. An appraisal of the Nushagak spawning survey data, 1946-1957. Fisheries Research Institute, University of Washington, unpublished report, 50 p.
1958: John R. Gilbert. 1958. Spawning ground surveys in the Nushagak District in 1958. Fisheries Research Institute, University of Washington, unpublished report, table 10.
1959: Nelson (1960).

Sources of escapement counts at trunk river tower sites:
1953-59: Fisheries Research Institute, University of Washington, unpublished records (for Wood River).
1958-59: Annual report for Bristol Bay, by Fishery Management Biologists, U.S. Fish and Wildlife Service (for Igushik, 1958-1959, and Tikchiks 1959), on file Biological Laboratory, Auke Bay.

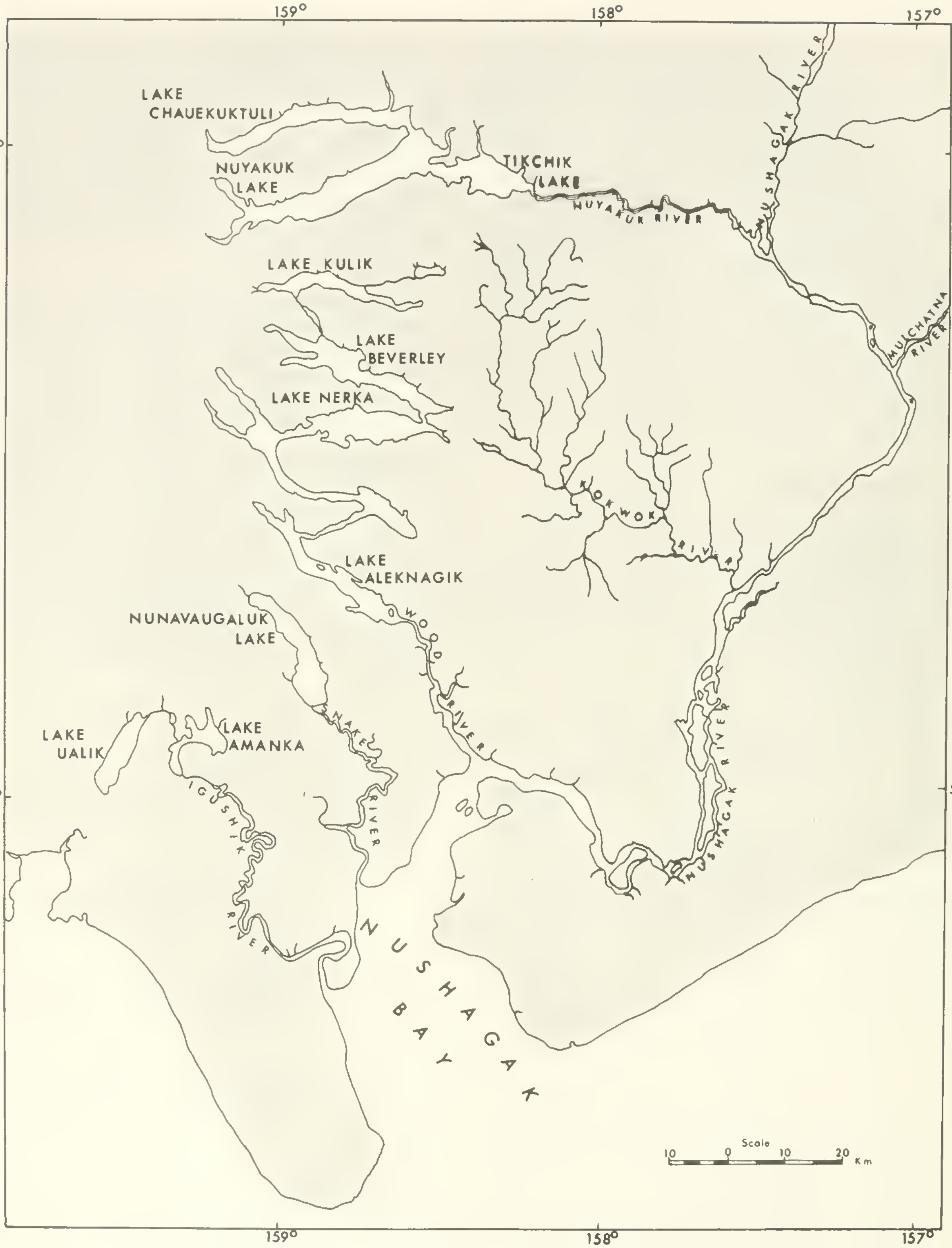


Figure 2.--Nushagak District watershed.

Table 3.--Daily estimates of red salmon escapements, Wood River, 1953-59

[Number of fish]

Date	1953[1]	1954[2]	1955[3]	1956[4]	1957[4]	1958[4]	1959[4]
June							
18			878				
19			108				
20			128			825	57
21				126		1,365	480
22	541		144	10	656	2,376	348
23	688	4,985	144	2,218	734	6,747	996
24	748	2,638	456	2,838	1,168	5,541	1,452
25	961	974	8,396	1,523	748	1,512	1,176
26	288	1,773	24,097	872	906	2,247	3,048
27	120	826	10,129	943	1,246	2,121	16,986
28	2,028	941	14,745	5,964	2,216	902	105,984
29	2,575	1,622	7,534	5,816	4,326	1,134	82,752
30	27,564	1,425	9,095	4,602	8,977	17,087	62,148
July							
1	52,554	3,105	7,657	730	15,566	81,246	84,978
2	37,645	19,584	3,127	2,020	6,047	41,658	115,782
3	45,705	54,486	20,798	1,243	3,155	12,749	340,752
4	55,127	47,497	199,154	16,845	4,617	8,586	201,930
5	46,156	41,404	210,358	43,257	3,217	12,300	184,734
6	54,600	38,558	185,898	47,776	3,528	104,862	163,254
7	40,462	33,995	134,851	26,870	4,147	190,619	85,086
8	19,676	23,730	197,878	16,689	4,019	129,522	29,730
9	21,086	43,022	97,217	8,124	7,398	80,454	23,802
10	34,753	47,986	49,779	4,825	9,575	30,149	23,292
11	20,379	42,881	32,981	87,299	77,502	21,314	13,698
12	12,151	15,688	35,929	80,213	64,265	14,555	116,058
13	5,285	34,418	11,477	71,748	24,588	76,137	250,602
14	6,193	15,009	28,078	47,216	10,303	33,249	129,270
15	1,701	20,379	19,712	79,427	4,109	24,648	52,248
16	1,260	20,859	17,607	68,389	4,274	7,763	13,788
17	2,344	9,235	14,836	47,168	2,785	4,325	11,334
18	1,478	4,736	12,838	18,168	1,685	3,023	24,612
19	1,929	13,800	4,625	21,670	2,785	4,214	27,738
20	2,448	6,982	4,274	18,057	2,080	7,926	13,242
21	3,003	3,802	4,096	13,921	2,806	8,208	5,976
22	3,702	3,984	1,742	6,690	2,834	6,747	4,698
23	2,125	5,580	3,859	3,852	789	2,652	3,912
24	1,320	2,152	2,922	2,416	522	2,028	4,266
25	5,442	1,296	3,648	4,662	147	1,610	1,515
26	731	1,272	1,560	3,554	852	1,548	2,631
27	456			1,792	2,625	1,026	912
28	258			486	1,530	1,287	1,575
29	60			1,520		1,677	552
30				892		1,023	36
31				180		737	1,836
August							
1				490		450	
2						306	
Total	515,542	570,624	1,382,755	773,101	288,727	960,455	2,209,266

[1] See table 4 in "A summary of observations of adult red salmon migrations through the Wood River, 1953," by John R. Gilbert. Official records of the Fisheries Research Institute, University of Washington.

[2] See table 3 in "Preliminary summary of the Wood River escapement counts and Nushagak spawning ground index: with a revision of the Nushagak escapement index," by John R. Gilbert. Official records of the Fisheries Research Institute, University of Washington.

[3] See table 4, page 20, in "Enumeration of the Wood River lakes escapement in 1955," by John R. Gilbert. Official records of the Fisheries Research Institute, University of Washington.

[4] Compiled from tower counts, using hourly multiplication factors to obtain a corrected estimated escapement.

of Commercial Fisheries on the Igushik River and Nuyakuk River in 1958 and 1959, respectively. Within the Wood River lakes system, escapement estimates of individual areas are being continued to assess the percentages and numbers of fish spawning in each lake and major river. Escapement estimates for the period 1946-58 were evaluated by J. R. Gilbert and for 1959 by M. O. Nelson.

Escapement sampling.--Since 1946, extensive annual sampling of dead fish on the spawning areas has been conducted for length frequency, scale samples, and sex ratio determination. Dead salmon were measured from mideye to hypural plate and measurements converted to mideye-tail fork lengths based on a conversion table worked out from commercial fishery samples by R. E. Duncan (1956). No correction has been made for possible differences in length between fish as measured dead in commercial fishery samples and as measured dead on the spawning grounds. In general, larger samples were taken from the more heavily utilized spawning areas. Sampling was more comprehensive in the Wood River lakes. Total numbers of fish measured annually by sex are given in table 1.

Accurate determination of sex ratio of fish on the spawning grounds is difficult because of observed differences between sexes in behavior during and after spawning, in time of dying after spawning, in drifting after death, and in selective feeding by predators. The sex ratios from live and dead counts that were considered to be most representative have been used to arrive at escapement sex ratios in the Wood River lakes for the period 1946-58. In 1959, sex ratios for the Wood River lakes escapement were obtained from daily samples collected throughout the season by beach seine as the salmon entered Lake Aleknagik from Wood River. Daily sex ratios in 1959 were weighted by daily escapements past the Wood River tower enumeration site.

DETERMINATION OF AGE AND DISTRIBUTION OF AGE GROUPS

The red salmon of Bristol Bay mostly spend one or two winters in fresh water and two or three winters in the ocean before maturing. This gives rise to four major age components in addition to several minor age categories. The IBM program discussed earlier will calculate the different age components of both catch and escapement without the use of length frequency measurements if representative age data samples are available. These components can then be combined to examine any relationships between year classes or between escapement and return.

For the period covered by this report a somewhat different approach was followed because escapement sampling for age was not conducted in the trunk streams as it has been since 1960.[2] For the years 1946-59, scale samples from the escapement were taken on the individual spawning beds, where resorption of the marginal areas of scales prevents an assessment of ocean age. Therefore, it was necessary to ascertain ocean age from length frequency distributions.

The size of adult salmon is largely determined by the number of years the fish spend in the ocean. Those that have spent two winters in the ocean form the small size group, and those that have spent three winters in the ocean, the large size group. These two size groups usually differ in mean length by about 5 cm.

In addition to the above two size groups, there are a small number of jack salmon (males that return after one winter in the ocean) in some years and a variable but insignificant percentage of fish that spend four winters in the ocean. In calculating age distribution, the jack salmon are included with the small size group, and the 4-year-ocean fish, with the large size group.

Further, since age composition in the catch within individual fishing periods was generally based on a scale sample one-fifth the size of the sample used in determining length frequency distribution, we felt that a better estimate of the distribution of ocean age would be obtained by also using the available length

[2] Trunk stream sampling for age composition was initiated at Wood River in 1959, but data were not available for the other trunk rivers of the district.

frequency data. This was done in the following manner:

1. Scales collected from the catch were read in a routine manner. Length frequencies of age groups .2 and .3 [3] were tallied, and a dividing line between these two size groups was determined. This was done each year for each sex. This dividing line was applied to the total season's weighted length frequency for the catch in order to arrive at the percentages of small and large size groups of fish.

2. For the escapement, the dividing line was ascertained from the length frequency itself, which then gave percentages of small and large size groups.

3. The scale readings for each fishing period were weighted by the fraction of the total catch in the period and summed in order to calculate season values for percentages of the fresh-water age groups within each of the two marine size groups. Males and females were combined.

4. The percentages of the age groups within each marine size group were then applied to the catch, as well as to the escapement, to calculate the number of fish for each age.

This method assumes that the fresh-water age composition within each ocean age group is the same in the escapement as in the catch. This assumption finds support in the fact that fresh-water age has no detectable relation to size at return, which would mean that the gill net fishery has little differential selectivity on fish of different fresh-water ages that are of the same ocean age.

[3] In designating age groups, Arabic numerals are used to represent numbers of annuli, and a dot to differentiate fresh-water and salt-water growth. An Arabic numeral followed by a dot designates fresh-water annuli, and Arabic numeral preceded by a dot designates salt-water annuli.

ORGANIZATION OF THE TABLES

The extent of sampling done each year is given in table 1. Basic data on number of salmon in catch and escapement are contained in tables 2 and 3, followed by summaries of the weighted length frequencies for males and females in catch, escapement, and total run (tables 4-9). Seasonal sex ratios in catch and escapement are found in table 10, and the numbers of males and females in table 11.

Table 12 gives the percentage distribution for males and females in catch and escapement according to ocean age, while table 13 gives the same information expressed in numbers.

Table 14 contains a breakdown of percentage age distribution within the two ocean age groups and with males and females combined. The salmon returning in each year within different age groups are given in table 15, and the number of 4-, 5-, and 6-year fish returning from a given year of spawning is contained in table 16.

In table 17 the return is distributed by ocean age groups. Table 18 contains the total return of all ocean age groups from a given year of spawning.

A further refinement is achieved in table 19 with the total return from a given smolt migration given by individual age groups. Table 20 contains the same compilation on a percentage basis. In table 21 the return of adult red salmon per smolt migration index point is calculated.

Finally, the fishing periods for the years 1946-59 are shown as calendar charts on pages 25-31.

Table 4.--Cumulative weighted length frequencies of male red salmon in Nushagak catch, 1946-59

Mideye-fork length (mm.)	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
315														
320														
325														
330														
335												0.066		
340												0.066		
345												0.066		
350												0.066		
355												0.066		
360												0.066		
365									0.107			0.066		
370									0.107			0.066		
375									0.107			0.066		
380									0.107			0.066		
385									0.256			0.066		
390									0.256			0.066		
395									0.289			0.066		
400						0.050		0.099	0.431			0.066		
405		0.089				0.050		0.099	0.458			0.066		
410		0.178		0.021		0.050		0.099	0.546			0.085		
415		0.178		0.021		0.050		0.099	0.546			0.085		
420	0.007	0.178		0.021		0.050	0.081	0.099	0.546			0.173		
425	0.010	0.178		0.021	0.011	0.050	0.081	0.099	0.546			0.173		
430	0.017	0.178		0.021	0.011	0.050	0.081	0.099	0.633	0.045	0.028	0.259		
435	0.017	0.178		0.123	0.011	0.050	0.081	0.099	0.633	0.045	0.045	0.259		
440	0.017	0.178		0.123	0.011	0.050	0.081	0.099	0.660	0.045	0.108	0.259		
445	0.066	0.178		0.219	0.011	0.050	0.081	0.099	0.855	0.045	0.108	0.259		0.045
450	0.073	0.178		0.219	0.011	0.050	0.130	0.099	0.910	0.045	0.188	0.259	0.076	0.108
455	0.114	0.195		0.219	0.031	0.050	0.130	0.099	0.983	0.065	0.188	0.259	0.097	0.141
460	0.195	0.233		0.264	0.094	0.158	0.130	0.193	1.133	0.143	0.452	0.278	0.269	0.373
465	0.412	0.288		0.264	0.094	0.158	0.475	0.193	1.234	0.389	0.761	0.362	0.404	0.373
470	0.610	0.343		0.724	0.284	0.158	0.475	0.193	1.423	1.082	1.106	0.362	0.647	0.793
475	1.087	0.418	0.026	0.724	0.429	0.158	1.477	0.287	1.786	1.250	1.796	0.428	0.851	1.028
480	1.995	0.669	0.132	1.575	0.704	0.158	2.742	0.287	2.608	2.143	3.004	0.811	1.287	1.583
485	3.561	1.410	0.186	2.195	1.187	0.208	3.173	0.287	4.435	3.427	4.069	1.677	2.426	2.324
490	5.177	1.868	0.186	3.056	1.913	0.313	4.357	0.386	6.010	3.992	6.077	2.750	3.798	3.602
495	8.872	2.992	0.381	4.105	3.467	0.710	7.031	0.575	9.110	5.787	8.775	3.608	5.641	6.023
500	13.404	4.552	0.677	5.405	5.769	1.396	10.112	1.151	12.984	8.131	11.540	4.551	8.149	8.416
505	18.009	6.761	1.104	7.134	8.289	2.950	13.555	1.335	19.762	12.432	15.488	6.460	11.721	12.343
510	25.551	9.400	1.427	9.647	10.947	4.369	18.622	2.391	26.579	19.064	19.671	8.898	15.785	17.886
515	33.870	13.271	1.772	12.345	14.219	6.836	24.442	3.646	34.130	26.795	24.123	11.544	19.387	23.456
520	42.875	17.641	2.007	14.423	17.963	9.253	30.847	5.303	42.181	33.473	30.027	14.917	24.676	30.986
525	50.573	22.138	2.580	16.390	21.707	12.782	35.899	6.938	49.997	41.931	35.351	18.918	30.085	38.962
530	58.664	27.157	3.057	18.456	25.651	16.907	41.031	8.645	56.483	49.995	40.005	23.300	35.108	47.875
535	64.675	32.054	3.501	19.901	28.225	20.833	44.214	12.021	62.380	57.965	43.974	27.059	40.010	57.251
540	71.494	35.364	4.641	21.783	31.675	24.491	46.307	14.536	67.518	65.101	47.334	30.972	43.722	64.129
545	76.032	39.016	6.327	22.705	33.632	28.489	47.830	16.991	71.134	70.954	50.265	34.575	47.641	70.568
550	80.197	42.650	8.023	25.095	36.577	30.877	49.853	18.966	74.592	74.270	52.968	38.010	50.542	77.023
555	82.457	46.251	9.586	27.349	39.330	33.902	51.556	21.000	77.790	77.374	55.257	41.104	53.891	81.689
560	84.640	49.437	12.073	29.533	40.975	36.045	53.598	24.263	79.802	80.427	57.385	44.526	56.392	84.631
565	85.606	53.163	15.518	33.062	43.947	38.381	54.951	27.413	81.398	83.764	60.047	49.028	58.791	86.554
570	87.060	56.973	20.494	37.340	47.198	41.345	57.682	29.826	83.048	87.210	63.063	53.384	62.117	88.408
575	87.879	61.881	27.553	43.539	52.650	43.581	61.397	33.459	85.505	89.384	66.111	58.787	64.876	89.821
580	88.859	66.690	34.991	49.497	58.369	48.257	64.508	37.586	86.820	91.843	69.989	65.111	68.917	91.463
585	89.662	70.764	43.614	57.903	64.132	53.163	68.349	42.629	88.995	93.496	73.449	71.672	72.770	92.704
590	90.559	76.369	52.428	64.583	70.255	59.317	72.469	47.853	91.004	95.615	77.738	77.423	77.744	94.074
595	91.874	80.937	61.851	71.759	76.362	65.193	77.377	54.347	92.947	96.965	81.927	83.383	82.968	95.506
600	92.698	85.823	70.007	77.424	82.104	71.201	82.281	63.140	95.106	97.896	86.016	88.333	87.685	96.835
605	94.109	89.682	77.774	84.608	87.222	78.250	87.019	70.835	96.275	98.592	89.297	92.297	91.133	98.077
610	95,292	92.465	85.010	88.612	91.987	83.384	90.835	75.887	97.225	99.109	92.364	95.002	94.027	98.589
615	96.377	94.997	91.072	91.707	94.959	88.242	93.193	81.775	98.034	99.456	94.905	97.021	96.385	99.074
620	97.472	96.500	94.537	94.009	97.242	91.898	94.941	86.954	98.845	99.584	96.694	98.268	97.897	99.578
625	98.106	97.920	96.779	96.024	98.291	94.755	96.216	90.292	99.525	99.935	97.903	99.016	98.949	99.714
630	99.033	99.187	97.836	97.251	98.895	96.937	97.472	93.576	99.668	99.935	98.816	99.660	99.607	99.802
635	99.243	99.601	98.679	97.920	99.288	97.420	98.225	96.100	99.914	99.955	99.112	99.917	99.862	99.959
640	99.497	99.952	99.428	98.632	99.533	98.133	99.056	97.661	99.941	99.955	99.694	99.977	99.925	100.000
645	99.652	100.000	99.652	98.941	99.810	98.818	99.405	98.441	99.973	99.955	99.771	99.977	99.963	
650	99.800		99.701	99.668	100.000	99.350	99.583	98.823	100.000	100.000	99.910	99.977	100.000	
655	99.864		99.822	99.809		99.586	99.860	98.922			99.924	100.000		
660	99.917		99.856	100.000		99.679	99.909	99.508			99.924			
665	99.958		99.856			99.741	100.000	99.801			100.000			
670	99.958		99.905			99.835		99.801						
675	100.000		99.955			99.835		100.000						
680			100.000			99.835								
685						99.947								
690						99.947								
695						100.000								
700														

Table 5.--Cumulative weighted length frequencies of female red salmon in Nushagak catch, 1946-59

Mideye-fork length (mm.)	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
315														
320														
325														
330														
335														
340														
345														
350														
355														
360														
365														
370														
375														
380														
385														
390														
395					0.021									
400					0.021									
405					0.021									
410					0.021									
415					0.021									
420					0.021			0.060						
425	0.088				0.021			0.060				0.014		
430	0.103				0.021			0.060				0.014		
435	0.191				0.021			0.060				0.014		
440	0.206	0.015		0.073	0.021			0.060			0.015	0.014		
445	0.309	0.030		0.204	0.021		0.079	0.060	0.213		0.034	0.014		0.027
450	0.653	0.138	0.037	0.292	0.021		0.079	0.060	0.243		0.034	0.014	0.231	0.174
455	1.197	0.216	0.037	0.335	0.021		0.079	0.060	0.372		0.144	0.029	0.347	0.251
460	1.646	0.403	0.037	0.335	0.021	0.032	0.243	0.127	0.653	0.150	0.433	0.074	0.427	0.426
465	2.452	0.635	0.037	0.485	0.190	0.078	0.243	0.127	0.913	0.294	0.512	0.235	0.767	0.892
470	4.288	1.176	0.061	0.599	0.395	0.126	0.570	0.127	1.839	0.800	0.959	0.402	1.460	2.176
475	5.810	1.974	0.132	0.708	0.743	0.177	1.077	0.190	2.672	1.447	1.580	0.775	2.446	3.129
480	7.823	2.811	0.155	1.175	1.252	0.349	1.548	0.250	4.331	3.110	2.913	1.229	3.354	5.320
485	11.795	4.244	0.155	1.618	1.603	0.679	2.068	0.434	6.301	5.763	4.035	1.862	5.295	8.412
490	16.234	6.016	0.232	2.124	2.138	1.261	3.539	0.627	9.398	9.509	6.162	3.210	7.280	13.194
495	22.322	8.137	0.330	2.367	3.131	2.036	5.494	0.757	14.200	15.114	8.764	4.416	10.395	19.927
500	28.837	10.612	0.556	2.813	4.261	3.387	8.496	1.409	20.212	21.791	11.666	6.397	13.941	29.631
505	35.505	13.693	0.881	3.466	5.545	4.880	10.960	2.300	27.223	31.516	15.170	8.735	17.386	37.996
510	42.480	16.845	1.293	4.311	7.279	6.680	12.461	3.095	35.077	39.406	18.469	11.503	21.296	47.227
515	49.437	19.618	1.734	5.452	8.973	8.848	15.662	3.996	41.424	47.339	21.657	14.286	24.367	55.072
520	54.379	24.004	2.696	6.860	10.567	10.649	17.117	5.489	47.015	54.350	24.511	16.789	27.495	61.949
525	58.103	28.367	4.141	8.903	12.345	13.301	18.738	7.184	51.267	60.291	27.321	20.676	30.562	67.869
530	61.169	33.232	6.850	12.901	15.591	16.028	21.413	9.763	54.799	65.049	30.577	24.844	33.537	72.643
535	63.539	39.892	11.448	17.306	19.063	18.426	24.721	12.226	59.169	68.374	34.273	29.161	38.304	76.871
540	65.980	46.363	17.331	24.689	24.230	21.608	29.825	14.634	63.662	73.123	37.503	34.931	43.096	79.836
545	69.024	52.998	25.181	32.625	32.052	25.430	35.342	18.901	67.915	76.731	42.959	40.714	49.127	82.670
550	72.781	61.274	35.011	41.396	41.259	30.221	41.689	24.131	73.240	80.668	48.260	48.115	55.742	85.363
555	75.340	69.339	46.963	51.335	51.527	35.982	48.145	29.695	78.177	85.023	54.581	56.521	62.734	88.437
560	78.385	76.965	58.125	61.163	63.109	43.635	57.129	38.337	82.339	88.520	64.008	64.330	70.561	91.322
565	81.770	83.610	68.610	69.643	72.087	51.584	67.897	45.296	86.214	92.374	72.324	71.486	78.209	93.458
570	85.506	88.120	77.801	77.532	80.687	60.795	75.054	52.195	90.303	95.436	80.174	77.984	84.285	94.978
575	88.537	92.292	[illegible]5.421	83.671	87.821	69.268	82.183	61.392	93.441	97.082	86.885	84.384	89.682	97.109
580	91.804	95.263	90.088	89.161	92.077	78.270	87.349	71.398	96.126	97.789	91.842	90.551	94.168	98.253
585	94.243	96.910	93.734	92.272	96.115	84.120	91.636	78.280	97.537	98.877	95.072	93.666	96.453	98.848
590	95.442	98.444	95.884	95.473	98.224	88.591	94.551	84.269	98.633	99.430	97.574	96.486	97.590	99.511
595	97.212	99.436	97.608	97.141	99.279	92.556	96.950	90.241	98.948	99.784	98.592	98.207	98.656	99.745
600	98.308	99.800	98.807	98.408	99.589	95.718	98.576	94.488	99.474	99.883	99.328	99.083	99.291	99.816
605	98.978	99.813	99.343	98.897	99.842	97.661	98.883	96.536	99.920	99.900	99.748	99.484	99.671	99.963
610	99.371	99.987	99.669	99.209	99.988	98.745	99.231	98.244	99.920	99.989	99.922	99.641	99.825	99.963
615	99.460	100.000	99.872	99.505	100.000	99.277	99.729	98.965	99.920	99.989	100.000	99.804	99.922	100.000
620	99.734		99.955	99.689		99.716	99.777	99.534	99.920	99.989		99.907	100.000	
625	99.911		100.000	99.689		99.754	99.777	99.667	99.920	100.000		99.967		
630	99.911			99.773		99.875	100.000	99.933	99.920			99.967		
635	99.911			99.773		99.922		100.000	99.920			100.000		
640	99.911			99.773		99.953			100.000					
645	99.911			99.773		99.953								
650	100.000			99.916		99.953								
655				100.000		99.953								
660						99.953								
665						99.953								
670						99.953								
675						99.953								
680						99.953								
685						100.000								
690														
695														
700														

Table 6.--Cumulative weighted length frequencies of male red salmon in Nushagak escapement, 1946-59

Mideye-fork length (mm.)	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
315						0.008							0.020	
320						0.039				0.006			0.060	
325						0.089				0.020			0.084	
330						0.121	0.013		0.007	0.020			0.144	
335						0.122	0.091	0.003	0.050	0.023			0.232	
340						0.139	0.131	0.053	0.169	0.077			0.381	
345						0.156	0.133	0.080	0.289	0.080			0.565	
350						0.159	0.133	0.135	0.476	0.080			0.869	
355						0.181	0.163	0.169	0.599	0.108			1.137	
360						0.224	0.230	0.194	0.698	0.120			1.525	
365						0.284	0.288	0.204	0.853	0.131			1.885	
370						0.360	0.310	0.228	1.063	0.142			2.422	
375						0.414	0.310	0.269	1.234	0.142			2.843	0.009
380						0.415	0.310	0.288	1.303	0.142			3.372	0.028
385					0.016	0.420	0.310	0.288	1.350	0.142			3.861	0.055
390					0.104	0.420	0.310	0.288	1.428	0.142			4.179	0.055
395					0.104	0.420	0.310	0.288	1.428	0.142		0.054	4.570	0.083
400		0.072			0.104	0.420	0.310	0.288	1.517	0.142		0.490	4.836	0.101
405		0.072			0.104	0.420	0.310	0.288	1.530	0.142		0.490	5.024	0.192
410	0.051	0.072		0.064	0.104	0.420	0.310	0.288	1.530	0.142		0.548	5.220	0.228
415	0.051	0.122		0.148	0.104	0.420	0.310	0.288	1.530	0.184		0.664	5.220	0.247
420	0.051	0.148		0.285	0.104	0.440	0.310	0.301	1.530	0.212	0.014	0.837	5.280	0.320
425	0.102	0.273		0.580	0.104	0.466	0.350	0.336	1.539	0.219	0.027	0.953	5.335	0.392
430	0.220	0.370		0.945	0.137	0.491	0.463	0.370	1.566	0.228	0.027	1.011	5.362	0.465
435	0.288	0.489		1.309	0.252	0.522	0.625	0.383	1.610	0.230	0.040	1.185	5.393	0.543
440	2.060	0.681	0.012	2.068	0.451	0.538	0.837	0.405	1.713	0.245	0.120	1.398	5.483	0.615
445	2.195	0.790	0.090	3.276	0.736	0.579	1.313	0.415	2.061	0.306	0.370	1.560	5.650	0.948
450	2.499	1.191	0.208	5.163	1.042	0.674	2.078	0.517	2.689	0.427	0.999	2.316	6.012	1.450
455	4.407	1.730	0.376	5.973	1.829	0.809	3.041	0.664	3.956	0.698	1.645	2.766	6.764	1.932
460	6.196	2.641	0.685	10.829	3.335	1.023	3.925	0.857	5.359	0.883	2.967	3.432	7.594	2.606
465	8.053	3.435	1.011	13.924	5.118	1.448	5.608	1.007	7.440	1.437	4.526	4.111	8.507	3.684
470	10.974	5.213	1.386	15.823	7.039	1.946	7.478	1.370	10.016	2.378	6.456	5.038	9.918	5.243
475	12.325	6.905	1.884	19.653	9.160	2.613	9.611	1.779	13.388	3.675	8.788	6.527	11.362	7.264
480	19.923	9.048	2.359	23.882	11.539	3.521	12.282	2.221	17.383	5.770	11.872	8.066	13.738	10.798
485	22.895	12.491	2.791	26.161	14.387	4.708	15.339	2.794	22.130	8.715	15.398	10.277	16.418	14.875
490	26.053	14.822	3.305	27.931	17.575	6.362	18.542	3.419	28,094	12.183	18.698	12.522	20.318	19.743
495	29.972	18.699	3.704	30.659	20.233	8.659	21.855	4.139	34.600	16.779	22.586	14.700	24.641	25.738
500	34.633	21.936	4.175	34.101	23.075	11.210	24.466	5.266	41.938	22.721	27.030	17.454	30.230	33.276
505	45.187	25.248	4.988	36.952	25.578	14.253	26.709	6.668	49.134	29.318	31.545	20.065	36.225	41.256
510	51.604	28.590	5.586	39.322	27.535	17.771	29.392	8.187	56.122	36.996	35.355	22.917	41.936	49.822
515	56.112	33.324	6.303	40.959	29.934	21.145	31.584	9.734	62.326	44.786	39.136	25.206	47.471	57.766
520	63.306	36.562	7.363	41.646	31.462	24.619	33.556	11.161	68.059	52.409	42.662	27.389	52.891	65.669
525	65.501	39.789	8.264	43.371	32.848	28.435	35.366	12.715	73.000	59.305	46.191	29.685	57.961	73.374
530	69.469	42.870	9.492	44.661	34.215	31.904	36.792	14.361	77.461	65.709	49.289	31.432	61.983	78.847
535	70.500	45.589	10.847	45.120	35.458	35.123	38.063	15.852	81.162	71.071	51.829	33.893	65.575	83.513
540	72.561	48.461	12.077	46.034	37.016	38.206	39.412	17.245	83.745	75.062	54.005	36.615	67.850	86.880
545	75.735	50.845	13.748	47.587	39.442	40.669	40.724	19.032	85.561	78.307	55.927	40.473	70.264	89.053
550	78.825	53.249	16.157	49.379	42.634	42.864	42.207	21.522	86.893	80.766	57.860	44.418	72.597	90.825
555	81.931	56.170	19.840	53.421	46.642	44.931	44.269	24.243	87.840	82.560	59.913	49.456	74.970	92.231
560	83.501	58.651	25.066	55.924	51.310	47.499	46.178	26.671	88.705	83.775	63.163	54.730	77.074	93.648
565	85.138	62.265	31.072	62.426	55.466	49.844	48.729	30.693	89.731	86.252	66.912	60.385	80.148	94.673
570	86.776	65.129	37.684	67.436	60.397	53.565	51.269	34.436	90.978	88.204	70.624	66.358	83.018	95.500
575	88.532	70.226	45.237	70.692	65.842	57.753	54.338	38.972	92.317	89.832	74.915	72.194	85.844	96.279
580	91.605	73.340	53.116	74.270	70.185	62.732	57.943	44.622	93.730	91.739	79.383	78.608	88.354	96.864
585	93.277	78.170	62.168	78.293	75.157	67.751	61.889	50.602	95.157	93.552	83.431	83.544	91.690	97.544
590	93.852	81.692	70.935	82.007	80.955	72.359	65.792	57.302	96.351	94.959	87.337	89.163	93.794	97.950
595	94.156	84.747	78.236	85.545	85.535	76.862	69.943	64.696	97.162	96.170	91.157	92.903	95.710	98.377
600	96.081	88.998	84.922	88.872	88.524	81.553	74.818	71.612	97.789	97.318	94.099	94.788	96.910	98.906
605	96.200	91.716	90.047	90.425	92.031	86.158	79.539	78.153	98.495	98.144	96.056	96.494	97.931	99.278
610	97.855	95.081	93.732	91.524	95.051	89.375	84.091	83.397	99.036	98.777	97.885	97.833	98.744	99.633
615	99.425	96.559	96.216	93.709	97.567	92.577	89.286	88.199	99.364	99.252	98.520	98.446	99.333	99.887
620	99.696	97.944	97.390	94.815	98.951	94.768	93.300	92.993	99.737	99.488	99.365	99.387	99.720	99.948
625	99.696	98.366	98.437	94.966	99.371	96.537	95.784	95.519	99.863	99.664	99.793	99.802	99.804	99.948
630	99.814	99.096	99.055	96.568	99.499	97.801	97.068	97.308	99.924	99.819	99.944	99.946	99.927	100.000
635	99.814	99.665	99.387	98.101	99.721	98.588	97.551	98.528	99.942	99.948	99.989	99.946	99.962	
640	99.932	99.870	99.623	99.236	99.903	99.003	98.099	99.216	99.942	100.000	100.000	99.946	100.000	
645	100.000	99.958	99.777	99.805	99.973	99.300	98.972	99.600	99.942			100.000		
650		99.958	99.827	99.869	100.000	99.607	99.584	99.837	99.961					
655		99.958	99.862	100.000		99.818	99.689	99.949	100.000					
660		99.958	99.942			99.936	100.000	100.000						
665		100.000	99.944			100.000								
670			99.991											
675			99.993											
680			99.993											
685			99.993											
690			99.993											
695			99.993											
700			100.000											

Table 7.--Cumulative weighted length frequencies of female red salmon in Nushagak escapement, 1946-59

Mideye-fork length (mm.)	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
315														
320														
325														
330														
335														
340														
345														
350														
355							0.026							
360							0.038							
365							0.038							
370							0.038							
375							0.038							
380							0.038							
385							0.038							
390					0.004		0.038							
395					0.074		0.038						0.023	
400					0.077		0.038					0.013	0.023	
405					0.137		0.069					0.013	0.042	
410		0.008			0.207		0.098					0.039	0.065	
415	0.042	0.008		0.037	0.245		0.130	0.044	0.013	0.011	0.015	0.066	0.098	0.005
420	0.042	0.016		0.319	0.254		0.248	0.090	0.044	0.038	0.053	0.066	0.115	0.005
425	0.102	0.120	0.004	0.656	0.456		0.442	0.115	0.105	0.066	0.111	0.066	0.205	0.026
430	1.534	0.179	0.017	0.860	0.957		0.787	0.171	0.187	0.084	0.236	0.145	0.322	0.197
435	3.091	0.471	0.083	1.299	1.622	0.054	1.403	0.262	0.294	0.099	0.515	0.704	0.649	0.287
440	4.782	0.727	0.401	2.606	2.536	0.265	2.218	0.340	0.647	0.233	1.080	1.446	0.960	0.606
445	6.835	1.561	1.287	5.294	4.013	0.529	3.628	0.703	1.863	0.875	2.396	2.733	2.431	2.336
450	12.006	3.016	1.857	9.533	7.165	1.180	6.124	0.877	4.566	1.806	4.824	4.859	5.213	4.365
455	14.827	5.125	2.700	11.765	10.347	1.995	9.596	1.288	8.158	3.253	8.199	7.098	8.853	8.093
460	19.386	8.716	3.373	16.163	14.212	3.207	13.378	1.947	12.705	5.378	12.488	9.402	13.045	12.540
465	27.556	12.411	4.206	20.135	19.644	4.990	17.913	3.187	19.472	8.860	17.318	12.110	18.233	18.358
470	40.784	18.177	5.499	24.039	24.958	7.765	22.429	4.617	27.137	13.743	23.051	15.355	24.967	26.637
475	50.541	23.619	6.568	27.722	30.678	11.516	27.063	5.975	34.996	20.001	28.849	18.726	32.324	35.966
480	60.321	28.939	7.512	30.901	36.584	15.570	31.725	7.598	43.109	27.785	34.672	21.939	38.476	45.392
485	68.419	34.822	8.529	33.679	41.346	19.771	35.716	9.514	51.411	36.311	40.518	24.998	45.082	55.532
490	71.609	39.173	9.265	35.994	44.691	24.141	38.704	11.280	59.259	44.582	45.306	28.588	51.455	64.463
495	74.517	43.853	10.150	37.525	47.377	27.512	41.189	13.195	65.694	53.045	48.712	30.945	55.735	71.062
500	78.227	46.838	11.453	39.108	49.065	30.622	43.391	15.660	70.296	59.659	52.202	34.770	59.895	76.654
505	81.854	50.064	13.330	41.225	50.656	32.762	45.504	17.321	74.510	65.356	54.745	38.332	63.902	80.794
510	82.464	52.418	15.209	44.025	52.745	35.018	47.535	19.388	77.555	69.318	56.950	41.193	66.221	84.446
515	82.816	54.684	18.902	48.993	55.188	37.100	49.751	21.142	80.333	72.442	59.112	44.702	68.704	87.312
520	85.851	57.032	24.078	51.909	57.894	39.443	51.410	24.118	82.442	75.644	61.803	50.506	70.920	89.014
525	86.035	59.031	30.452	56.241	61.575	41.726	53.515	27.169	84.315	78.600	64.786	57.036	73.791	90.518
530	86.235	62.714	38.294	61.443	65.982	44.645	56.407	30.367	86.332	81.394	68.530	63.106	76.740	91.648
535	87.806	66.305	47.226	68.262	70.467	48.646	60.449	34.511	88.303	84.587	73.046	70.068	80.762	92.910
540	92.374	71.131	56.466	75.635	74.566	53.656	65.139	39.561	90.078	87.676	77.658	75.684	83.702	94.781
545	95.405	75.564	65.736	79.958	78.385	59.632	69.377	45.152	91.801	89.877	82.020	81.430	87.047	96.133
550	95.789	80.740	74.903	83.488	82.692	66.334	73.893	51.984	93.322	92.369	86.416	86.007	90.285	96.859
555	96.090	85.408	82.683	87.088	87.299	72.919	79.255	59.619	94.721	94.580	90.266	90.180	93.239	97.781
560	97.624	88.674	88.232	89.580	92.182	78.522	82.922	66.096	96.002	95.893	93.144	92.863	94.982	98.274
565	99.380	92.990	93.035	92.091	94.159	83.989	87.401	73.690	97.290	97.302	95.704	95.570	96.935	98.893
570	99.648	95.219	95.940	93.441	95.272	88.368	90.427	79.618	98.105	98.484	97.551	96.817	98.105	99.341
575	99.805	97.282	97.523	95.018	96.354	92.246	92.933	84.738	98.832	98.981	98.699	98.246	98.785	99.793
580	99.926	98.321	98.344	96.298	97.675	94.911	95.318	89.299	99.336	99.292	99.389	99.149	99.280	99.883
585	99.926	98.937	98.827	97.785	98.721	96.738	97.908	93.028	99.644	99.501	99.766	99.650	99.662	99.989
590	99.944	99.347	99.155	98.923	99.341	97.981	99.427	95.638	99.808	99.658	99.919	99.841	99.844	100.000
595	99.963	99.603	99.386	99.139	99.706	98.776	99.604	97.281	99.900	99.819	99.968	99.958	99.926	
600	99.963	99.885	99.569	99.139	99.834	99.419	99.897	98.429	100.000	99.892	100.000	99.958	99.926	
605	99.981	99.933	99.686	99.157	99.841	99.656	99.965	99.250		99.892		100.000	99.963	
610	100.000	99.988	99.686	99.257	99.883	99.754	99.993	99.504		99.897			99.980	
615		99.988	99.686	99.257	99.953	99.888	99.993	99.827		99.996			100.000	
620		100.000	99.686	99.360	99.956	99.922	99.993	99.868		100.000				
625			99.721	99.375	99.956	99.927	99.993	99.915						
630			99.740	99.806	99.971	99.927	99.993	99.928						
635			99.775	100.000	99.978	99.927	99.993	99.928						
640			99.840		99.989	99.927	99.993	99.960						
645			99.883		100.000	99.927	99.993	99.991						
650			99.905			99.927	99.995	99.991						
655			99.961			99.944	100.000	99.991						
660			100.000			100.000		99.992						
665								100.000						
670														
675														
680														
685														
690														
695														
700														

Table 8.--Weighted length frequencies of male red salmon in Nushagak total run, 1946-59

Mideye-fork Length (mm.)	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
315						0.004							0.011	
320						0.017				0.004			0.021	
325						0.029				0.008			0.013	
330						0.018	0.005		0.004	0.			0.032	
335						0.001	0.028	0.002	0.029	0.002		0.031	0.047	
340						0.010	0.015	0.034	0.078	0.035		0.	0.079	
345						0.010	0.001	0.018	0.078	0.002		0.	0.098	
350						0.001	0.	0.037	0.123	0.		0.	0.162	
355						0.012	0.011	0.023	0.081	0.018		0.	0.143	
360						0.024	0.024	0.016	0.065	0.008		0.	0.206	
365						0.034	0.021	0.007	0.138	0.007		0.	0.192	
370						0.042	0.008	0.016	0.137	0.007		0.	0.286	
375						0.030	0.	0.028	0.112	0.		0.	0.224	0.005
380						0.001	0.	0.012	0.045	0.		0.	0.282	0.011
385					0.005	0.003	0.	0.	0.082	0.		0.	0.260	0.016
390					0.027	0.	0.	0.	0.051	0.		0.	0.169	0.
395					0.	0.	0.	0.	0.011	0.		0.028	0.208	0.016
400		0.030			0.	0.022	0.	0.033	0.107	0.		0.230	0.142	0.011
405		0.051			0.	0.	0.	0.	0.018	0.		0.	0.100	0.054
410	0.028	0.051		0.028	0.	0.	0.	0.	0.030	0.		0.040	0.104	0.022
415	0.	0.021		0.013	0.	0.	0.	0.	0.	0.027	0.	0.061	0.	0.011
420	0.003	0.011		0.021	0.	0.011	0.052	0.009	0.	0.018	0.007	0.133	0.032	0.043
425	0.029	0.053	0.	0.045	0.007	0.015	0.014	0.023	0.006	0.004	0.007	0.061	0.029	0.043
430	0.068	0.041	0.	0.056	0.010	0.014	0.041	0.023	0.048	0.022	0.015	0.071	0.015	0.043
435	0.037	0.050	0.	0.141	0.035	0.018	0.059	0.009	0.029	0.001	0.015	0.092	0.016	0.046
440	0.966	0.081	0.006	0.116	0.061	0.009	0.076	0.015	0.077	0.010	0.071	0.113	0.048	0.043
445	0.096	0.046	0.035	0.266	0.087	0.023	0.172	0.007	0.295	0.039	0.122	0.086	0.089	0.216
450	0.169	0.169	0.053	0.287	0.094	0.053	0.308	0.068	0.430	0.077	0.348	0.398	0.228	0.322
455	1.058	0.238	0.076	0.123	0.254	0.076	0.348	0.099	0.854	0.181	0.315	0.237	0.410	0.299
460	1.012	0.407	0.139	0.778	0.504	0.168	0.320	0.160	0.971	0.146	0.780	0.361	0.522	0.493
465	1.110	0.367	0.147	0.471	0.544	0.238	0.829	0.100	1.397	0.444	0.919	0.398	0.549	0.637
470	1.682	0.783	0.169	0.679	0.718	0.280	0.676	0.243	1.752	0.851	1.119	0.489	0.864	1.094
475	0.953	0.758	0.239	0.583	0.748	0.375	1.411	0.304	2.333	0.892	1.492	0.816	0.864	1.292
480	4.552	1.050	0.273	1.366	0.917	0.510	1.773	0.296	2.898	1.664	2.124	0.993	1.468	2.317
485	2.332	1.883	0.225	0.872	1.204	0.688	1.381	0.384	3.738	2.349	2.267	1.576	1.959	2.714
490	2.456	1.249	0.232	0.999	1.477	0.975	1.914	0.451	4.448	2.427	2.639	1.691	2.717	3.401
495	3.817	2.287	0.288	1.305	1.891	1.464	2.892	0.544	5.330	3.591	3.279	1.554	3.163	4.535
500	4.603	2.269	0.375	1.626	2.466	1.733	2.924	0.945	6.141	4.651	3.585	1.898	4.147	5.436
505	7.845	2.675	0.602	1.900	2.515	2.390	3.009	0.999	7.051	5.774	4.225	2.279	4.861	6.325
510	6.930	2.936	0.446	2.491	2.444	2.598	4.206	1.366	6.929	7.303	4.001	2.656	4.941	7.330
515	6.243	4.236	0.514	2.536	3.006	2.976	4.508	1.450	6.670	7.769	4.124	2.458	4.631	6.974
520	8.018	3.892	0.607	1.866	3.068	3.011	4.802	1.503	6.533	7.284	4.743	2.745	5.358	7.751
525	4.701	3.961	0.721	1.930	3.024	3.690	3.880	1.581	5.935	7.456	4.447	3.102	5.229	7.816
530	5.845	4.200	0.816	1.947	3.158	3.756	3.792	1.667	5.160	6.999	3.894	2.993	4.491	6.879
535	3.299	3.977	0.855	1.295	2.168	3.529	2.491	2.114	4.460	6.298	3.271	3.074	4.204	6.590
540	4.227	3.125	1.181	1.735	2.873	3.335	1.824	1.764	3.465	5.119	2.782	3.285	2.948	4.801
545	3.795	3.116	1.679	1.018	2.100	3.136	1.447	2.008	2.438	4.181	2.438	3.738	3.118	3.916
550	3.579	3.115	2.018	2.299	3.021	2.280	1.828	2.320	2.066	2.767	2.327	3.704	2.599	3.686
555	2.721	3.313	2.520	2.526	3.135	2.487	1.832	2.493	1.724	2.263	2.174	4.119	2.829	2.737
560	1.849	2.888	3.724	2.232	2.567	2.381	1.994	2.705	1.261	1.874	2.676	4.399	2.290	2.040
565	1.332	3.678	4.601	3.982	3.334	2.341	1.786	3.734	1.223	2.786	3.192	5.109	2.758	1.392
570	1.554	3.411	5.715	4.389	3.763	3.390	2.662	3.303	1.386	2.488	3.356	5.209	3.084	1.246
575	1.329	4.988	7.282	5.751	5.450	3.332	3.481	4.237	1.725	1.824	3.655	5.631	2.795	1.038
580	2.120	4.093	7.637	5.595	5.299	4.847	3.289	5.146	1.379	2.105	4.166	6.371	3.226	1.017
585	1.276	4.394	8.817	7.738	5.522	4.969	3.879	5.670	1.685	1.755	3.747	5.704	3.578	0.909
590	0.722	4.725	8.793	6.228	6.024	5.286	4.042	6.212	1.476	1.662	4.102	5.681	3.447	0.800
595	0.764	3.929	8.464	6.622	5.641	5.105	4.634	7.096	1.202	1.261	4.009	4.790	3.464	0.837
600	1.424	4.618	7.492	5.309	4.902	5.268	4.894	7.537	1.157	1.070	3.529	3.334	2.845	0.856
605	0.707	3.377	6.574	6.326	4.627	5.677	4.732	6.923	0.865	0.779	2.634	2.774	2.156	0.728
610	1.440	3.029	5.631	3.562	4.233	4.057	4.081	5.180	0.683	0.591	2.463	1.984	1.786	0.419
615	1.349	2.087	4.447	2.957	2.832	3.928	3.384	5.161	0.494	0.429	1.611	1.278	1.417	0.348
620	0.646	1.453	2.430	2.120	2.009	2.833	2.567	4.922	0.524	0.198	1.328	1.085	0.914	0.242
625	0.289	0.998	1.702	1.731	0.857	2.246	1.712	2.794	0.317	0.238	0.828	0.573	0.537	0.056
630	0.487	1.041	0.859	1.284	0.459	1.667	1.266	2.285	0.089	0.099	0.541	0.380	0.373	0.067
635	0.096	0.479	0.612	0.801	0.341	0.654	0.655	1.651	0.097	0.090	0.174	0.121	0.138	0.064
640	0.180	0.290	0.518	0.776	0.226	0.545	0.729	0.977	0.009	0.033	0.303	0.029	0.049	0.017
645	0.107	0.065	0.193	0.348	0.214	0.468	0.538	0.515	0.011	0.	0.040	0.028	0.017	
650	0.067	0.	0.049	0.627	0.140	0.405	0.335	0.285	0.022	0.016	0.071	0.	0.017	
655	0.029	0.	0.082	0.139		0.222	0.215	0.108	0.026		0.007	0.011		
660	0.024	0.	0.055	0.162		0.107	0.144	0.228			0.			
665	0.019	0.018	0.001			0.063	0.058	0.097			0.039			
670	0.		0.048			0.041		0.						
675	0.019		0.028			0.		0.066						
680			0.025			0.								
685			0.			0.049								
690			0.			0.								
695			0.003			0.023								
700			0.003											

Table 9.--Weighted length frequencies of female red salmon in Nushagak total run, 1946-59

Mideye-fork length (mm.)	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
315						0.							0.	
320						0.				0.			0.	
325						0.				0.			0.	
330						0.	0.		0.	0.			0.	
335						0.	0.	0.	0.	0.		0.	0.	
340						0.	0.	0.	0.	0.		0.	0.	
345						0.	0.	0.	0.	0.		0.	0.	
350						0.	0.	0.	0.	0.		0.	0.	
355						0.	0.011	0.	0.	0.		0.	0.	
360						0.	0.005	0.	0.	0.		0.	0.	
365						0.	0.	0.	0.	0.		0.	0.	
370						0.	0.	0.	0.	0.		0.	0.	
375						0.	0.	0.	0.	0.		0.	0.	0.
380						0.	0.	0.	0.	0.		0.	0.	0.
385					0.	0.	0.	0.	0.	0.		0.	0.	0.
390					0.001	0.	0.	0.	0.	0.		0.	0.	0.
395					0.038	0.	0.	0.	0.	0.		0.	0.013	0.
400		0.			0.001	0.	0.	0.	0.	0.		0.006	0.	0.
405		0.			0.020	0.	0.012	0.	0.	0.		0.	0.010	0.
410	0.	0.004		0.	0.023	0.	0.012	0.	0.	0.		0.013	0.013	0.
415	0.034	0.		0.005	0.013	0.	0.013	0.028	0.009	0.007	0.007	0.013	0.018	0.003
420	0.	0.004		0.041	0.003	0.	0.047	0.051	0.022	0.017	0.019	0.	0.009	0.
425	0.065	0.054	0.002	0.049	0.068	0.	0.078	0.016	0.044	0.019	0.028	0.007	0.049	0.014
430	1.185	0.030	0.005	0.029	0.167	0.	0.139	0.036	0.059	0.012	0.062	0.039	0.064	0.116
435	1.301	0.150	0.027	0.063	0.223	0.029	0.249	0.058	0.077	0.010	0.137	0.277	0.178	0.061
440	1.399	0.132	0.129	0.251	0.306	0.115	0.328	0.049	0.252	0.087	0.286	0.368	0.169	0.217
445	1.713	0.429	0.359	0.499	0.494	0.144	0.615	0.230	0.931	0.418	0.657	0.638	0.800	1.183
450	4.330	0.749	0.254	0.685	1.054	0.355	1.006	0.110	1.944	0.607	1.195	1.054	1.619	1.426
455	2.424	1.093	0.342	0.358	1.064	0.444	1.399	0.260	2.608	0.943	1.716	1.118	2.034	2.556
460	3.843	1.872	0.273	0.633	1.293	0.675	1.622	0.441	3.335	1.438	2.257	1.165	2.318	3.076
465	6.886	1.955	0.338	0.699	1.929	0.994	1.828	0.785	4.918	2.320	2.416	1.424	2.978	4.101
470	11.242	3.023	0.539	0.659	1.914	1.535	2.015	0.906	5.750	3.359	3.047	1.693	3.981	6.035
475	8.322	2.928	0.476	0.623	2.145	2.068	2.170	0.883	5.863	4.304	3.168	1.860	4.453	6.642
480	8.426	3.008	0.397	0.857	2.314	2.289	2.160	1.049	6.279	5.653	3.541	1.822	3.762	7.105
485	7.378	3.380	0.413	0.779	1.826	2.441	1.919	1.280	6.503	6.482	3.445	1.836	4.480	7.879
490	3.408	2.811	0.344	0.766	1.474	2.648	2.082	1.188	6.498	6.695	3.436	2.460	4.373	7.600
495	3.462	3.090	0.418	0.428	1.559	2.191	2.169	1.260	5.971	7.468	2.997	1.776	3.748	6.642
500	4.199	2.354	0.663	0.610	1.317	2.310	2.680	1.799	5.002	6.636	3.191	2.895	3.880	6.911
505	4.157	3.023	0.955	0.863	1.387	1.846	2.323	1.379	5.009	7.100	3.031	2.945	3.751	5.496
510	1.720	2.467	1.008	1.126	1.853	2.049	1.714	1.600	4.411	5.329	2.761	2.814	3.045	5.442
515	1.503	2.536	1.760	1.692	1.945	2.121	2.804	1.441	3.792	4.798	2.684	3.143	2.751	4.463
520	3.367	2.733	2.672	1.625	1.965	2.097	1.538	2.431	3.098	4.528	2.774	4.139	2.631	3.362
525	0.802	2.988	3.446	2.373	2.415	2.451	1.816	2.553	2.549	3.996	2.895	5.198	2.960	2.921
530	0.699	3.704	4.792	4.171	3.634	2.831	2.763	2.971	2.448	3.478	3.496	5.111	2.961	2.299
535	1.710	4.229	6.356	4.752	3.311	3.272	3.604	3.527	2.652	3.239	4.100	5.629	4.362	2.214
540	4.198	5.403	7.245	7.381	4.810	4.180	4.937	4.080	2.547	3.667	3.909	5.693	3.784	2.222
545	3.033	5.508	8.426	7.416	6.483	4.996	5.002	5.105	2.442	2.691	4.918	5.765	4.569	1.827
550	0.972	5.876	9.561	8.017	7.568	5.833	5.609	6.244	2.602	2.995	4.856	6.001	4.778	1.357
555	0.695	6.445	10.259	9.027	8.375	6.210	6.015	6.875	2.404	2.958	5.105	6.307	4.794	1.612
560	1.797	6.253	8.885	8.773	9.342	6.535	6.841	7.272	2.099	2.073	6.206	5.267	4.516	1.261
565	2.040	6.083	8.179	7.622	6.637	6.596	8.233	7.361	2.023	2.260	5.485	4.950	4.549	1.106
570	0.827	4.537	6.640	6.948	6.096	6.576	5.493	6.285	1.745	1.837	4.396	3.894	3.406	0.791
575	0.658	3.592	5.171	5.483	5.110	5.967	5.266	6.616	1.413	0.897	3.975	3.935	2.830	0.991
580	0.669	2.822	3.107	4.885	3.275	5.547	4.045	6.559	1.123	0.449	2.858	3.557	2.313	0.428
585	0.425	1.824	2.362	2.877	3.037	3.656	3.602	4.886	0.621	0.515	1.827	1.819	1.250	0.263
590	0.224	0.987	1.411	2.904	1.611	2.711	2.352	3.850	0.429	0.295	1.346	1.516	0.617	0.220
595	0.324	0.943	1.118	1.459	0.824	2.236	1.503	3.232	0.156	0.228	0.542	0.926	0.530	0.075
600	0.191	0.632	0.786	1.085	0.249	1.788	1.089	2.285	0.221	0.082	0.390	0.442	0.289	0.023
605	0.132	0.208	0.366	0.421	0.171	1.013	0.210	1.271	0.127	0.006	0.213	0.223	0.193	0.047
610	0.084	0.048	0.194	0.281	0.111	0.546	0.219	0.788	0.	0.034	0.089	0.079	0.080	0.
615	0.016	0.086	0.121	0.254	0.032	0.315	0.297	0.469	0.	0.064	0.039	0.082	0.055	0.012
620	0.048	0.006	0.049	0.172	0.001	0.218	0.028	0.235	0.	0.003	0.	0.052	0.035	0.
625	0.031	0.	0.041	0.002	0.	0.019	0.	0.079	0.	0.004	0.	0.030	0.	0.
630	0.	0.	0.008	0.134	0.005	0.055	0.133	0.105	0.	0.	0.	0.	0.	0.
635	0.	0.	0.014	0.028	0.002	0.021	0.	0.024	0.	0.	0.	0.017	0.	0.
640	0.	0.	0.026	0.	0.004	0.014	0.	0.020	0.023	0.	0.	0.	0.	0.
645	0.	0.	0.017	0.	0.004	0.	0.	0.020	0.	0.	0.	0.	0.	
650	0.016	0.	0.009	0.122	0.	0.	0.001	0.	0.	0.	0.	0.	0.	
655	0.	0.	0.023	0.072		0.010	0.002	0.	0.		0.	0.		
660	0.	0.	0.016	0.		0.030	0.	0.001			0.			
665	0.	0.	0.			0.	0.	0.005			0.			
670	0.		0.			0.		0.						
675	0.		0.			0.		0.						
680			0.			0.								
685			0.			0.021								
690			0.			0.								
695			0.			0.								
700			0.											

Table 10.--Sex ratios of red salmon in catch and in escapement, Nushagak District, 1946-59

Year	Percent ratio between male: female in--	
	Catch	Escapement
1946	68.1 : 31.9	35 : 65
1947	47.1 : 52.9	38 : 62
1948	44.3 : 55.7	49 : 51
1949	38.4 : 61.6	40 : 60
1950	47.4 : 52.6	44 : 56
1951	43.4 : 56.6	45 : 55
1952	49.4 : 50.6	45 : 55
1953	40.1 : 59.9	44 : 56
1954	52.1 : 47.9	45 : 55
1955	46.1 : 53.9	45 : 55
1956	50.4 : 49.6	50 : 50
1957	40.9 : 59.1	44 : 56
1958	45.2 : 54.8	44 : 56
1959	52.0 : 48.0	42.6 : 57.4

Note: 1946-58 escapement sex ratios obtained from spawning ground samples. 1959 escapement sex ratio obtained from beach seine samples of fish entering the Wood River system.

Table 11.--Number of red salmon in each sex group and sex ratio in total run, Nushagak District, 1946-59 (Calculated from tables 2 and 10)

Year	Males			Females			Sex ratio in total run
	Catch	Escapement	Total	Catch	Escapement	Total	
1946	1,381,166	1,651,650	3,032,816	646,978	3,067,350	3,714,328	44.9 : 55.1
1947	1,303,392	952,660	2,256,052	1,463,895	1,554,340	3,018,235	42.8 : 57.2
1948	1,242,969	1,024,712	2,267,681	1,562,829	1,066,538	2,629,367	43.6 : 53.7
1949	307,247	55,210	362,457	492,876	82,815	575,691	38.6 : 61.4
1950	574,531	251,944	826,475	637,560	320,656	958,216	46.3 : 53.7
1951	189,636	242,820	432,456	247,314	296,780	544,094	44.3 : 55.7
1952	344,847	195,210	540,057	353,224	238,590	591,814	47.7 : 52.3
1953	180,185	364,558	544,743	269,154	463,984	733,138	42.6 : 57.4
1954	164,301	311,231	475,532	151,056	380,393	531,449	47.2 : 52.8
1955	486,344	870,190	1,356,534	568,633	1,063,565	1,632,198	45.4 : 54.6
1956	516,643	606,051	1,122,694	746,543	606,051	1,352,594	45.4 : 54.6
1957	201,022	219,440	420,462	290,475	279,287	569,762	42.5 : 57.5
1958	493,655	562,291	1,055,946	598,501	715,642	1,314,143	44.6 : 55.4
1959	894,237	1,295,843	2,190,080	825,450	1,746,042	2,571,492	46.0 : 54.0

Table 12.--Percent distribution of small (.1 and .2) and large (.3 and .4) red salmon, Nushagak District, 1946-59

Year	Catch			Escapement			Total run[1]	
	Dividing line	Small	Large	Dividing line	Small	Large	Small	Large
				Males				
		Percent	Percent		Percent	Percent	Percent	Percent
1946	575	87.9	12.1	565	85.1	14.9	86.4	13.6
1947	555	46.3	53.7	555	56.2	43.8	50.5	49.5
1948	535	3.5	96.5	535	10.8	89.2	6.8	93.2
1949	540	21.8	78.2	535	45.1	54.9	25.3	74.7
1950	560	41.0	59.0	535	35.5	64.5	39.3	60.7
1951	560	36.0	64.0	555	44.9	55.1	41.0	59.0
1952	555	51.6	48.4	545	40.7	59.3	47.7	52.3
1953	560	24.3	75.7	555	24.2	75.8	24.2	75.8
1954	565	81.4	18.6	560	88.7	11.3	86.2	13.8
1955	555	77.4	22.6	555	82.6	17.4	80.7	19.3
1956	560	57.4	42.6	545	55.9	44.1	55.6	44.4
1957	545	34.6	65.4	530	31.4	68.6	32.9	67.1
1958	555	53.9	46.1	550	72.6	27.4	63.9	36.1
1959	565	86.6	13.4	565	94.7	5.3	91.4	8.6
				Females				
1946	535	63.5	36.5	525	86.0	14.0	82.1	17.9
1947	525	28.4	71.6	515	54.7	45.3	41.9	58.1
1948	515	1.3	98.3	495	10.2	89.8	5.1	94.9
1949	510	4.1	95.7	500	39.1	60.9	9.3	90.7
1950	525	12.3	87.7	505	50.7	49.3	25.2	74.8
1951	535	18.4	81.6	515	37.1	62.9	28.6	71.4
1952	525	18.7	81.3	520	51.4	48.6	31.9	68.1
1953	530	9.8	90.2	525	27.2	72.8	20.8	79.2
1954	530	54.8	45.2	525	84.3	15.7	75.9	24.1
1955	535	68.4	31.6	525	78.6	21.4	75.0	25.0
1956	525	27.3	72.7	515	59.1	40.9	41.5	58.5
1957	525	20.7	79.3	510	41.2	58.8	30.7	69.3
1958	530	33.5	66.5	520	70.9	29.1	53.9	46.1
1959	535	76.9	23.1	530	91.6	8.4	86.9	13.1

[1] Calculated from the last two columns of table 13.

Table 13.--Number of small and large red salmon in each year's run, Nushagak District, 1946-59 (Calculated from tables 11 and 12)

Year	Catch		Escapement		Total run	
	Small	Large	Small	Large	Small	Large
			Males			
1946	1,214,045	167,121	1,405,554	246,096	2,619,599	413,217
1947	603,470	699,922	535,395	417,265	1,138,865	1,117,187
1948	43,504	1,199,465	110,669	914,043	154,173	2,113,508
1949	66,980	240,267	24,900	30,310	91,880	270,577
1950	235,558	338,973	89,440	162,504	324,998	501,477
1951	68,269	121,367	109,026	133,794	177,295	255,161
1952	177,941	166,906	79,450	115,760	257,391	282,666
1953	43,785	136,400	88,223	276,335	132,008	412,735
1954	133,741	30,560	276,062	35,169	409,803	65,729
1955	376,430	109,914	718,777	151,413	1,095,207	261,327
1956	296,553	220,090	327,268	278,783	623,821	498,873
1957	69,554	131,468	68,904	150,536	138,458	282,004
1958	266,080	227,575	408,223	154,068	674,303	381,643
1959	774,409	119,828	1,227,163	68,680	2,001,572	188,508
			Females			
1946	410,831	236,147	2,637,921	429,429	3,048,752	665,576
1947	415,746	1,048,149	850,224	704,116	1,265,970	1,752,265
1948	26,568	1,536,261	108,787	957,751	135,355	2,494,012
1949	21,194	471,682	32,381	50,434	53,575	522,116
1950	78,420	559,140	162,573	158,083	240,993	717,223
1951	45,506	201,808	110,105	186,675	155,611	388,483
1952	66,053	287,171	122,635	115,955	188,688	403,126
1953	26,377	242,777	126,204	337,780	152,581	580,557
1954	82,779	68,277	320,671	59,772	403,450	127,999
1955	388,945	179,688	835,962	227,603	1,224,907	407,291
1956	203,806	542,737	358,176	247,875	561,982	790,612
1957	60,128	230,347	115,066	164,221	175,194	394,568
1958	200,498	398,003	507,390	208,252	707,888	606,255
1959	634,771	190,679	1,599,374	146,668	2,234,145	337,347

Table 14.--Percentage of age groups within each size group as determined from scale readings, male and female red salmon combined, Nushagak District, 1946-59

Year	Small size group			Large size group					
	Number of scales read	Age groups		Number of scales read	Age groups				
		1.2	2.2		0.3	1.3	2.3	0.4	1.4
1946	703	99.42	0.58	164	-	81.25	8.38	2.49	7.88
1947	541	57.30	42.70	697	0.03	98.96	1.01	-	-
1948	100	88.46	11.54	962	0.12	94.07	5.20	0.24	0.37
1949	74	55.78	44.22	596	2.01	82.57	9.12	0.31	5.99
1950[1]	135	92.23	7.58	554	1.99	65.67	25.18	0.58	6.58
1951[2]	146	66.44	33.56	418	4.87	82.46	9.47	0.90	2.06
1952[3]	173	89.76	7.18	456	11.18	85.51	1.40	1.45	0.46
1953	68	64.58	35.42	408	2.52	89.90	6.83	0.33	0.42
1954[4]	550	98.28	1.23	850	14.03	79.45	4.68	1.30	0.54
1955	722	90.72	9.28	349	14.96	84.14	-	0.76	0.14
1956	257	70.41	29.59	516	1.66	86.26	10.88	1.10	0.10
1957	398	91.17	8.83	960	3.23	87.87	8.48	-	0.42
1958[5]	373	89.87	10.13	492	0.79	89.10	9.08	0.14	0.61
1959	564	68.94	31.06	165	5.83	75.07	18.13	-	0.97

[1] Not listed in table: 0.2, 0.19 percent.
[2] Not listed in table: 2.4, 0.24 percent.
[3] Not listed in table: 0.2, 2.37 percent; 2.1, 0.69 percent.
[4] not listed in table: 1.1, 0.49 percent.
[5] Not listed in table: 3.3, 0.28 percent.

Table 15.--Number of red salmon distributed by age groups, Nushagak District, 1946-59 (Calculated from tables 13 and 14)

[Numbers in parentheses indicate total age of fish]

Year	Age groups							Total run
	1.2(4)	2.2(5)	0.3(4)	1.3(5)	2.3(6)	0.4(5)	1.4(6)	
1946	5,635,475	32,876	-	876,519	90,403	26,862	85,009	6,747,144
1947	1,377,970	1,026,865	861	2,839,610	28,981	-	-	5,274,287
1948	256,116	33,412	5,529	4,334,294	239,591	11,058	17,048	4,897,048
1949	81,135	64,320	15,933	654,527	72,294	2,457	47,482	938,148
1950	522,014	42,902	24,252	800,320	306,869	7,069	80,190	1,783,616[1]
1951	221,183	111,723	31,345	530,749	60,953	5,793	13,259	975,005[2]
1952	400,401	32,028	76,672	586,421	9,601	9,944	3,155	1,118,222[3]
1953	183,788	100,801	25,031	892,970	67,842	3,278	4,172	1,277,882
1954	799,265	10,003	27,180	153,917	9,066	2,518	1,046	1,002,995[4]
1955	2,104,807	215,307	100,025	562,575	-	5,082	936	2,988,732
1956	834,924	350,879	21,405	1,112,310	140,296	14,184	1,289	2,475,287
1957	285,957	27,695	21,853	594,504	57,373	-	2,842	990,224
1958	1,242,175	140,016	7,804	880,217	89,701	1,383	6,026	2,367,322[5]
1959	2,920,103	1,315,614	30,657	394,759	95,338	-	5,101	4,761,572

[1] Not listed in the table: 0.19 percent of age group 0.2 (1,075 fish).
[2] Not listed in the table: 0.24 percent of age group 2.4 (1,545 fish).
[3] Not listed in the table: 2.37 percent of age group 0.2 (10,572 fish); 0.69 percent of age group 2.1 (3,077 fish).
[4] Not listed in the table: 0.49 percent of age group 1.1 (3,985 fish).
[5] Not listed in the table: 0.28 percent of age group 3.3 (2,766 fish).

Table 16.--Number and ratio of red salmon returning from the year of spawning as 4-year, 5-year, and 6-year fish, Nushagak District (Calculated from table 15)

[Year in parentheses indicates year of return]

Spawning		Return from year of spawning						Total return
Year of spawning	Relative magnitude (female)	4-year fish		5-year fish		6-year fish		
		Number	*Percent*	*Number*	*Percent*	*Number*	*Percent*	*Number*
1942		5,635,475 (1946)	57.75	3,866,475 (1947)	39.62	256,639 (1948)	2.63	9,758,589
1943		1,378,831 (1947)	23.46	4,378,764 (1948)	74.50	119,776 (1949)	2.04	5,877,371
1944		261,645 (1948)	19.10	721,304 (1949)	52.65	387,059 (1950)	28.25	1,370,008
1945		97, 068 (1949)	9.50	850,291 (1950)	83.23	74,212 (1951)	7.27	1,021,571
1946	288	546,266 (1950)	45.25	648,265 (1951)	53.70	12,756 (1952)	1.05	1,207,287
1947	146	252,528 (1951)	26.50	628,393 (1952)	65.94	72,014 (1953)	7.56	952,935
1948	100	477,073 (1952)	32.14	997,049 (1953)	67.18	10,112 (1954)	0.68	1,484,234
1949	8	208,819 (1953)	55.51	166,438 (1954)	44.24	936 (1955)	0.25	376,193
1950	30	826,445 (1954)	47.20	782,964 (1955)	44.71	141,585 (1956)	8.09	1,750,994
1951	28	2,204,832 (1955)	58.91	1,477,373 (1956)	39.48	60,215 (1957)	1.61	3,742,420
1952	22	856,329 (1956)	54.40	622,199 (1957)	39.52	95,727 (1958)	6.08	1,574,255
1953	44	307,810 (1957)	21.53	1,021,616 (1958)	71.45	100,439 (1959)	7.02	1,429,865
1954	36	1,249,979 (1958)		1,710,373 (1959)		(1960)		
1955	100	2,950,760 (1959)		(1960)		(1961)		
1942-1953 Mean			37.60		56.35		6.04	

Table 17.--Number of red salmon by salt-water age groups, Nushagak District, 1946-59
(Calculated from table 15)

Year	.2 fish	.3 fish	.4 fish	Total
1946	5,668,351	966,922	111,871	6,747,144
1947	2,404,835	2,869,452	0	5,274,287
1948	289,528	4,579,414	28,106	4,897,048
1949	145,455	742,754	49,939	938,148
1950	565,991	1,131,441	87,259	1,784,691
1951	332,906	623,047	20,597	976,550
1952	443,001	672,694	13,099	[1] 1,128,794
1953	284,589	985,843	7,450	1,277,882
1954	809,268	190,163	3,564	[2] 1,002,995
1955	2,320,114	662,600	6,018	2,988,732
1956	1,185,803	1,274,011	15,473	2,475,287
1957	313,652	673,730	2,842	990,224
1958	1,382,191	980,488	7,409	2,370,088
1959	4,235,717	520,754	5,101	4,761,572

[1] Not listed in table: 3,077 fish (.1).
[2] Not listed in table: 3,985 fish (.1).

Table 18.--Number and percent return of red salmon from the year of seaward migration as .2, .3, and .4 fish, Nushagak District (Calculated from table 17)

[Year in parentheses indicates year of return]

Year of seaward migration	Smolt migration (relative magnitude)[1]	Return from the year of seaward migration						Total return
		.2 fish		.3 fish		.4 fish		
		Number	*Percent*	*Number*	*Percent*	*Number*	*Percent*	*Number*
1944		5,668,351 (1946)	66.17	2,869,452 (1947)	33.50	28,106 (1948)	0.33	8,565,909
1945		2,404,835 (1947)	34.19	4,579,414 (1948)	65.10	49,939 (1949)	0.71	7,034,188
1946		289,528 (1948)	25.86	742,754 (1949)	66.35	87,259 (1950)	7.79	1,119,541
1947		145,455 (1949)	11.21	1,131,441 (1950)	87.20	20,597 (1951)	1.59	1,297,493
1948		565,991 (1950)	47.08	623,047 (1951)	51.83	13,099 (1952)	1.09	1,202,137
1949		332,906 (1951)	32.86	672,694 (1952)	66.40	7,450 (1953)	0.74	1,013,050
1950		443,001 (1952)	30.93	985,843 (1953)	68.82	3,564 (1954)	0.25	1,432,408
1951	9.9	284,589 (1953)	59.20	190,163 (1954)	39.55	6,018 (1955)	1.25	480,770
1952	100.0	809,268 (1954)	54.41	662,600 (1955)	44.55	15,473 (1956)	1.04	1,487,341
1953	296.1	2,320,114 (1955)	64.50	1,274,011 (1956)	35.42	2,842 (1957)	0.08	3,596,967
1954	438.6	1,185,803 (1956)	63.52	673,730 (1957)	36.09	7,409 (1958)	0.39	1,866,942
1955	221.7	313,652 (1957)	24.14	980,488 (1958)	75.47	5,101 (1959)	0.39	1,299,241
1956	326.6	1,382,191 (1958)		520,754 (1959)		(1960)		
1957	165.6	4,235,717 (1959)		(1960)		(1961)		
1944-1955 Mean			42.84		55.86		1.30	

[1] Relative magnitude of smolt migration based on enumeration indices for the Wood River system only.

Table 19.--Number of red salmon by age groups in returns from year of seaward migration, Nushagak District (Calculated from table 15)

[Numbers in parentheses indicate total age of fish]

Year of seaward migration	Age groups in return							Total return
	1.2(4)	2.2(5)	0.3(4)	1.3(5)	2.3(6)	0.4(5)	1.4(6)	
1944	5,635,475	32,876	861	2,839,610	28,981	11,058	17,048	8,565,909
1945	1,377,970	1,026,865	5,529	4,334,294	239,591	2,457	47,482	7,034,188
1946	256,116	33,412	15,933	654,527	72,294	7,069	80,190	1,119,541
1947	81,135	64,320	24,252	800,320	302,869	5,793	13,259	1,295,948
1948	522,014	42,902	31,345	530,749	60,953	9,944	3,155	1,201,062
1949	221,183	111,723	76,672	586,421	9,601	3,278	4,172	1,013,050
1950	400,401	32,028	25,031	892,970	67,842	2,518	1,046	1,421,836
1951	183,788	100,801	27,180	153,917	9,066	5,082	936	480,770
1952	799,265	10,003	100,025	562,575	-	14,184	1,289	1,487,341
1953	2,104,807	215,307	21,405	1,112,310	140,296	-	2,842	3,596,967
1954	834,924	350,879	21,853	594,504	57,373	1,383	6,026	1,866,942
1955	285,957	27,695	7,804	880,217	89,701	-	5,101	[1] 1,296,475
1956	1,242,175	140,016	30,657	394,759	95,338			
1957	2,920,103	1,315,614						

[1] Total returns do not correspond to those in table 18 because minor age groups are omitted.

Table 20.--The percentage by age groups in returns of red salmon from year of seaward migration, Nushagak District (Calculated from table 19)

[Numbers in parentheses indicate total age of fish]

Year of seaward migration	Percent of age groups in returns							Total
	1.2(4)	2.2(5)	0.3(4)	1.3(5)	2.3(6)	0.4(5)	1.4(6)	
1944	65.79	0.38	0.01	33.15	0.34	0.13	0.20	100.0
1945	19.59	14.60	0.08	61.62	3.41	0.03	0.67	100.0
1946	22.88	2.99	1.42	58.46	6.46	0.63	7.16	100.0
1947	6.26	4.96	1.87	61.76	23.68	0.45	1.02	100.0
1948	43.46	3.57	2.61	44.19	5.08	0.83	0.26	100.0
1949	21.83	11.03	7.57	57.89	0.95	0.32	0.41	100.0
1950	28.16	2.25	1.76	62.80	4.77	0.18	0.08	100.0
1951	38.23	20.97	5.65	32.01	1.89	1.06	0.19	100.0
1952	53.74	0.67	6.73	37.82	0.00	0.95	0.09	100.0
1953	58.52	5.99	0.59	30.92	3.90	0.00	0.08	100.0
1954	44.72	18.80	1.17	31.85	3.07	0.07	0.32	100.0
1955	22.06	2.14	0.60	67.89	6.92	0.00	0.39	100.0

Table 21.--Return of adult red salmon per smolt index point, Nushagak District (Calculated from table 18)

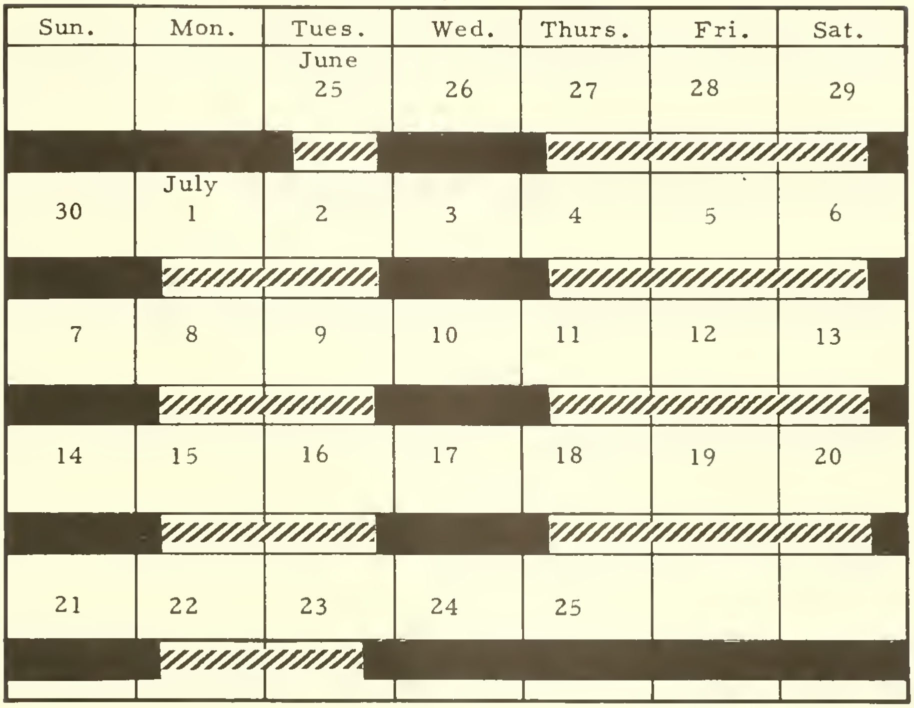
[Year in parentheses indicates year of return]

Year of seaward migration	Smolt[1] index	Number of returning adults per index point			
		.2	.3	.4	Total
1951	9.9	28,746 (1953)	19,208 (1954)	608 (1955)	48,562
1952	100.0	8,093 (1954)	6,626 (1955)	155 (1956)	14,874
1953	296.1	7,836 (1955)	4,303 (1956)	10 (1957)	12,149
1954	438.6	2,704 (1956)	1,536 (1957)	17 (1958)	4,257
1955	221.7	1,415 (1957)	4,423 (1958)	23 (1959)	5,620
1956	326.6	4,232 (1958)	1,594 (1959)		
1957	165.5	25,593 (1959)			

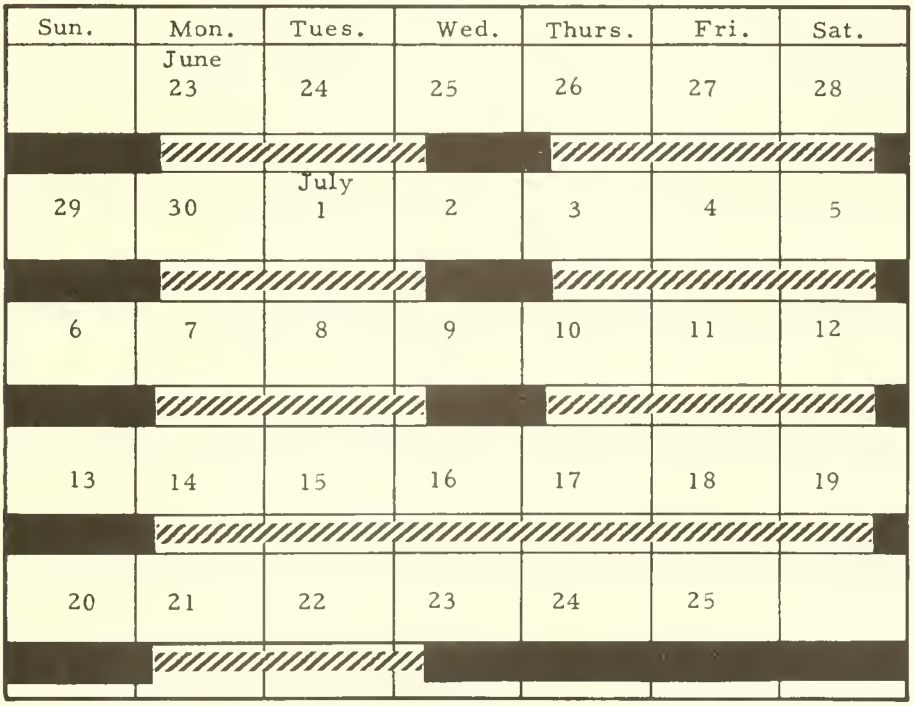
[1] Relative magnitude of seaward migration based on enumeration indices for the Wood River system.

FISHING PERIODS, NUSHAGAK DISTRICT

1946



1947



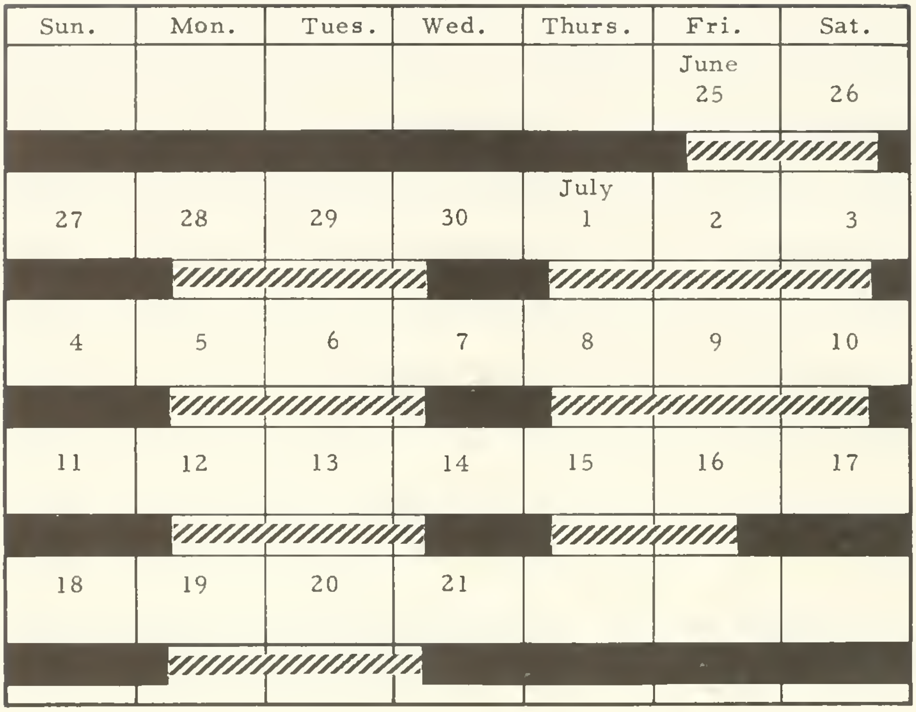
Rectangles correspond to 3 hours

Periods open to fishing

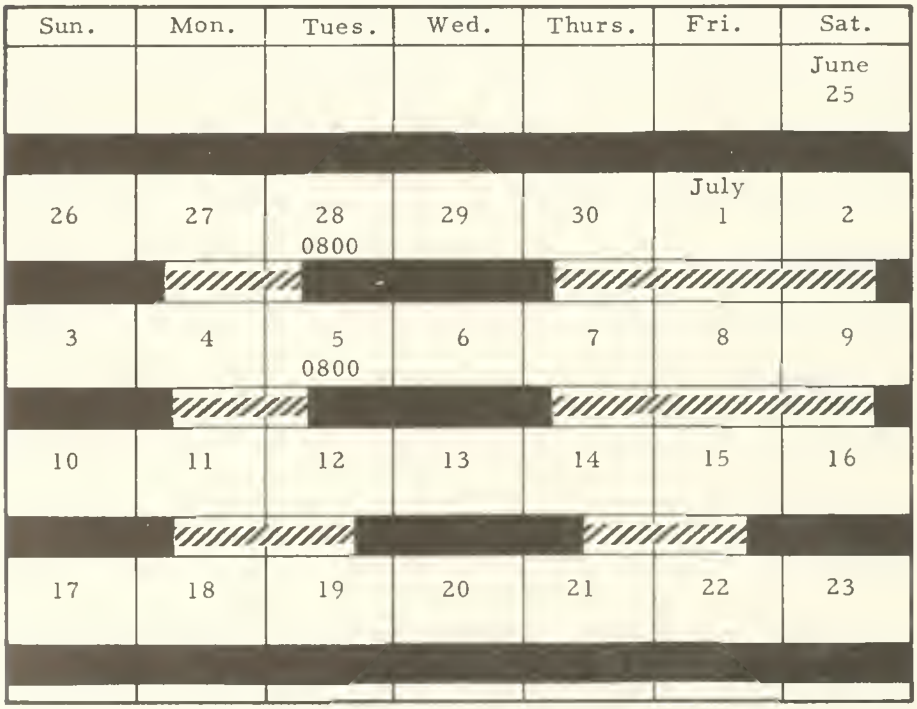
Periods closed to fishing

FISHING PERIODS, NUSHAGAK DISTRICT

1948



1949



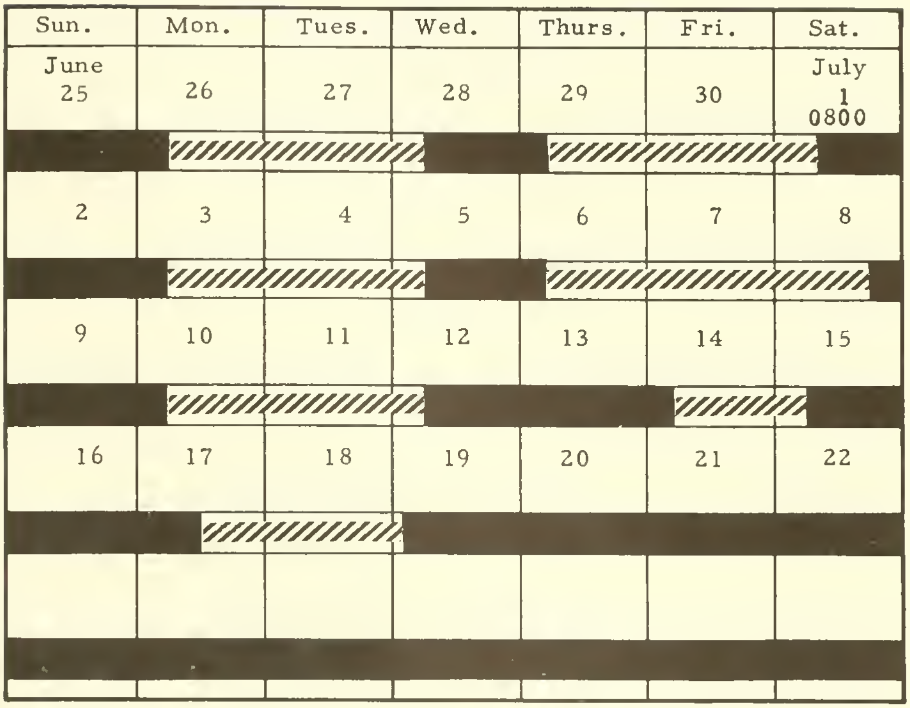
Rectangles correspond to 3 hours

Periods open to fishing

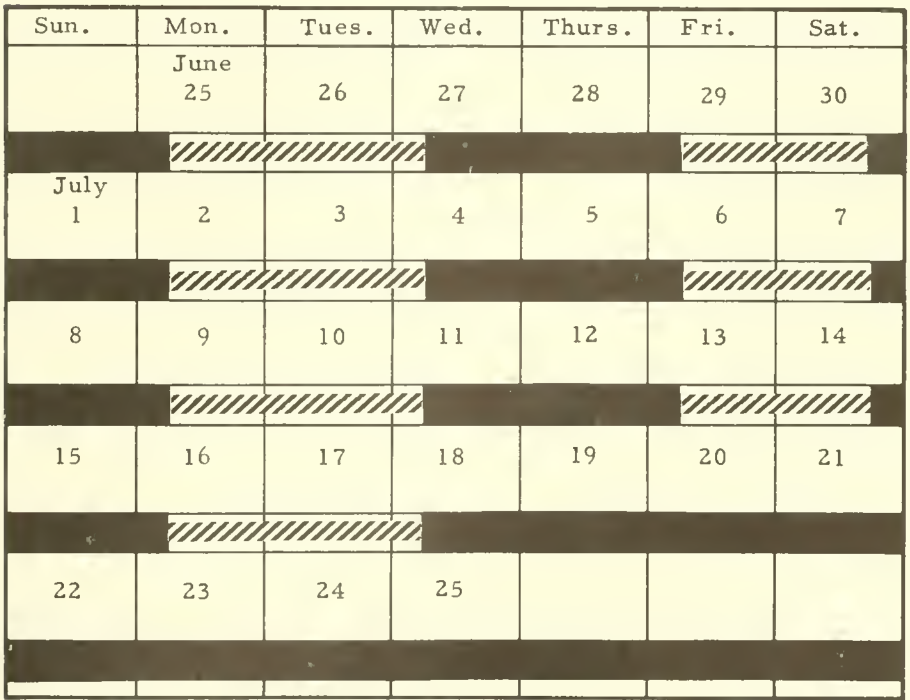
Periods closed to fishing

FISHING PERIODS, NUSHAGAK DISTRICT

1950



1951



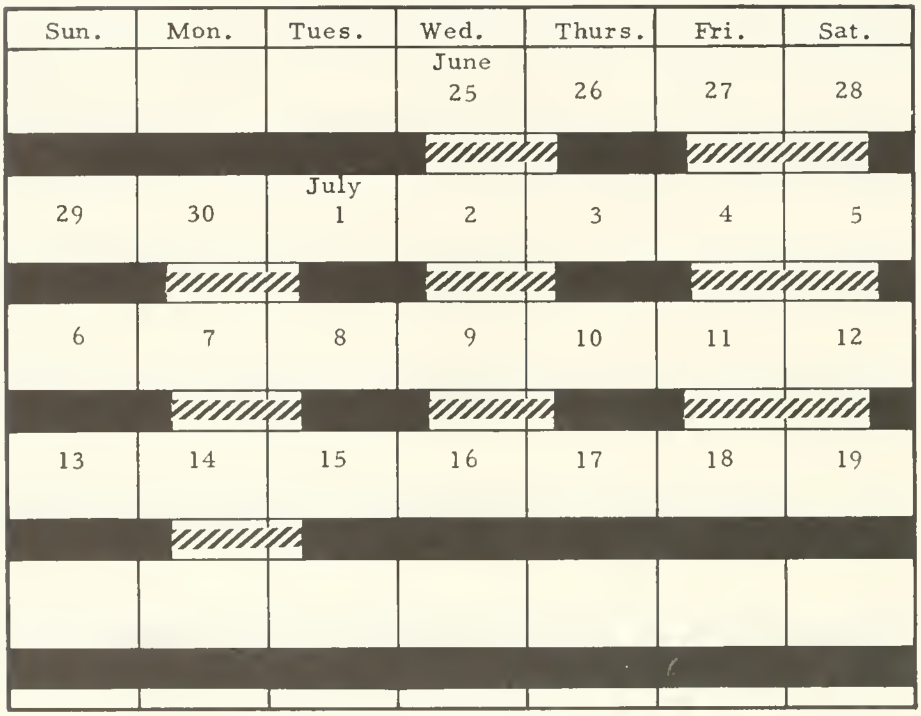
Rectangles correspond to 3 hours

Periods open to fishing

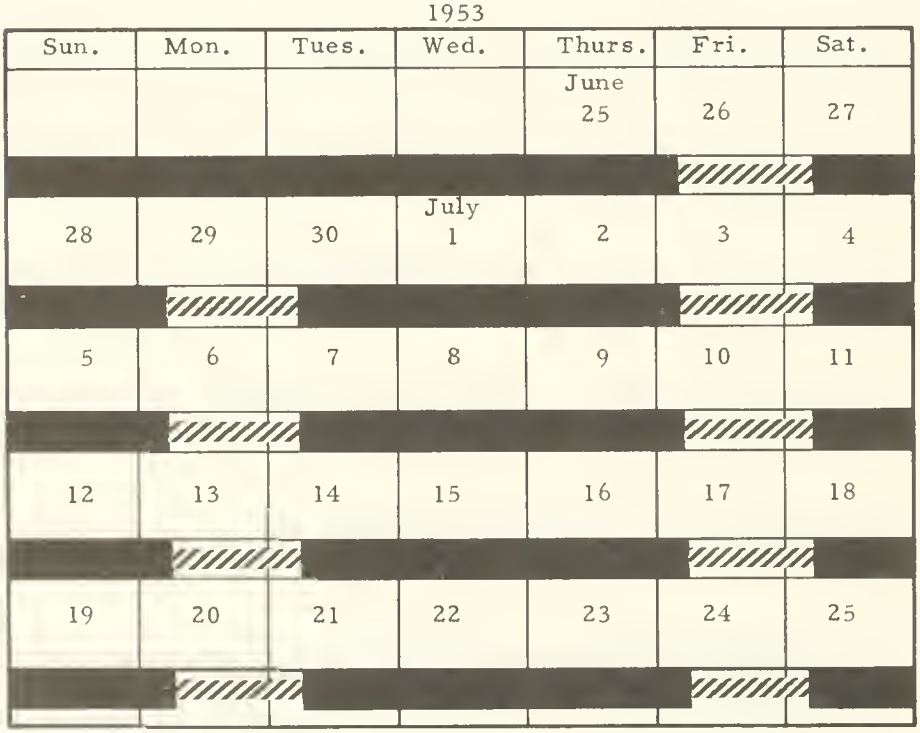
Periods closed to fishing

FISHING PERIODS, NUSHAGAK DISTRICT

1952



1953



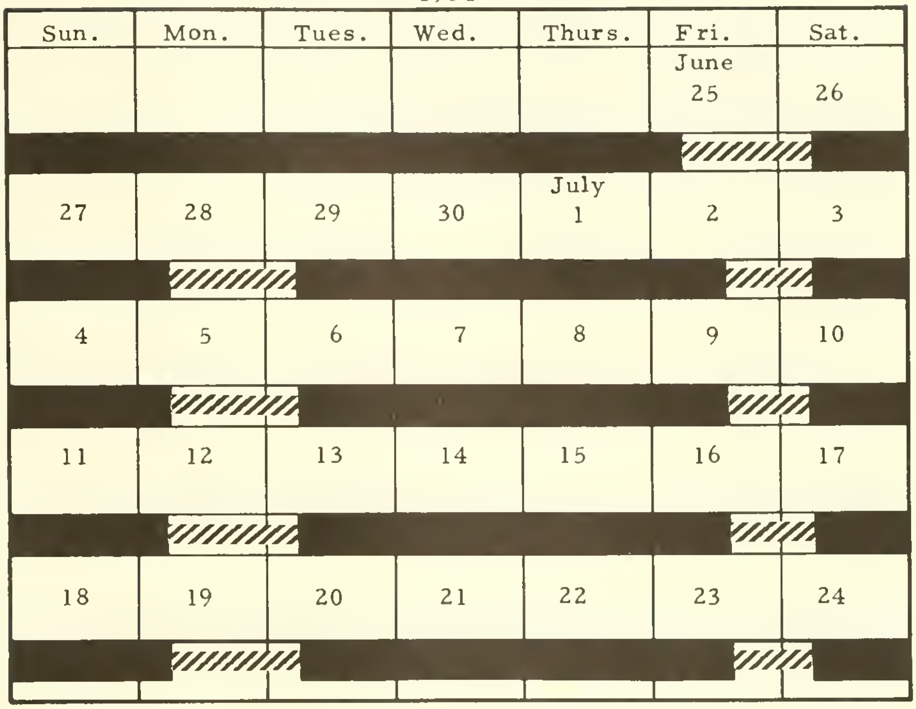
Rectangles correspond to 3 hours

Periods open to fishing

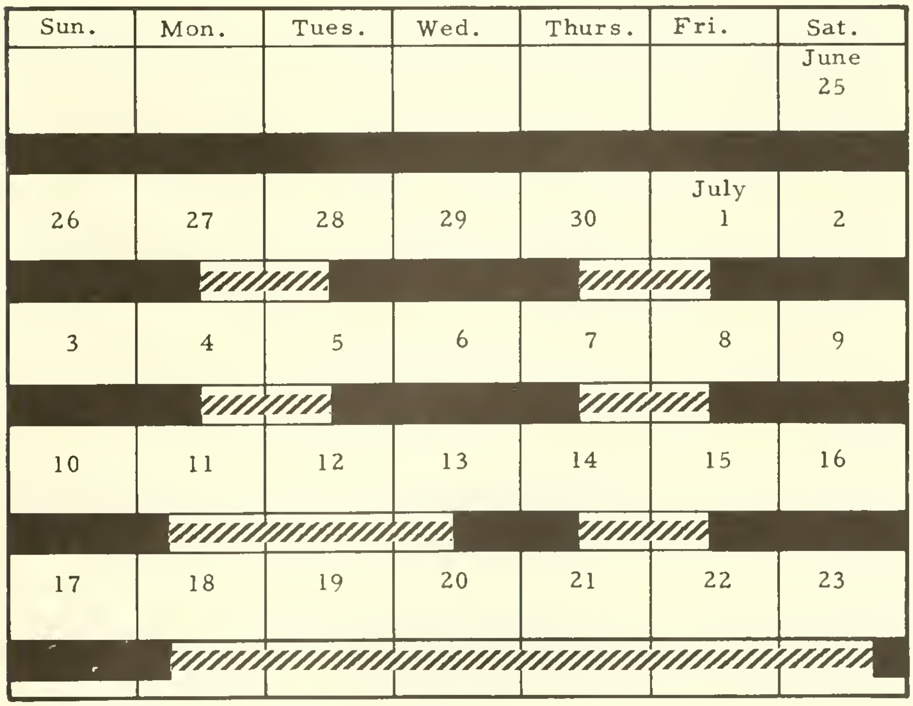
Periods closed to fishing

FISHING PERIODS, NUSHAGAK DISTRICT

1954



1955



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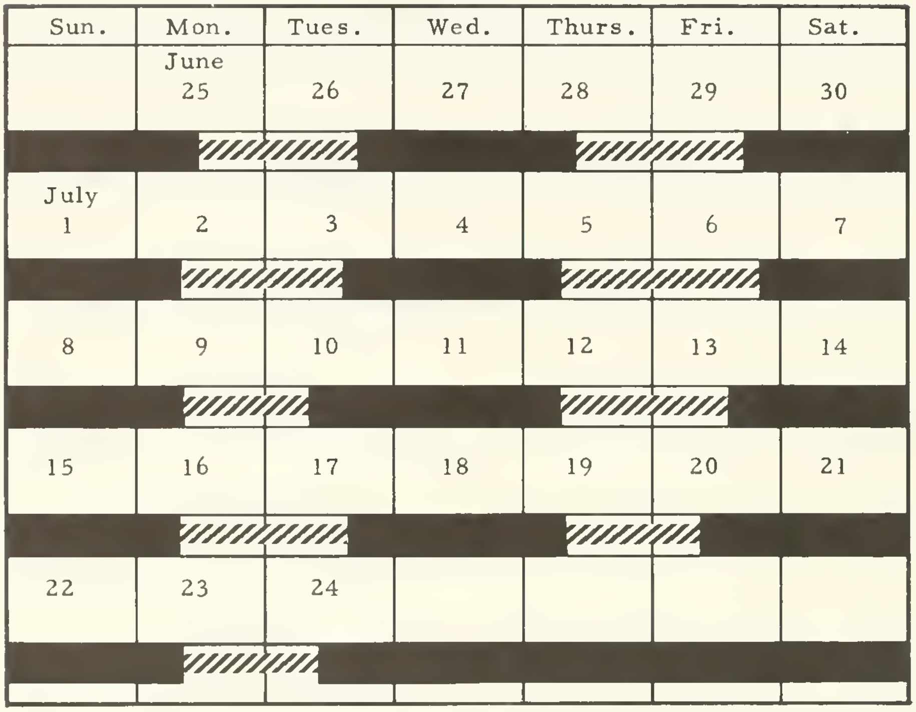
Periods open to fishing

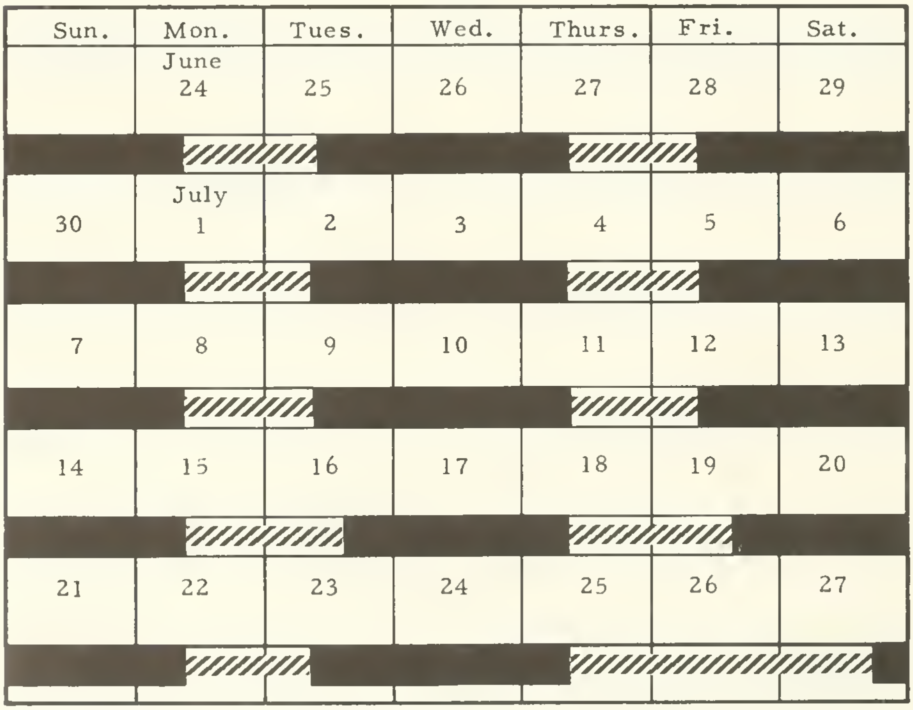
Periods closed to fishing

FISHING PERIODS, NUSHAGAK DISTRICT

1956



1957



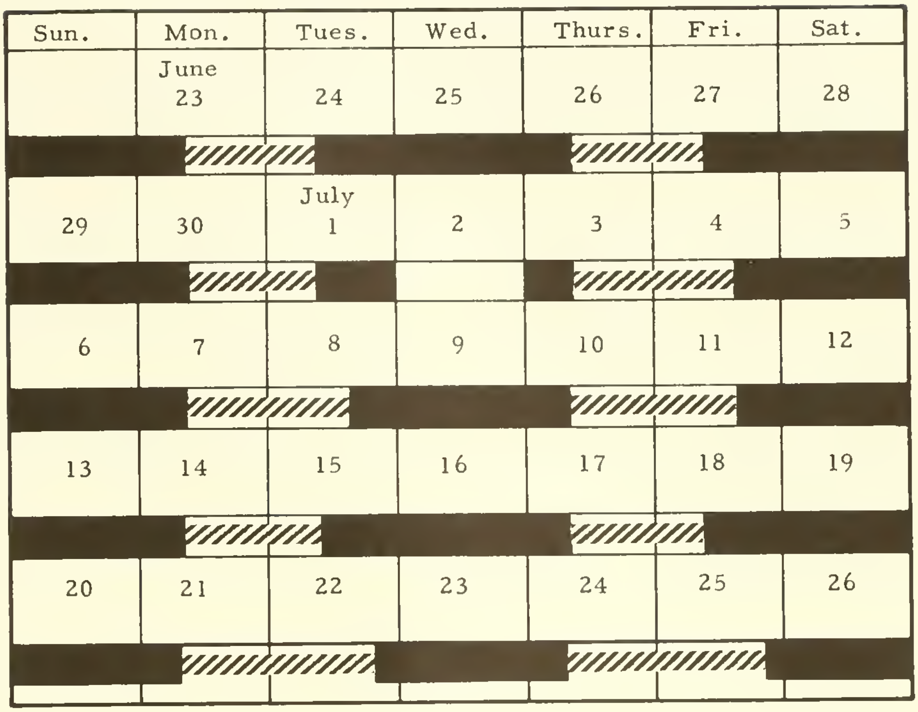
Rectangles correspond to 3 hours

Periods open to fishing

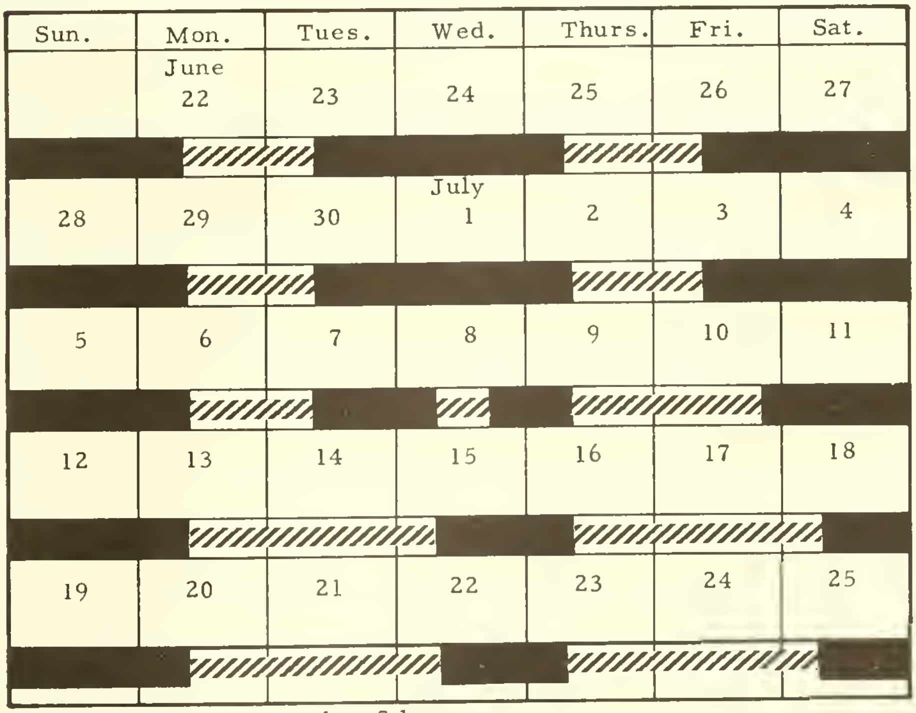
Periods closed to fishing

FISHING PERIODS, NUSHAGAK DISTRICT

1958



1959



Rectangles correspond to 3 hours

Periods open to fishing

Periods closed to fishing

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