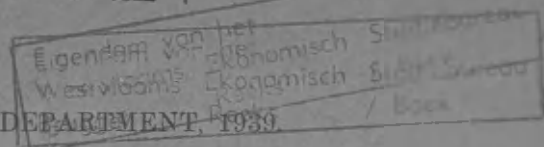


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BRITISH COLUMBIA FISHERIES DEPARTMENT, 1939

STUDIES FROM THE STATIONS  
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# CONTRIBUTIONS TO THE LIFE-HISTORY OF THE SCKEYE SALMON.

(PAPER 24.)

BY

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DIRECTOR, PACIFIC BIOLOGICAL STATION, NANAIMO.

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## APPENDICES.

CONTRIBUTIONS TO THE LIFE-HISTORY OF THE SOCKEYE SALMON.  
(No. 24.)

BY WILBERT A. CLEMENS, PH.D., DIRECTOR, PACIFIC BIOLOGICAL STATION, NANAIMO, B.C.

## INTRODUCTION.

In view of the fact that the study of the sockeye salmon of the Fraser River has been undertaken by the International Pacific Salmon Fisheries Commission, no collection of scales and data from the run to this river system was made by the Provincial Fisheries Department in 1938. The report on the annual analysis of the runs to this river system thus disappears from this series of contributions after a continuous record of twenty-three years.

The runs of sockeye salmon to Rivers Inlet and the Skeena and Nass Rivers in 1938 were very much according to expectancy. That to Rivers Inlet produced a medium-sized pack of 87,942 cases; and that to the Skeena was relatively small, yielding a pack of 47,257 cases; and that to the Nass supplied what perhaps may be called a medium-sized pack of 21,462 cases.

The history of the sockeye-fisheries of British Columbia has indicated rather clearly the tendency of a fishery to develop beyond the productive capacity of the stock. The Rivers Inlet record shows a probable serious decline in production in the period 1916 to 1921 when the packs reached low levels of approximately 45,000 cases. The general trend since then has been upward and there would seem to be good reason to believe that the population of this area is being fairly well maintained as judged both by the packs and the spawning escapements. As the results of investigations on the relation of catch to escapement become available, it may be found necessary to provide for a considerable "margin of safety" in the escapements to this area.

The history of the sockeye-fishery of the Skeena is one of steady decline since about the year 1910. Whether overfishing has been entirely responsible for the situation cannot be determined, but it is well known that the quickest and most certain procedure for raising the production level is to reduce the catch to a point where adequate escapement is provided for. On this basis certain restrictive fishing regulations have been put into effect by the Dominion Department of Fisheries in recent years, and it is hoped that eventually the balance will be thrown decidedly on the side of escapement and increased production.

As has been pointed out in previous reports, the sockeye runs to the Nass River have been unpredictable and it is thought that this condition has possibly some relation to fishing effort in Alaskan waters. In general the production trend appears to have been downward, but the runs of very recent years have tended toward somewhat higher levels.

## DESIGNATION OF AGE-GROUPS.

Two outstanding features in the life-history of the fish have been selected in designating the age-groups—namely, the age at maturity and the year of its life in which the fish migrated from fresh water. These are expressed symbolically by two numbers, one in large type, which indicates the age of maturity, and the other in small type, placed to the right and below, which signifies the year of life in which the fish left the fresh water. The age-groups which are met most commonly in these river systems are:—

- 3<sub>1</sub>, 4<sub>1</sub>—the "sea-types" or fish which migrate in their first year and mature at the ages of three and four years respectively.
- 3<sub>2</sub>—"the grilse," usually males, which migrate in their second year and mature at the age of three.
- 4<sub>2</sub>, 5<sub>2</sub>—fish which migrate in their second year and mature at the ages of four and five respectively.
- 5<sub>3</sub>, 6<sub>3</sub>—fish which migrate in their third year and mature at the ages of five and six respectively.
- 6<sub>4</sub>, 7<sub>4</sub>—fish which migrate in their fourth year and mature at the ages of six and seven respectively.

## 1. THE RIVERS INLET SOCKEYE RUN OF 1938.

## (1.) GENERAL CHARACTERISTICS.

The sockeye-salmon run to Rivers Inlet in 1938 produced a pack of 87,942 cases, and the escapement is reported as "better than usual" and better than the brood-years 1933 and 1934.

The return in 1939 will be the result of the spawnings of 1934 and 1935. In the former year the pack was 76,923 cases and the escapement was reported as average; in the latter year the pack was 135,038 cases and the escapement recorded as unusually large. Since each brood-year produces four- and five-year-old fish and since the 1934 spawning has apparently produced a relatively small number of four-year-olds, there should be a fairly large return of five-year-olds in 1939. Furthermore, as there is usually a fairly high representation of four-year-old fish in the Rivers Inlet population, there should be a good return of this age-group from the excellent spawning of 1935. Altogether, the prospects would seem good for a large run to Rivers Inlet in 1939.

Table I.—Rivers Inlet Sockeyes, Percentages of Age-groups in Runs of Successive Years and Packs.

Year.	PERCENTAGE OF INDIVIDUALS.			
	4 <sub>2</sub>	5 <sub>2</sub>	5 <sub>3</sub>	6 <sub>3</sub>
1907 (87,874 cases)	—	—	—	—
1908 (64,652 cases)	—	—	—	—
1909 (89,027 cases)	—	—	—	—
1910 (126,921 cases)	—	—	—	—
1911 (88,763 cases)	—	—	—	—
1912 (112,884 cases)	21	79	—	—
1913 (61,745 cases)	80	20	—	—
1914 (89,890 cases)	35	65	—	—
1915 (130,350 cases)	13	87	—	—
1916 (44,936 cases)	26	74	—	—
1917 (61,195 cases)	39	61	—	—
1918 (53,401 cases)	57	43	—	—
1919 (56,258 cases)	46	54	—	—
1920 (121,254 cases)	5	95	—	—
1921 (46,300 cases)	49	51	—	—
1922 (60,700 cases)	81	18	1	—
1923 (107,174 cases)	74	24	2	—
1924 (94,891 cases)	43	54	2	1
1925 (159,554 cases)	23	77	—	—
1926 (65,581 cases)	59	38	2	1
1927 (64,461 cases)	81	16	3	—
1928 (60,044 cases)	55	40	4	1
1929 (70,260 cases)	77	18	3	2
1930 (119,170 cases)	49	48	2	1
1931 (76,428 cases)	53	44	2	1
1932 (69,732 cases)	67	27	5	1
1933 (83,507 cases)	44	55	1	—
1934 (76,923 cases)	77	20	2	1
1935 (135,038 cases)	57	47	1	1
1936 (46,351 cases)	53	46	1	—
1937 (84,832 cases)	60	37	2	—
1938 (87,942 cases)	27	70	1	2

## (2.) AGE-GROUPS.

The material for this year's analysis was obtained from 1,469 individuals taken in fifteen random samplings from July 12th to August 5th. The 4<sub>2</sub> age-group is represented by 398 individuals or 27 per cent.; the 5<sub>2</sub> by 1,023 or 70 per cent.; the 5<sub>3</sub> by 9 or 1 per cent.; and the 6<sub>3</sub> by 39 or 2 per cent. In addition there is one female of the 6<sub>2</sub> age-class—7½ lb. and 27 inches—and not included in the tabulations and calculations. The outstanding feature



of the age-group representation in 1938 is the low percentage of four-year-old fish. It is interesting to note that the spawning of 1933 was evidently a successful one in that 60 per cent. of the run in 1937 consisted of four-year-old fish and 70 per cent. of the run in 1938 was comprised of five-year-old fish.

Table II.—Rivers Inlet Sockeyes, 1938, grouped by Age, Sex, and Length, and by their Early History.

Length in Inches.	NUMBER OF INDIVIDUALS.								Total.
	4 <sub>2</sub>		5 <sub>2</sub>		5 <sub>3</sub>		6 <sub>3</sub>		
	M.	F.	M.	F.	M.	F.	M.	F.	
20		1							1
20½	2								2
21	8	15				1			24
21½	9	13	1			1			24
22	38	39		1	1				79
22½	14	19	1	5		1			40
23	56	61	6	29				1	153
23½	16	21	7	14		1		1	60
24	21	21	26	83					151
24½	7	7	6	48	1			1	70
25	8	3	29	112				2	154
25½	6	1	21	91				4	123
26	9	1	57	144	3		3	13	230
26½			37	63				1	101
27	2		66	70			5		143
27½			23				1	1	25
28			25	17			1		43
28½			16				2		18
29			5	15			2		22
29½			2				1		3
30			1	2					3
Totals	196	202	329	694	5	4	15	24	1,469
Ave. lengths	23.1	22.8	26.6	25.5	24.9	22.1	27.5	25.6	

### (3.) LENGTHS AND WEIGHTS.

The average lengths of both sexes of the four- and five-year-old classes are very high, those for the latter being the highest on record (Table IV.). On the other hand, the average weights for the 4<sub>2</sub> age-group are below the average of the past twenty-three years while those for the 5<sub>2</sub> group are practically identical (Table V.). The data concerning the distribution of lengths and weights are given in Tables II. and III.

### (4.) DISTRIBUTION OF THE SEXES.

The total number of males in the samplings is 545 and of females 924, percentages of 37 and 63 respectively. In the four-year age-class the sexes are approximately equal, 196 and 202, but in the five-year age-class the number of females is approximately double that of the males, 329 and 694. As will be seen in Table VI., the average percentages of the males and females in the Rivers Inlet run for the past twenty-four years are 50:50.

Table III.—Rivers Inlet Sockeyes, 1938, grouped by Age, Sex, and Weight, and by their Early History.

Weight in Pounds.	NUMBER OF INDIVIDUALS.								Total.
	4 <sub>2</sub>		5 <sub>2</sub>		5 <sub>3</sub>		6 <sub>3</sub>		
	M.	F.	M.	F.	M.	F.	M.	F.	
3½	9	8	—	—	—	1	—	—	18
4	42	71	1	10	—	2	—	—	126
4½	70	63	7	16	1	1	—	1	164
5	34	34	12	62	1	—	—	2	145
5½	23	16	29	95	—	—	—	1	164
6	8	5	36	123	1	—	—	1	174
6½	7	—	35	118	1	—	—	6	167
7	2	—	44	115	1	—	1	7	170
7½	1	—	60	96	—	—	5	4	166
8	—	—	48	43	—	—	2	2	95
8½	—	—	32	9	—	—	3	—	44
9	—	—	15	7	—	—	2	—	24
9½	—	—	6	—	—	—	2	—	8
10	—	—	4	—	—	—	—	—	4
Totals	196	202	329	694	5	4	15	24	1,469
Ave. weights	4.7	4.5	7.1	6.4	5.8	4.0	8.2	6.7	—

Table IV.—Rivers Inlet Sockeyes, Average Lengths in Inches of the 4<sub>2</sub> and 5<sub>2</sub> Groups, 1912 to 1938.

Year.	Four-year Males.	Four-year Females.	Five-year Males.	Five-year Females.
1912	23.2	22.8	25.8	24.6
1913	22.9	23.0	25.9	25.2
1914	23.0	22.8	25.9	25.2
1915	22.9	22.8	26.0	25.1
1916	22.9	22.8	25.8	25.0
1917	22.5	22.3	25.0	24.4
1918	22.3	22.5	24.9	24.5
1919	22.4	22.3	24.8	24.4
1920	—	—	26.0	25.0
1921	22.9	22.6	25.2	24.2
1922	22.5	22.4	24.6	24.2
1923	22.4	22.3	24.6	24.1
1924	22.3	22.3	24.9	24.3
1925	22.2	22.2	25.5	24.8
1926	22.8	22.9	25.1	24.6
1927	22.1	22.4	24.6	24.2
1928	22.3	22.8	26.1	25.2
1929	22.6	22.2	25.2	25.3
1930	22.7	22.6	26.0	25.2
1931	21.9	22.0	25.2	24.8
1932	22.4	22.4	25.2	24.6
1933	22.1	22.0	25.5	24.7
1934	22.4	22.2	25.6	25.0
1935	22.4	22.4	25.8	25.1
1936	21.0	20.9	24.6	23.4
1937	22.0	21.9	24.5	24.0
Average lengths	22.4	22.4	25.3	24.7
1938	23.1	22.8	26.6	25.5

Table V.—Rivers Inlet Sockeyes, Average Weights in Pounds of the 4<sub>2</sub> and 5<sub>2</sub> Groups, 1914 to 1938.

Year.	Four-year Males.	Four-year Females.	Five-year Males.	Five-year Females.
1914	5.4	5.2	7.3	6.8
1915	5.3	5.1	7.3	6.6
1916	5.5	5.0	7.6	6.7
1917	5.0	4.9	6.6	6.2
1918	4.9	5.1	6.7	6.7
1919	4.9	4.8	6.3	5.9
1921	5.2	4.9	6.9	6.0
1922	6.0	5.9	7.4	7.0
1923	5.0	4.8	6.5	5.9
1924	4.9	4.8	6.6	6.1
1925	4.6	4.4	6.9	6.2
1926	5.2	5.2	6.9	6.3
1927	5.3	5.8	7.3	7.6
1928	4.8	5.0	7.5	6.7
1929	5.0	4.8	6.6	6.7
1930	4.9	4.8	7.5	6.9
1931	4.5	4.6	6.7	6.4
1932	4.7	4.7	6.5	6.5
1933	4.8	4.6	7.3	6.6
1934	4.9	4.6	7.3	6.7
1935	4.5	4.3	6.9	6.1
1936	4.9	4.1	7.2	6.7
1937	4.6	4.4	6.1	5.8
Average weights	5.0	4.9	7.0	6.5
1938	4.7	4.5	7.1	6.4

Table VI.—Rivers Inlet Sockeyes, Percentages of Males and Females of the 4<sub>2</sub> and 5<sub>2</sub> Age-groups, 1915 to 1938.

Year.	4 <sub>2</sub>		5 <sub>2</sub>		Per Cent. Total Males.	Per Cent. Total Females.
	M.	F.	M.	F.		
1915	—	—	—	—	45	55
1916	65	35	43	57	49	51
1917	63	37	39	61	48	52
1918	79	21	49	51	66	34
1919	77	23	41	59	58	42
1920	74	26	48	52	49	51
1921	63	37	40	60	51	49
1922	66	34	38	62	61	39
1923	71	29	31	69	62	38
1924	74	26	31	69	50	50
1925	66	34	34	66	41	59
1926	63	37	32	68	51	49
1927	68	32	35	64	62	38
1928	63	37	30	70	50	50
1929	57	43	36	64	53	47
1930	56	44	37	63	47	53
1931	59	41	33	67	47	53
1932	54	46	28	72	47	53
1933	56	44	32	68	42	58
1934	55	45	27	73	49	51
1935	63	37	39	61	53	47
1936	43	57	20	80	32	68
1937	61	39	28	72	43	57
1938	49	51	32	68	27	73
Average	63	37	35	65	50	50



## 2. THE SKEENA RIVER SOCKEYE RUN OF 1938.

## (1.) GENERAL CHARACTERISTICS.

The Skeena sockeye run produced a pack of 47,257 cases and an escapement reported as very good. While the number of fish appearing on the spawning-grounds is somewhat encouraging, it may be pointed out that the run of 1938 was comparatively small. Taking the actual counts of fish in the streams tributary to Babine Lake, it is estimated that approximately 80,000 fish spawned there. Making liberal allowances for the numbers of sockeye appearing in the Babine River, Lakelse Lake, and other areas, it is doubtful if the spawning population for the entire river system exceeded 125,000 fish. The pack represents 575,000 fish. To illustrate the significance of these figures, it may be pointed out that had the escapement been equivalent to the catch there would have been four times as many fish in the streams as were observed and such a number of fish would have been striking. On the basis of results obtained at Cultus Lake, on the Fraser River, it is probable that a pack of 150,000 cases or better cannot be expected on the Skeena until an escapement of 400,000 to 500,000 fish is provided for; that is, about three or four times the escapement of 1938.

The run to the Skeena in 1939 will be the result of the spawnings of 1934 and 1935. In 1934 the pack was 54,558 cases. The escapement to the Babine area was considered inadequate while that to the Lakelse area was reported as good. In 1935 the pack was 52,879 cases. The escapements to both the Babine and Lakelse areas were recorded as good, but subsequently it was reported that severe freshets damaged the spawning-beds in the latter region. Taking into account all the available information, it would appear that the run to the Skeena River in 1939 will be relatively small.

Table VII.—Skeena River Sockeyes, Percentages of Age-groups in Runs of Successive Years and Packs.

Year.	PERCENTAGE OF INDIVIDUALS.			
	4 <sub>2</sub>	5 <sub>2</sub>	5 <sub>3</sub>	6 <sub>3</sub>
1907 (108,413 cases)	—	—	—	—
1908 (139,846 cases)	—	—	—	—
1909 (87,901 cases)	—	—	—	—
1910 (187,246 cases)	—	—	—	—
1911 (131,066 cases)	—	—	—	—
1912 (92,498 cases)	57	43	—	—
1913 (52,927 cases)	50	50	—	—
1914 (130,166 cases)	25	75	—	—
1915 (116,553 cases)	36	64	—	—
1916 (60,923 cases)	34	38	13	18
1917 (65,760 cases)	57	29	9	5
1918 (123,322 cases)	51	34	9	6
1919 (184,945 cases)	27	60	9	4
1920 (90,869 cases)	15	71	6	8
1921 (41,018 cases)	69	22	6	3
1922 (96,277 cases)	70	16	12	2
1923 (131,731 cases)	66	29	8	7
1924 (144,747 cases)	23	69	7	1
1925 (77,784 cases)	51	45	3	1
1926 (82,360 cases)	62	26	9	3
1927 (83,996 cases)	62	28	9	1
1928 (34,559 cases)	51	39	7	3
1929 (78,017 cases)	62	30	6	2
1930 (132,372 cases)	39	52	8	1
1931 (93,023 cases)	40	30	28	2
1932 (59,916 cases)	44	37	7	12
1933 (30,506 cases)	57	36	5	2
1934 (54,558 cases)	58	34	7	1
1935 (52,879 cases)	49	31	18	2
1936 (81,973 cases)	67	20	11	2
1937 (42,491 cases)	45	40	11	4
1938 (47,257 cases)	64	15	16	5

## (2.) AGE-GROUPS.

Scales and length, weight and sex data were obtained from 1,268 fish from July 14th to August 17th in twenty-three random samplings. The  $4_2$  age-group is represented by 808 individuals or 64 per cent.; the  $5_2$  by 195 or 15 per cent.; the  $5_3$  by 201 or 16 per cent.; and the  $6_3$  by 64 or 5 per cent. In addition there is one individual of the  $3_2$  age-group, four of the  $4_3$ , and one of the  $6_4$ ; these are not included in the tabulations or calculations. The four-year-old fish form the predominant group in the run. The five-year-old fish are about equally distributed in the  $5_2$  and  $5_3$  age-classes, the former with the unusually low percentage of 15 and the latter with a rather high percentage of 16 (Table VII.).

## (3.) LENGTHS AND WEIGHTS.

The average lengths of both sexes of all the age-groups are slightly below the averages of the past twenty-six years. The average weights are slightly below the averages of the past twenty-four years in five cases, equivalent in two and above in one (Tables VIII., IX., X., and XI.). There are no features of particular significance in the length and weight data.

## (4.) PROPORTIONS OF THE SEXES.

During the past years it has been the practice in dealing with the proportions of the sexes to consider only the  $4_2$  and  $5_2$  groups, because they have usually formed 85 to 90 per cent. of the run. This year, with the  $5_3$ 's having a percentage representation of 16, the percentage figures for total males and females as given in Table XII. do not exactly represent the proportions of the sexes for the whole run.

The total number of males in the samplings is 566 and of females 702, percentages of 45 and 55 respectively. The percentages when only the  $4_2$  and  $5_2$  age-groups are considered are 42 and 58 respectively. The females outnumber the males in the  $4_2$  age-group as they have done consistently in recent years, being represented by a percentage of 60. On the other hand, the males slightly outnumber the females in the  $5_2$  age-group with a percentage of 51. It has been rare for the males to be in the majority in this age-group (Table XII.). In the  $5_3$  age-group the females slightly outnumber the males while in the  $6_3$  age-group the number of males is double that of the females.

Table VIII.—Skeena River Sockeyes, 1938, grouped by Age, Sex, and Length, and by their Early History.

Length in Inches.	NUMBER OF INDIVIDUALS.								Total.
	4 <sub>2</sub>		5 <sub>2</sub>		5 <sub>3</sub>		6 <sub>3</sub>		
	M.	F.	M.	F.	M.	F.	M.	F.	
18½	-----	1	-----	-----	-----	-----	-----	-----	1
19	1	-----	-----	-----	-----	-----	-----	-----	1
19½	-----	-----	-----	-----	-----	-----	-----	-----	-----
20	3	6	-----	-----	-----	1	-----	-----	10
20½	2	10	-----	-----	-----	-----	-----	-----	12
21	10	33	-----	-----	3	5	-----	-----	51
21½	14	25	-----	-----	5	5	-----	-----	49
22	35	117	-----	5	11	15	-----	1	184
22½	25	80	2	1	9	19	-----	-----	136
23	66	111	3	9	14	18	-----	4	225
23½	44	51	2	6	15	11	1	1	131
24	63	39	12	18	12	11	2	6	163
24½	31	9	8	21	4	2	5	2	82
25	22	1	27	16	16	8	10	3	103
25½	6	-----	15	7	2	3	9	1	43
26	-----	-----	13	3	2	4	8	2	37
26½	3	-----	6	2	2	-----	1	-----	14
27	-----	-----	5	1	3	1	5	1	16
27½	-----	-----	4	1	-----	-----	-----	-----	5
28	-----	-----	-----	-----	-----	-----	1	-----	1
28½	-----	-----	1	-----	-----	-----	1	-----	2
29	-----	-----	1	-----	-----	-----	-----	-----	1
29½	-----	-----	-----	-----	-----	-----	-----	-----	-----
30	-----	-----	1	-----	-----	-----	-----	-----	1
Totals	325	483	100	95	98	103	43	21	1,268
Ave. lengths	23.3	22.5	25.3	24.4	23.6	23.1	25.6	24.3	-----



Table IX.—Skeena River Sockeyes, 1938, grouped by Age, Sex, and Weight, and by their Early History.

Weight in Pounds.	NUMBER OF INDIVIDUALS.								Total.
	4 <sub>2</sub>		5 <sub>2</sub>		5 <sub>3</sub>		6 <sub>3</sub>		
	M.	F.	M.	F.	M.	F.	M.	F.	
2½	1	1	—	—	—	—	—	—	2
3	2	2	—	—	—	1	—	—	5
3½	9	30	—	—	4	2	—	—	45
4	33	111	—	4	12	15	—	1	176
4½	55	154	6	5	17	20	—	3	260
5	81	113	5	11	16	23	—	1	255
5½	65	52	6	10	19	23	2	7	133
6	46	18	21	22	11	10	11	3	142
6½	24	1	16	20	11	1	9	—	82
7	5	—	13	13	7	1	7	2	53
7½	3	—	15	6	1	1	4	2	32
8	1	1	5	3	1	1	4	—	16
8½	—	—	3	1	—	—	3	2	9
9	—	—	4	—	—	—	2	—	6
9½	—	—	1	—	—	—	1	—	2
Totals	325	433	100	95	98	103	43	21	1,268
Ave. weights	5.2	4.6	6.6	6.1	5.3	5.0	6.9	5.9	—

Table X.—Skeena River Sockeyes, Average Lengths in Inches of Principal Age-groups, 1912 to 1938.

Year.	4 <sub>2</sub>		5 <sub>2</sub>		5 <sub>3</sub>		6 <sub>3</sub>	
	M.	F.	M.	F.	M.	F.	M.	F.
1912	24.6	23.5	26.4	25.2	—	—	—	—
1913	23.5	22.9	25.5	24.7	—	—	—	—
1914	24.2	23.4	26.2	25.1	—	—	—	—
1915	24.2	23.5	25.9	25.0	24.5	23.4	25.6	24.4
1916	23.9	23.6	26.2	25.0	24.1	23.8	26.2	24.8
1917	23.6	23.2	25.5	24.7	23.9	23.8	25.4	25.0
1918	24.1	23.3	25.9	25.0	23.9	23.4	25.2	24.7
1919	24.3	23.4	25.7	24.8	24.3	23.4	25.8	24.7
1920	23.8	23.2	26.2	25.3	24.1	23.4	26.2	25.1
1921	23.8	23.1	25.2	24.2	24.2	23.4	24.9	24.2
1922	23.6	23.2	25.3	24.4	23.8	23.3	24.6	24.1
1923	23.7	23.1	25.5	24.5	23.9	23.2	25.6	24.4
1924	24.1	23.3	26.2	25.2	24.7	23.6	25.8	24.8
1925	23.6	22.8	25.6	24.7	24.1	23.3	25.8	24.3
1926	23.8	23.4	25.6	24.8	24.6	23.8	26.0	25.0
1927	23.9	23.3	25.7	24.8	24.1	23.5	25.2	24.9
1928	23.3	22.8	25.3	24.7	23.5	22.8	25.6	24.7
1929	22.9	22.7	25.5	24.7	23.8	22.8	25.5	24.3
1930	23.1	22.7	24.7	23.9	23.5	22.4	24.6	23.2
1931	23.5	23.1	25.7	24.8	23.8	23.1	25.8	24.7
1932	23.4	22.7	25.2	24.4	24.1	22.8	25.4	24.4
1933	23.2	22.8	26.1	25.2	24.3	23.4	26.4	25.3
1934	23.8	23.2	26.3	25.2	25.2	24.1	26.0	24.9
1935	23.1	22.9	26.3	25.2	23.6	22.8	26.2	25.1
1936	23.8	23.2	26.0	25.2	24.4	23.5	26.3	25.0
1937	23.5	22.9	26.2	25.1	24.9	24.1	26.9	25.5
Average lengths	23.7	23.1	25.8	24.8	24.7	23.3	25.7	24.7
1938	23.3	22.5	25.3	24.4	23.6	23.1	25.6	24.3

Table XI.—Skeena River Sockeyes, Average Weights in Pounds of Principal Age-groups, 1914 to 1938.

Year.	4 <sub>2</sub>		5 <sub>2</sub>		5 <sub>3</sub>		6 <sub>3</sub>	
	M.	F.	M.	F.	M.	F.	M.	F.
1914	5.9	5.3	7.2	6.3	—	—	—	—
1915	5.7	5.2	6.8	6.2	5.9	5.2	6.6	6.0
1916	5.4	5.1	7.1	6.3	5.8	5.4	7.1	5.9
1917	5.3	5.0	6.4	6.0	5.5	5.2	6.3	5.8
1918	5.8	5.3	6.9	6.4	5.7	5.3	6.6	6.1
1919	6.1	5.5	7.0	6.2	6.1	6.4	6.9	6.3
1920	5.6	5.1	7.2	6.4	6.3	5.1	7.3	6.3
1921	5.7	5.1	6.4	5.7	5.8	5.1	6.0	5.6
1922	5.4	5.1	6.5	5.7	5.5	5.1	6.2	5.7
1923	5.3	4.9	6.3	5.7	5.3	4.8	6.3	5.4
1924	5.6	5.0	7.0	6.3	5.9	5.1	6.6	5.8
1925	5.1	4.7	6.5	5.8	5.5	4.9	6.9	5.4
1926	5.3	5.1	6.5	5.8	5.9	5.2	6.9	6.2
1927	5.4	5.1	6.5	5.9	5.4	5.0	6.0	5.8
1928	5.0	4.6	6.4	5.8	5.0	4.6	6.5	5.8
1929	4.9	4.7	6.8	6.2	5.6	4.9	6.8	5.7
1930	5.4	5.1	6.7	6.0	5.6	5.0	6.8	5.8
1931	5.4	5.1	6.8	6.3	5.5	5.0	6.9	6.0
1932	5.4	4.9	6.9	6.1	6.0	5.0	6.8	5.9
1933	4.9	4.7	7.1	6.3	5.7	5.0	7.1	6.3
1934	5.7	5.2	7.7	6.6	6.7	5.8	7.7	6.2
1935	6.1	4.9	7.4	6.5	5.5	4.7	7.2	6.4
1936	5.6	5.2	7.3	6.6	6.1	5.5	7.4	6.2
1937	4.9	4.6	6.4	5.8	5.7	5.1	7.0	6.1
Average weights	5.4	5.0	6.8	6.1	5.7	5.1	6.8	5.9
1938	5.2	4.6	6.6	6.1	5.3	5.0	6.9	5.9

Table XII.—Skeena River Sockeyes, Percentages of Males and Females of the 4<sub>2</sub> and 5<sub>2</sub> Age-groups, 1915 to 1938.

Year.	4 <sub>2</sub>		5 <sub>2</sub>		Per Cent. Total Males.	Per Cent. Total Females.
	M.	F.	M.	F.		
1915	56	44	46	55	49	51
1916	70	30	43	57	55	45
1917	66	34	43	52	60	40
1918	63	37	46	54	57	43
1919	53	47	46	54	49	51
1920	41	59	37	63	38	62
1921	44	56	44	56	45	55
1922	52	48	41	59	50	50
1923	60	40	37	63	52	48
1924	50	50	43	57	45	55
1925	57	43	42	58	50	50
1926	40	60	43	57	42	58
1927	45	55	41	59	44	56
1928	48	52	45	55	46	54
1929	50	50	46	54	50	50
1930	47	53	56	44	53	47
1931	43	57	39	61	44	56
1932	47	53	63	37	54	46
1933	48	52	40	60	45	55
1934	42	58	33	67	39	61
1935	41	59	32	68	40	60
1936	38	62	36	64	39	61
1937	45	55	39	61	42	58
1938	40	60	51	49	42	58
Average	49	51	43	57	47	53

## 3. THE NASS RIVER SOCKEYE RUN OF 1938.

## (1.) GENERAL CHARACTERISTICS.

The pack on the Nass River amounted to 21,462 cases. The escapement is reported as large and the seeding as heavy. The packs from 1912 to 1938, inclusive, have varied from 5,500 to 39,300 cases; so that of 1938 may be considered as a medium-sized one.

As has been repeatedly pointed out, the runs to the Nass River have been very erratic and a reliable prediction is out of the question. However, it is of interest to review the conditions as they prevailed in the brood-years. The pack in 1934 was very large, amounting to 36,242 cases, and the escapement was reported as good. In 1935 the pack was 12,712 cases and the escapement was again reported as good. If conditions of production and fishing remain reasonably stable there should be a medium-sized run in 1939, possibly much like that of 1938.

## (2.) AGE-GROUPS.

The analysis of the run of 1938 is based on data for 1,378 fish collected in twelve random samplings between July 18th and August 19th. The 5<sub>3</sub> age-group predominates as usual with 969 individuals or 70 per cent. The 4<sub>2</sub>'s are represented by 281 fish or 21 per cent.; the 5<sub>2</sub>'s by 56 or 4 per cent.; and the 6<sub>3</sub>'s by 72 or 5 per cent. In addition, there are two individuals of the 6<sub>4</sub> age-group, both males, one 5½ lb., 24 inches, and the other 7¼ lb., 26 inches; these are not included in the tabulations or calculations.

The representations of the age-groups in 1938 do not present any unusual features (Table XIII.).

Table XIII.—Nass River Sockeyes, Percentages of Principal Age-groups from 1912 to 1938 and Packs.

Year.	PERCENTAGE OF INDIVIDUALS THAT SPENT			
	One Year in Lake.		Two Years in Lake.	
	Four Years old.	Five Years old.	Five Years old.	Six Years old.
1912 (36,087 cases)	8	27	63	2
1913 (23,574 cases)	15	12	71	2
1914 (31,327 cases)	4	41	45	10
1915 (39,349 cases)	19	14	59	8
1916 (31,411 cases)	9	17	66	8
1917 (22,188 cases)	10	15	71	4
1918 (21,816 cases)	30	16	45	9
1919 (28,259 cases)	7	22	65	6
1920 (16,740 cases)	8	14	72	6
1921 (9,364 cases)	10	7	75	8
1922 (31,277 cases)	6	2	91	1
1923 (17,821 cases)	11	6	77	6
1924 (33,590 cases)	4	3	91	2
1925 (18,945 cases)	23	8	67	2
1926 (15,929 cases)	12	12	63	13
1927 (12,026 cases)	8	7	81	4
1928 (5,540 cases)	30	6	61	3
1929 (16,077 cases)	25	9	60	6
1930 (26,405 cases)	28	15	54	3
1931 (16,929 cases)	10	17	67	6
1932 (14,154 cases)	28	4	61	7
1933 (9,757 cases)	35	7	55	3
1934 (36,242 cases)	13	9	74	4
1935 (12,712 cases)	11	10	78	6
1936 (28,562 cases)	16	7	67	10
1937 (17,567 cases)	22	4	68	6
1938 (21,462 cases)	21	4	70	5



## (3.) LENGTHS AND WEIGHTS.

The average lengths of both sexes of all the age-groups is somewhat less than those of the averages for the past twenty-six years. The difference is considerable in the cases of the 5<sub>3</sub> age-group and of the males of the 6<sub>3</sub>.

The average weights are very slightly below the general averages except in the case of the females of the 4<sub>2</sub> and the males of the 5<sub>2</sub> age-groups (Tables XIV., XV., XVI., and XVII.).

## (4.) PROPORTIONS OF THE SEXES.

The total number of males in the samplings is 605 and of females 773, percentages of 44 and 56 respectively. The representation of the males is slightly below the average for the past twenty-four years—namely, 47. Examination of the data shows that the percentage of the males in the dominant 5<sub>3</sub> age-group was low (40 per cent.) while in the age-groups less well represented numerically—namely, 4<sub>2</sub>, 5<sub>2</sub>, and 6<sub>3</sub>—the percentages of the males in each case were slightly higher than those of the females (Table XVIII.).

Table XIV.—Nass River Sockeyes, 1938, grouped by Age, Sex, and Length, and by their Early History.

Length in Inches.	NUMBER OF INDIVIDUALS.								Total.
	4 <sub>2</sub>		5 <sub>2</sub>		5 <sub>3</sub>		6 <sub>3</sub>		
	M.	F.	M.	F.	M.	F.	M.	F.	
21.....	—	1	—	—	—	1	—	—	2
21½.....	—	4	—	—	—	2	—	—	6
22.....	5	14	—	—	3	10	—	—	32
22½.....	2	11	—	—	2	9	—	—	24
23.....	30	35	2	2	14	47	—	3	133
23½.....	11	11	—	1	11	41	—	—	75
24.....	35	36	4	9	52	164	2	—	302
24½.....	16	15	2	4	28	69	1	1	136
25.....	27	6	5	2	97	138	4	4	283
25½.....	4	3	2	2	45	48	2	1	103
26.....	10	3	2	1	86	43	7	6	159
26½.....	2	—	—	2	27	6	2	5	44
27.....	—	—	3	2	25	4	13	7	54
27½.....	—	—	—	1	2	—	3	—	6
28.....	—	—	6	—	—	—	6	1	13
28½.....	—	—	1	—	—	—	—	—	1
29.....	—	—	1	—	—	—	2	2	5
29½.....	—	—	—	—	—	—	—	—	—
30.....	—	—	1	—	—	—	—	—	1
Totals.....	142	139	29	27	392	577	42	30	1,378
Average lengths.....	24.1	23.5	26.0	24.8	25.2	24.4	26.6	26.1	—

Table XV.—Nass River Sockeyes, 1938, grouped by Age, Sex, and Weight, and by their Early History.

Weight in Pounds.	NUMBER OF INDIVIDUALS.								Total.
	4 <sub>2</sub>		5 <sub>2</sub>		5 <sub>3</sub>		6 <sub>3</sub>		
	M.	F.	M.	F.	M.	F.	M.	F.	
3½	----	1	----	----	----	1	----	----	2
4	----	----	----	----	----	----	----	----	----
4½	9	1	----	1	3	18	----	2	34
5	15	21	2	----	13	33	----	----	124
5½	40	38	1	5	51	166	1	1	303
6	38	49	4	7	77	178	1	3	357
6½	26	18	5	2	107	95	6	9	274
7	8	10	2	4	79	27	6	5	141
7½	6	1	2	2	48	7	13	5	84
8	----	----	4	----	14	2	3	5	28
8½	----	----	4	----	----	----	7	----	11
9	----	----	2	----	----	----	4	----	6
9½	----	----	3	----	----	----	1	----	4
Totals.....	142	139	29	27	392	577	42	30	1,378
Average weights.....	5.9	5.8	7.4	6.3	6.5	5.8	7.6	6.8	----

Table XVI.—Nass River Sockeyes, Average Lengths in Inches of Principal Age-groups, 1912 to 1938.

Year.	4 <sub>2</sub>		5 <sub>2</sub>		5 <sub>3</sub>		6 <sub>3</sub>	
	M.	F.	M.	F.	M.	F.	M.	F.
1912	24.6	23.3	26.5	25.1	26.2	25.4	27.0	25.6
1913	24.1	23.5	25.6	24.8	26.0	25.2	26.0	26.6
1914	24.6	22.7	26.1	25.1	26.3	25.5	26.9	25.6
1915	24.0	23.5	25.9	25.2	26.5	25.9	26.6	25.3
1916	24.5	23.3	26.4	25.0	26.5	25.6	27.9	25.7
1917	23.4	23.2	25.5	24.7	25.3	24.7	26.5	25.5
1918	25.0	24.3	25.7	24.7	25.9	25.0	27.2	25.2
1919	24.9	24.1	26.2	25.2	26.5	25.8	27.9	26.7
1920	24.0	23.4	26.3	25.0	26.7	25.9	27.4	25.9
1921	24.3	23.5	25.5	24.3	26.2	25.6	27.9	26.2
1922	24.2	23.4	25.6	24.6	25.7	25.0	28.0	25.9
1923	24.3	23.7	25.9	25.3	26.2	25.5	27.2	26.5
1924	24.7	23.8	26.2	24.9	26.3	25.4	28.0	25.4
1925	24.4	23.3	25.9	24.7	25.9	25.0	26.9	25.4
1926	24.9	24.1	26.1	25.3	26.1	25.3	27.9	27.0
1927	24.9	24.2	25.3	25.2	26.3	25.9	27.6	26.5
1928	24.3	23.5	26.0	25.1	25.5	24.6	28.1	26.2
1929	24.1	23.5	26.1	25.2	25.9	24.9	27.2	26.2
1930	24.5	23.7	26.5	25.4	26.4	25.3	27.9	26.8
1931	24.5	23.8	26.5	25.7	26.1	25.3	28.2	27.1
1932	24.9	23.9	26.4	25.2	26.6	25.6	28.3	27.1
1933	24.6	23.7	27.1	25.8	25.9	25.2	28.4	27.9
1934	24.9	24.1	26.9	25.9	26.3	25.4	28.6	27.1
1935	24.9	24.0	27.3	25.9	26.5	25.2	28.9	27.6
1936	24.9	24.1	26.8	25.8	26.6	25.6	28.3	27.1
1937	23.8	23.3	26.0	24.5	25.0	24.2	27.2	26.3
Average lengths	24.5	23.7	26.2	25.1	26.1	25.3	27.6	26.3
1938	24.1	23.5	26.0	24.8	25.2	24.4	26.6	26.1

Table XVII.—Nass River Sockeyes, Average Weights in Pounds of Principal Age-groups, 1914 to 1938.

Year.	4 <sub>2</sub>		5 <sub>2</sub>		5 <sub>3</sub>		6 <sub>3</sub>	
	M.	F.	M.	F.	M.	F.	M.	F.
1914	6.2	5.0	7.4	6.5	7.2	6.5	7.9	6.8
1915	5.6	5.2	6.9	6.4	7.0	6.6	7.2	6.5
1916	6.0	5.3	7.2	6.3	7.2	6.2	8.1	6.4
1917	5.3	5.3	6.8	6.2	6.3	5.8	7.3	6.4
1918	6.3	5.8	7.2	6.3	7.2	6.4	8.3	6.7
1919	6.0	5.5	6.6	5.9	6.7	6.1	7.8	6.7
1920	5.6	5.2	7.4	6.3	7.4	6.7	7.9	7.0
1921	6.0	5.4	6.9	6.1	6.9	6.3	7.7	6.6
1922	5.9	5.4	6.8	6.2	6.8	6.3	8.1	6.6
1923	5.8	5.2	6.7	6.1	6.6	6.0	7.2	6.8
1924	5.9	5.4	7.2	6.1	6.8	6.1	8.0	6.5
1925	5.9	5.4	6.8	6.1	6.7	6.0	7.4	6.3
1926	6.0	5.4	6.9	6.2	6.7	6.0	7.8	7.1
1927	6.2	5.8	7.1	6.3	6.9	6.2	7.8	7.0
1928	5.6	5.0	7.0	6.2	6.2	5.5	8.1	6.6
1929	5.7	5.2	7.1	6.6	6.7	5.9	7.6	6.8
1930	5.9	5.2	7.3	6.5	7.1	6.1	8.2	7.2
1931	6.0	5.5	7.4	6.8	6.8	6.2	8.3	7.4
1932	6.3	5.6	7.5	6.6	7.3	6.3	8.7	7.5
1933	6.2	5.4	8.1	7.0	7.0	6.2	8.4	7.9
1934	6.7	5.9	8.4	7.3	7.6	6.7	9.4	8.1
1935	6.1	5.2	7.8	6.5	7.0	6.1	8.4	7.4
1936	6.5	5.7	7.8	7.1	7.6	6.7	8.7	7.5
1937	5.5	5.2	6.8	6.1	6.2	5.5	7.8	7.0
Average weights	6.0	5.4	7.2	6.4	6.9	6.2	8.0	6.9
1938	5.9	5.8	7.4	6.3	6.5	5.8	7.6	6.8

Table XVIII.—Nass River Sockeyes, Percentages of Males and Females of the 4<sub>2</sub>, 5<sub>2</sub>, 5<sub>3</sub>, and 6<sub>3</sub> Age-groups, 1915 to 1938.

Year.	4 <sub>2</sub>		5 <sub>2</sub>		5 <sub>3</sub>		6 <sub>3</sub>		Per Cent. Total Males.	Per Cent. Total Females.
	M.	F.	M.	F.	M.	F.	M.	F.		
1915	55	45	49	51	52	48	53	47	52	48
1916	61	39	61	39	50	50	68	32	55	45
1917	56	45	47	53	46	54	58	42	47	53
1918	52	48	40	60	50	50	70	30	51	49
1919	53	47	48	52	46	54	54	46	48	52
1920	46	54	39	61	40	60	66	34	42	58
1921	40	60	45	55	47	53	54	46	46	54
1922	36	64	32	68	46	54	64	36	44	56
1923	43	57	43	57	47	53	60	40	46	54
1924	55	45	44	56	47	53	67	33	48	52
1925	58	42	52	48	45	55	68	32	49	51
1926	43	57	44	56	44	56	57	43	46	54
1927	39	61	54	46	45	55	61	39	46	54
1928	50	50	48	52	42	58	62	38	46	54
1929	48	52	51	49	44	56	58	42	46	54
1930	49	51	43	57	40	60	63	37	43	57
1931	49	51	53	47	43	57	70	30	47	53
1932	49	51	46	54	45	55	72	28	48	52
1933	49	51	66	44	47	53	76	24	49	51
1934	48	52	51	49	50	50	68	32	50	50
1935	39	61	40	60	39	61	71	29	42	58
1936	42	58	35	65	43	57	50	50	43	57
1937	56	44	43	57	50	50	56	44	51	49
1938	51	49	52	48	40	60	58	42	44	56
Average	49	51	46	54	45	55	62	38	47	53







