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Ages and Physical Characteristics of Maturing Chinook Salmon of the Nass, Skeena and Fraser Rivers in 1964, 1965 and 1966

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INTRODUCTION

During the last several years the Department of Fisheries of Canada has conducted "test-fishing" operations on the Nass, Skeena and Fraser rivers in order to obtain information on the magnitude and composition of the salmon spawning escapements. The information is used in formulating fishing regulations and for other purposes of fisheries management.

"Test-fishing" is done near the mouths of the rivers, above the commercial fishing boundaries. Chartered gill netters are used to make systematically-scheduled drift sets with nets constructed of a graded series of mesh sizes.

The catches of chinook salmon that were made in the operations of 1964-1966 provided an opportunity to obtain samples and biological data on that species. The material was examined and analyzed at the Station. The present report summarizes the information gained and makes it available for limited distribution.

In addition to the data contained in this report there are on file at this Station IBM print-outs of the complete information obtained from each fish, grouped by year and river system, and frequency tables of age, round weight and fork length, grouped by sex and flesh colour. These can be obtained upon request.

The writer is most grateful to the Department's biologists and technicians who collected the material and made it available. He would also like to express his thanks for their considerable technical assistance to Mr. Robert Ball, Mrs. Doris Chilton and Mrs. Fran Newman; and to Dr. Leon Pienaar and Mr. John Thomson of the Station for help and advice with statistical procedures and the IBM processing of the data.

EGG COUNTS

Ovaries were removed from captured females, placed in numbered bags and preserved in formalin. Total counts were made by hand, and included only what appeared to be fully formed eggs. (After some months in the preservative the eggs had, of course, hardened, but they had retained their yellow-orange colouration; it was only the small whitish bodies, presumed to be unformed or resorbed eggs, that were not included in the counts).

Table I gives the average number of eggs per female by river, year and flesh colour. Combining the data for the three years, the average counts were:

Nass reds	- 6343;	Nass whites	- 7298
Skeena reds	- 6490;	Skeena whites	- 9109
Fraser reds	- 5857;	Fraser whites	- 5723

(Note that the sample sizes for both the Nass and Skeena white-fleshed fish were both small, only 8 and 20 fish respectively).

There are obviously differences between rivers and flesh colours that are statistically significant. However, since the egg count is dependent upon the size of the female (as well as on the size of the eggs) these differences could be due to differences in the sizes of the fish which the several groups comprise. Whether there are significant differences between years, rivers and flesh colours in the egg count-body length relationship will be examined later in this report.

The annual differences in egg count for each river and flesh colour, were not great, it may be noticed. Neither was there much variation during the three years in the average fork lengths of the female fish (Table XIV).

McGregor (1923) found a very marked difference between the egg counts of samples of chinook salmon of the Sacramento and Klamath rivers of northern California - a mean count of 7423 among 50 Sacramento fish as compared with 3760 among 111 Klamath River fish. Although there were differences in the average lengths of the two samples (93.0 cm for the Sacramento fish as compared with 84.1 cm for the Klamath River fish), Rounsefell (1957) noted that, "At 85 cm the calculated geometric means for the two populations are 3894 and 6912 eggs, an increase of 78 percent in number of eggs for the Sacramento River fish when compared with the king salmon of the Klamath River."

PYLORIC CAECA COUNTS

For each of the three rivers the pyloric caeca counts varied widely and were independent of the length of the fish. Table II lists the average counts, together with the standard deviation and range, by river and flesh colour. None of the differences are statistically significant.

Clemens and Wilby (1961) give the range of the number of pyloric caeca of chinook salmon of the Pacific coast of Canada as 140-185. These present data broaden that range from a minimum of 103 to a maximum of 237.

These data for the Nass, Skeena and Fraser rivers lead to agreement with the conclusion reached by Townsend (1944) regarding differences among populations of chinook salmon from several streams in Washington, Oregon and California in pyloric caeca counts. He, too, found a wide variation in the count and small differences between the average numbers of caeca among fish from different streams. He concluded therefore (and in contrast to McGregor, 1923), that the pyloric caeca count was not a useful parameter by which races of chinook salmon might be distinguished.

AGES

The age data are summarized in Tables III-XI. Table XII, with the 1964-66 data combined, provides some comparisons between the three river systems, according to "ocean" and "stream" type of fish.[1]

On the basis of these data at least, the age compositions of the escapements in the three rivers are fairly similar, both in the division between the "ocean" and "stream" types of fish, and in the distribution of ages within each of the two types.

In the case of the Fraser River it is possible to make a comparison between the assigned age composition of the test-fishing catches with the computed (samples weighted to the commercial catch) age composition of the catch of the Fraser River gillnet fishery, which was independently sampled in 1964-1966. This comparison is shown in Table XIII.

It is apparent that there were major differences between the two groups of fish. However, because it is not possible to describe the true age composition of the full escapement, it cannot therefore be determined whether the differences between the test-fishing ages and those of the commercial catch were due to the selective action of the commercial fishery, to that of the test fishing, or to both fisheries.

FORK LENGTHS

The fork length data are summarized in Table XIV (by sex and flesh colour, ages combined), Table XV (by sex, with ages and flesh colours combined), and Table XVI (by flesh colour, with ages and sexes combined).

Without exception the female fish of each river system and of both flesh colours averaged greater fork lengths than the males, and in almost

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[1] The ages of the fish were determined from the scales. In this text they are described in terms of total and freshwater age according to age after hatching. The first number describes the total age of the fish, and the second (the subscript) its freshwater age when it went to sea. Both are in terms of the year of life into which it has entered. Thus a 4_2 fish had entered its fourth year of life, having gone to sea in its second. The scale of such a fish therefore shows one freshwater annulus and two saltwater annuli. "Stream" and "Ocean" type scales are described in the footnote to Table XII.

Recent tests (Godfrey et al., 1968) have shown that experienced scale readers, using good equipment, can age chinook salmon scales with an encouragingly high level of accuracy and consistency.

all cases the difference was statistically significant. A principal factor in this difference was that in each river, and with both flesh colours, the male fish included important proportions of "jacks", the small and so-called "precocious" fish of ages 2_1, 2_2 and 3_2. In all the samples from the three years there were altogether only three[2] (0.4%) females of these ages as compared with 122 (13.9%) males (Tables III-XI).

With few exceptions (and these involved small samples), and with both sexes, the average fork lengths of the white-fleshed fish were greater than those of the red-fleshed fish. The differences are statistically significant in almost all cases. With all data combined (years, rivers and ages), the difference between the two flesh colours amounted to 5.93 cm for the females and 7.87 cm for the males.

ROUND WEIGHT[2]

Upon capture the fish were first weighed "whole" ("in the round"), and then in the "dressed" condition, after having been gutted and cleaned as is done by commercial troll fishermen (the head, with the gills removed, is retained). The round weight data are summarized in Table XVII (by sex and flesh colour, with ages combined); Table XVIII (by sex, with ages and flesh colours combined); and in Table XIX (by flesh colour, with ages and sexes combined).

As might be expected, the average weights of the females were invariably heavier than those of the males - that is, in each river and for the two flesh colours. With only two exceptions (those of the very small 1964 Nass River samples) the white-fleshed fish of both sexes had greater average round weights than the red-fleshed fish, and the differences are statistically significant in almost all cases. With all data combined (years, rivers and ages), the difference between the two flesh colours amounted to 4.91 lb for the females and 5.53 lb for the males.

SEX AND FLESH-COLOUR RATIOS

Table XX gives the sex and flesh-colour ratios (percentages) for the three rivers and the three years. The following tabulations summarize these data. The figures within the brackets give the total sample size.

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[2] "Dairy" scales were used, so that recorded weights are not highly accurate. However, new scales were used each year, and samplers were required to make checks and necessary adjustments frequently.

1. Sex ratios with flesh colours combined

		Males	Females
Nass River	1964-1966 range:	68-71	29-32
	1964-1966 combined:	70	30 (188)
Skeena River	1964-1966 range:	84-90	10-16
	1964-1966 combined:	87	13 (594)
Fraser River	1964-1966 range:	52-67	33-49
	1964-1966 combined:	63	37 (1524)

2. Sex ratios among red-fleshed fish

		Males	Females
Nass River	1964-1966 range:	61-74	26-39
	1964-1966 combined:	69	32 (149)
Skeena River	1964-1966 range:	51-69	31-49
	1964-1966 combined:	63	37 (517)
Fraser River	1964-1966 range:	50-53	47-50
	1964-1966 combined:	50	50 (964)

3. Sex ratios among white-fleshed fish

		Males	Females
Nass River	1964-1966 range:	54-86	14-46
	1964-1966 combined:	74	26 (39)
Skeena River	1964-1966 range:	60-68	32-40
	1964-1966 combined:	64	36 (77)
Fraser River	1964-1966 range:	38-56	44-62
	1964-1966 combined:	51	49 (560)

4. Flesh-colour ratios with sexes combined

		Red	White
Nass River	1964-1966 range:	72-85	15-28
	1964-1966 combined:	79	21 (188)
Skeena River	1964-1966 range:	84-90	10-16
	1964-1966 combined:	87	13 (594)
Fraser River	1964-1966 range:	52-67	33-49
	1964-1966 combined:	63	37 (1524)

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5. Flesh-colour ratios among males

		Red	White	
Nass River	1964-1966 range:	65-89	11-35	
	1964-1966 combined:	78	22	(131)
Skeena River	1964-1966 range:	84-91	9-16	
	1964-1966 combined:	87	13	(374)
Fraser River	1964-1966 range:	60-65	35-40	
	1964-1966 combined:	63	37	(773)

6. Flesh-colour ratios among females

		Red	White	
Nass River	1964-1966 range:	76-90	10-24	
	1964-1966 combined:	82	18	(57)
Skeena River	1964-1966 range:	83-89	11-17	
	1964-1966 combined:	87	13	(220)
Fraser River	1964-1966 range:	45-69	31-55	
	1964-1966 combined:	64	36	(751)

These data lead to the following conclusions: (a) in the three rivers males predominated in the test-fishing catches, roughly in the order of 2:1 or better; (b) to a lesser extent they also predominated among the two flesh colours separately in the Nass and Skeena samples, but not in the Fraser samples, where the sex proportions tended to be more equal; (c) in each of the three rivers the red-fleshed fish predominated strongly among both males and females.

CONVERSION FORMULAE FOR DRESSED AND ROUND WEIGHTS

Whereas troll-caught salmon are usually "dressed" immediately after capture, salmon taken in seines and gillnets are landed (and, therefore, sampled) whole, or "in the round". Thus, from different sources, weights of salmon reported in catches and samples are sometimes for the whole fish and sometimes for the dressed. Because of this, conversion factors are desirable.

Milne (1957) has already provided a practical formula for converting round weight of mature female chinook salmon from dressed weight ($R.W._{lb} = D.W._{lb} \times 1.15$), based upon the observation that in dressing they lose on the average about 15 per cent of their body weight.

In Table XXI regression (linear) formulae for deriving round weight from dressed weight, for males and females, are given, based on Skeena River samples taken in 1964-1966.

Table XXII provides similar formulae for deriving dressed weights from round weights, for males and females separately.

It can be concluded that for practical purposes rough weight conversions may be made on the basis that both maturing male and female chinook salmon lose between 15-20 per cent, on the average, of their body weight by being gutted and cleaned (head, without gills, retained).

CONVERSION FORMULAE FOR FORK AND ORBIT-HYPURAL LENGTHS

Body lengths of salmon are described by several kinds of measurements, of which the above two probably are used most frequently. Fork length measurements are often subject to error due to damage done to the snout and/or caudal fin, or because of the marked structural changes which the snout and jaws have undergone during the late stages of sexual maturation. The orbit-hypural length constitutes a more consistent linear skeletal measurement of the fish.

The "orbit-hypural" length (or even more accurately, the "post-orbit hypural" length) is measured from the posterior margin of the eye socket to the posterior end of the hypural plate (last vertebra).[3] The end of the hypural plate is identified quite accurately from the exterior by the crease that appears across the caudal peduncle when, with the fish on its side, the tail is flexed upward. The measurement is made with specially-designed rulers or calipers.

In the test-fishing operations both fork and orbit-hypural length measurements were made frequently, and these data have therefore provided an opportunity to compute formulae (linear regression) for deriving one kind of measurement from the other. These are given by river, sex and flesh colour (1964-1966 data combined), in Table XXIII.

LENGTH-WEIGHT RELATIONSHIP

The relationship (logarithmic) between the orbit-hypural length and round weight is derived in Table XXIV for maturing female chinook

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[3]Some fisheries agencies measure an "hypural length" from the centre of the eyeball to the posterior end of the hypural plate.

salmon, and in Table XXV for maturing male chinook salmon, for the Skeena and Fraser rivers, using the combined 1964-1966 data and with the flesh colours combined.

EGG COUNT ON BODY LENGTH, AND COMPARISONS BETWEEN FLESH COLOURS, RIVERS AND YEARS

Earlier in this report it was noted that although there were statistically significant differences in average egg count between flesh colours, rivers and years, these could have been due to differences in average body length between the groups being compared. With the test-fishing data, in comparisons by river, year and flesh colour, a positive relationship was found between the log of the egg count and the log of the orbit-hypural length. The correlation coefficients, together with the regression formulae for this relationship, are given in Table XXVI.

To test whether differences in adjusted mean egg number were significant in the between-groups comparisons of log egg number on log orbit-hypural length, covariance analysis was employed to compute F values. These are listed in Table XXVII, for such between-groups comparisons as had samples of adequate size. (Note: Scott, 1962, showed that the addition of egg size to the simple regression of egg number on fork length resulted in significant reduction in residual error variance. Because our material had been preserved in formalin, so that the eggs had hardened and become compressed, we were unable to obtain usable egg-size data).

The interpretations of these results (Tables XXVI and XXVII) are as follows:

A. Comparisons between the two flesh colours (same river and year)

For each of the four listed comparisons it is observed that the orbit-hypural length for fish of one flesh colour is a constant proportion of the rate of increase in egg number for fish of the other flesh colour - i.e., the number of eggs for one flesh colour is a constant proportion of the number of eggs for the other flesh colour. Within the observed length range the red-fleshed fish had more eggs than the white-fleshed fish, at any given length. This is further interpreted as indicating that the eggs of the red-fleshed chinook salmon tended to be smaller than those of the white-fleshed chinooks.

B. Comparisons between rivers (same year and flesh colour)

For each of the three listed comparisons it is observed that the orbit-hypural length for red-fleshed fish of the Skeena River is a constant proportion of the rate of increase in egg number for red-fleshed fish of the Fraser River - i.e., the number of eggs in one river is a constant

proportion of the number of eggs in the other river. Within the observed length range the Fraser River red-fleshed chinook salmon had more eggs than the Skeena River red-fleshed chinooks, at any given length. This is further interpreted as indicating that the eggs of the Fraser River fish tended to be smaller than those of the Skeena River fish.

C. Comparisons between years (same river and flesh colour)

In five of the seven comparisons the values for both elevation and slope were not significantly different (calculated F was less than that required for the 0.05 probability level). The differences in elevation were significant in two instances, as shown (Table XXVII). From this it is concluded that (at least among red-fleshed fish of the Fraser River system) annual differences in egg count (and, therefore, probably also in egg size) can occur between fish of the same orbit-hypural length.

D. These results would support an hypothesis that there are probably genetic differences in fecundity between red- and white-fleshed chinook salmon, and between populations of the same flesh-colour from different river systems.

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Table I. Average total egg counts of chinook salmon, by flesh colour.

Year	Red fleshed						White fleshed					
	Number	Mean	S.D.	Minimum value	Maximum value	Range	Number	Mean	S.D.	Minimum value	Maximum value	Range
Nass River												
1964	12	6714.1	1149.7	5,074	7,632	2,558	1	5907	-	-	-	-
1965	7	5754.3	1061.5	4,805	7,925	3,121	1	9513	-	-	-	-
1966	18	6325.1	1153.	4,713	8,937	4,224	6	7159.7	1318.	4,815	8,217	3,402
1964-1966	37	6343.3	1135.	4,713	8,937	4,224	8	7297.3	2420.	4,815	9,513	4,698
Skeena River												
1964	72	6418.8	1495.0	2,058	10,638	8,580	8	9266.5	1606.4	5,708	10,673	4,965
1965	9	6096.7	1198.6	4,383	7,632	3,249	2	8216.5	-	6,989	9,444	2,455
1966	74	6608.0	1647.0	3,872	11,537	7,665	10	9162.2	1131.	7,397	10,953	3,556
1964-1966	155	6490.4	1550.	2,058	11,537	9,479	20	9109.4	1345.	5,708	10,953	5,245
Fraser River												
1964	63	5913.3	1203.0	2,797	8,176	5,379	74	5670.8	1083.0	3,563	8,636	5,073
1965	62	5739.2	1450.4	2,638	8,350	5,712	43	5834.6	990.5	3,273	7,431	4,158
1966	77	5904.4	1317.	2,986	8,869	5,883	32	5695.1	1191.	3,664	7,824	4,160
1964-1966	202	5856.5	1322.	2,638	8,869	6,231	149	5723.3	1079.	3,273	8,636	5,363

Table II. Pyloric caeca counts of chinook salmon taken in the Nass, Skeena and Fraser rivers in 1964, by flesh colour.

	Number	Mean	Standard deviation	Range
Nass River - red	35	151.7	17.6	114-184
- white	14	148.4	17.0	130-197
Skeena River - red	217	154.8	19.5	104-225
- white	21	165.1	15.7	138-189
Fraser River - red	113	147.4	18.9	103-216
- white	99	150.3	20.0	115-237

Table III. Age composition of chinook salmon by sex and flesh colour, 1964.

Nass River

Age	Red males		Red females		White males		White females		All males		All females		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
2_1	1	4.5	0		1	10.0	0		2	6.3	0		2	4.2
2_2	0		0		0		0		0		0		0	
3_1	6	27.3	0		1	10.0	0		7	21.9	0		7	14.6
3_2	0		0		4	40.0	0		4	12.5	0		4	8.3
4_1	2	9.1	6	40.0	0		1	100.0	2	6.3	7	43.8	9	18.8
4_2	9	40.9	2	13.3	2	20.0	0		11	34.4	2	12.5	13	27.1
5_1	0		1	6.7	0		0		0		1	6.3	1	2.1
5_2	4	18.2	6	40.0	2	20.0	0		6	18.8	6	37.5	12	25.0
6_1	0		0		0		0		0		0		0	
6_2	0		0		0		0		0		0		0	
Sub-total	22	100.0	15	100.0	10	100.0	1	100.0	32	100.0	16	100.0	48	100.0
Unknown	8		4		6		2		14		6		20	
Total	30		19		16		3		46		22		68	

Table IV. Age composition of chinook salmon, by sex and flesh colour, 1964.

Skeena River

Age	Red males		Red females		White males		White females		All males		All females		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
2_1	4	4.3	0		0		0		4	4.0	0		4	2.7
2_2	1	1.1	0		1	11.1	0		2	2.0	0		2	1.3
3_1	6	6.5	0		2	22.2	0		8	7.9	0		8	5.4
3_2	24	26.1	0		0		0		24	23.8	0		24	16.1
4_1	10	10.9	16	36.4	0		0		10	9.9	16	33.3	26	17.4
4_2	32	34.8	4	9.1	3	33.3	0		35	34.7	4	8.3	39	26.2
5_1	3	3.3	1	2.3	0		2	50.0	3	3.0	3	6.3	6	4.0
5_2	11	12.0	21	47.7	2	22.2	2	50.0	13	12.9	23	47.9	36	24.2
6_1	0		0		0		0		0		0		0	
6_2	1	1.1	2	4.5	1	11.1	0		2	2.0	2	4.2	4	2.7
Sub-total	92	100.0	44	100.0	9	100.0	4	100.0	101	100.0	48	100.0	149	100.0
Unknown	56		29		6		5		62		34		96	
Total	148		73		15		9		163		82		245	

Table V. Age composition of chinook salmon, by sex and flesh colour, 1964.

Fraser River

Age	Red males		Red females		White males		White females		All males		All females		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
2_1	0		0		1	2.9	0		1	1.2	0		1	0.5
2_2	0		0		0		0		0		0		0	
3_1	8	15.7	2	4.3	4	11.4	0		12	14.0	2	1.8	14	7.1
3_2	1	2.0	0		0		0		1	1.2	0		1	0.5
4_1	13	25.5	20	42.6	18	51.4	38	58.5	31	36.0	58	51.8	89	44.9
4_2	12	23.5	9	19.1	7	20.0	3	4.6	19	22.1	12	10.7	31	15.7
5_1	1	2.0	1	2.1	1	2.9	11	16.9	2	2.3	12	10.7	14	7.1
5_2	15	29.4	15	31.9	4	11.4	13	20.0	19	22.1	28	25.0	47	23.7
6_1	1	2.0	0		0		0		1	1.2	0		1	0.5
6_2	0		0		0		0		0		0		0	
Sub-total	51	100.0	47	100.0	35	100.0	65	100.0	86	100.0	112	100.0	198	100.0
Unknown	21		17		14		14		35		31		66	
Total	72		64		49		79		121		143		264	

Table VI. Age composition of chinook salmon by sex and flesh colour, 1965.

Nass River

Age	Red males		Red females		White males		White females		All males		All females		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
2_1	0		0		0		0		0		0		0	
2_2	0		0		0		0		0		0		0	
3_1	10	76.9	0		2	50.0	0		12	70.6	0		12	44.4
3_2	0		0		0		0		0		0		0	
4_1	0		7	77.8	2	50.0	1	100.0	2	11.8	8	80.0	10	37.0
4_2	2	15.4	0		0		0		2	11.8	0		2	7.4
5_1	1	7.7	0		0		0		1	5.9	0		1	3.7
5_2	0		2	22.2	0		0		0		2	20.0	2	7.4
6_1	0		0		0		0		0		0		0	
6_2	0		0		0		0		0		0		0	
Sub-total	13	100.0	9	100.0	4	100.0	1	100.0	17	100.0	10	100.0	27	100.0
Unknown	4		0		2		0		6		0		6	
Total	17		9		6		1		23		10		33	

Table VII. Age composition of chinook salmon by sex and flesh colour, 1965.

Skeena River

Age	Red males		Red females		White males		White females		All males		All females		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
2_1	7	9.7	0		0		0		7	8.4	0		7	5.9
2_2	0		0		0		0		0		0		0	
3_1	23	31.9	1	3.2	3	27.3	0		26	31.3	1	2.8	27	22.7
3_2	11	15.3	0	0.0	4	36.4	0		15	18.1	0	0.0	15	12.6
4_1	8	11.1	19	61.3	2	18.2	2	40.0	10	12.0	21	58.3	31	26.1
4_2	16	22.2	1	3.2	1	9.1	0		17	20.5	1	2.8	18	15.1
5_1	3	4.2	3	9.7	1	9.1	1	20.0	4	4.8	4	11.1	8	6.7
5_2	4	5.6	6	19.4	0		2	40.0	4	4.8	8	22.2	12	10.1
6_1	0		0		0		0		0		0		0	
6_2	0		1	3.2	0		0		0		1	2.8	1	0.8
Sub-total	72	100.0	31	100.0	11	100.0	5	100.0	83	100.0	36	100.0	119	100.0
Unknown	28		14		8		4		36		18		54	
Total	100		45		19		9		119		54		173	

Table VIII. Age composition of chinook salmon by sex and flesh colour, 1965.

Fraser River

Age	Red males		Red females		White males		White females		All males		All females		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
2_1	6	4.6	0		1	1.2	1	1.4	7	3.2	1	0.5	8	2.0
2_2	0		0		0		0		0		0		0	
3_1	31	23.7	8	6.8	30	35.3	3	4.3	61	28.2	11	5.9	72	17.9
3_2	9	6.9	2	1.7	2	2.4	0	0.0	11	5.1	2	1.1	13	3.2
4_1	35	26.7	51	43.6	36	42.4	41	58.6	71	32.9	92	49.2	163	40.4
4_2	35	26.7	27	23.1	4	4.7	1	1.4	39	18.1	28	15.0	67	16.6
5_1	4	3.0	9	7.7	9	10.6	17	24.3	13	6.0	26	13.9	39	9.7
5_2	11	8.4	17	14.5	3	3.5	7	10.0	14	6.5	24	12.8	38	9.4
6_1	0		1	0.9	0		0		0		1	0.5	1	0.2
6_2	0		2	1.7	0		0		0		2	1.1	2	0.5
Sub-total	131	100.0	117	100.0	85	100.0	70	100.0	216	100.0	187	100.0	403	100.0
Unknown	44		57		24		17		68		74		142	
Total	175		174		109		87		284		261		545	

Table IX. Age composition of chinook salmon by sex and flesh colour, 1966.

Nass River

Age	Red males		Red females		White males		White females		All males		All females		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
2_1	7	19.4	0		1	25.0	0		8	20.0	0		8	15.1
2_2	0		0		0		0		0		0		0	
3_1	7	19.4	0		1	25.0	0		8	20.0	0		8	15.1
3_2	9	25.0	0		0		0		9	22.5	0		9	17.0
4_1	3	8.3	4	44.4	0		0		3	7.5	4	30.8	7	13.2
4_2	9	25.0	0		2	50.0	0		11	27.5	0		11	20.8
5_1	1	2.8	4	44.4	0		4	100.0	1	2.5	8	61.5	9	17.0
5_2	0		1	11.2	0		0		0		1	7.8	1	1.9
6_1	0		0		0		0		0		0		0	
6_2	0		0		0		0		0		0		0	
Sub-total	36	100.0	9	100.0	4	100.0	4	100.0	40	100.0	13	100.0	53	100.0
Unknown	19		10		3		2		22		12		34	
Total	55		19		7		6		62		25		87	

Table X. Age composition of chinook salmon by sex and flesh colour, 1966.

Skeena River

Age	Red males		Red females		White males		White females		All males		All females		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
2_1	0		0		0		0		0		0		0	
2_2	0		0		0		0		0		0		0	
3_1	16	26.7	1	1.8	0		0		16	23.2	1	1.5	17	12.7
3_2	0		0		0		0		0		0		0	
4_1	15	25.0	35	61.4	3	33.3	3	37.5	18	26.1	38	58.5	56	41.8
4_2	23	38.3	1	1.8	3	33.3	0	12.5	26	37.7	1	1.5	27	20.1
5_1	3	5.0	12	21.1	3	33.3	1		6	8.7	13	20.0	19	14.2
5_2	3	5.0	6	10.5	0		3	37.5	3	4.3	9	13.8	12	9.0
6_1	0		0		0		0		0		0		0	
6_2	0		2	3.5	0		1	12.5	0		3	4.6	3	2.2
Sub-total	60	100.0	57	100.0	9	100.0	8	100.0	69	100.0	65	100.0	134	100.0
Unknown	17		17		6		2		23		19		42	
Total	77		74		15		10		92		84		176	

Table XI. Age composition of chinook salmon by sex and flesh colour, 1966.

Fraser River

Age	Red males		Red females		White males		White females		All males		All females		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
2_1	1	0.6	0		14	13.2	0		15	5.7	0		15	3.0
2_2	0		0		0		0		0		0		0	
3_1	37	23.7	11	7.4	25	23.6	11		62	23.7	22	9.5	84	17.0
3_2	10	6.4	0		2	1.9	0		12	4.6	0		12	2.4
4_1	36	23.1	64	43.2	49	46.2	58		85	32.4	122	52.8	207	42.0
4_2	53	34.0	31	20.9	10	9.4	5		63	24.0	36	15.6	99	20.1
5_1	4	2.6	4	2.7	3	2.8	4		7	2.7	8	3.5	15	3.0
5_2	13	8.3	36	24.3	3	2.8	4		16	6.1	40	17.3	56	11.4
6_1	2	1.3	0	1.4	0		1		2	0.8	1	0.4	3	0.6
6_2	0		2		0		0		0		2	0.9	2	0.4
Sub-total	156	100.0	148	100.0	106	100.0	83	100.0	262	100.0	231	100.0	493	100.0
Unknown	84		91		22		25		106		116		222	
Total	240		239		128		108		368		347		715	

Table XII. Comparisons between rivers of the ages of chinook salmon (a) age composition including both "ocean" and "stream" types; (b) age composition among the "ocean" type separately; (c) age composition among the "stream" type separately. Data for 1964-1966 combined.[1]

		2_1	3_1	4_1	5_1	6_1	Total	2_2	3_2	4_2	5_2	6_2	Total	Types combined
A. Among "ocean" and "stream" types together														
Nass River	- No.	10	27	26	11	0	74	0	13	26	15	0	54	128
	%	7.8	21.1	20.3	8.6	0.0	57.8	0.0	10.2	20.3	11.7	0.0	42.2	100.0
Skeena River	- No.	11	52	113	33	0	209	2	39	84	60	8	193	402
	%	2.7	12.9	28.1	8.2	0.0	52.0	0.5	9.7	20.9	14.9	2.0	48.0	100.0
Fraser River	- No.	24	170	459	68	5	726	0	26	197	141	4	368	1094
	%	2.2	15.5	42.0	6.2	0.5	66.4	0.0	2.4	18.0	12.9	0.4	33.6	100.0
B. Among "ocean" type separately								**C. Among "stream" type separately**						
Nass River	- No.	10	27	26	11	0	74	0	13	26	15	0	54	
	%	13.5	36.5	35.1	14.9	0.0	100.0	0.0	24.1	48.1	27.8	0.0	100.0	
Skeena River	- No.	11	52	113	33	0	209	2	39	84	60	8	193	
	%	5.3	24.9	54.1	15.8	0.0	100.0	1.0	20.2	43.5	31.1	4.1	100.0	
Fraser River	- No.	24	170	459	68	5	726	0	26	197	141	4	368	
	%	3.3	23.4	63.2	9.4	0.7	100.0	0.0	7.1	53.5	38.3	1.1	100.0	

[1] "Ocean" type scales are from fish that went to sea in their first year of life; they may show freshwater growth (circuli), but no freshwater annulus. "Stream" type scales are from fish that went to sea after at least one full year in fresh water; they show at least one freshwater annulus. (In the above scales all "stream" types showed only one freshwater annulus.) For explanation of the age designation used see the footnote on page 3.

Table XIII. Fraser River comparison between the age composition of the Test Fishing samples and the computed age composition of the Commercial Gillnet Catch.[1]

	"Ocean" type						"Stream" type					
	2_1	3_1	4_1	5_1	6_1	Sub-total	2_2	3_2	4_2	5_2	6_2	Total
1964 - Test fishing	0.5	7.1	44.9	7.1	0.5	60.1	-	0.5	15.7	23.7	-	100.0
- Commercial catch	6.3	18.9	27.3	1.6	-	54.1	-	5.5	24.5	15.6	0.2	100.0
1965 - Test fishing	2.0	17.9	40.4	9.7	0.2	70.2	-	3.2	16.6	9.4	0.5	100.0
- Commercial catch	0.8	11.3	25.2	3.8	-	41.1	-	5.5	29.7	22.6	1.1	100.0
1966 - Test fishing	3.0	17.0	42.0	3.0	0.6	65.6	-	2.4	20.1	11.4	0.4	100.0
- Commercial catch	1.8	24.0	38.1	2.8	-	66.7	-	1.6	19.5	12.2	0.1	100.0

[1]The commercial gillnet catch (Fraser River, Area 29) samples were weighted to the catch by weekly periods (or monthly periods when catches were very small).

Table XIV. Average fork lengths (cm) of chinook salmon by sex and flesh colour, ages combined.

Year	Number	Mean	S.D.	Minimum value	Maximum value	Range	Number	Mean	S.D.	Minimum value	Maximum value	Range
					Nass River							
		Red-fleshed females						Red-fleshed males				
1964	19	93.2	9.8	62.7	108.0	45.3	30	73.6	12.3	42.3	101.5	59.2
1965	9	91.0	4.0	85.8	97.5	11.7	17	70.9	18.4	38.6	103.5	64.9
1966	19	92.6	7.9	74.6	108.2	33.6	55	57.5	15.4	34.4	112.8	78.4
1964-1966	47	92.6	8.1	62.7	108.2	45.5	102	64.4	16.8	34.4	112.8	78.4
		White-fleshed females						White-fleshed males				
1964	3	86.7	2.4	84.0	88.5	45.0	16	67.1	17.6	41.5	97.0	55.5
1965	1	97.5	-	97.5	97.5	-	6	83.1	15.2	65.5	107.5	42.0
1966	6	99.3	4.3	91.5	103.4	11.9	6	65.5	24.9	38.5	105.2	66.7
1964-1966	10	95.3	6.9	84.0	103.4	19.4	28	70.1	19.4	38.5	107.5	69.0
					Skeena River							
		Red-fleshed females						Red-fleshed males				
1964	73	91.8	9.1	42.7	112.8	70.1	148	67.2	20.5	34.8	123.0	88.2
1965	45	91.5	7.2	78.4	113.5	35.1	100	68.7	20.0	39.1	125.0	85.9
1966	74	92.4	7.1	74.3	111.0	35.7	77	78.0	13.9	58.0	133.6	75.6
1964-1966	192	91.9	7.9	42.7	113.5	70.8	325	70.2	18.6	34.8	133.6	79.9
		White-fleshed females						White-fleshed males				
1964	9	101.2	9.7	83.8	112.9	29.1	15	68.0	24.4	40.3	120.2	79.9
1965	9	99.0	6.8	86.9	109.0	22.1	19	72.0	19.5	42.2	110.5	68.3
1966	10	103.7	13.0	83.4	133.0	49.6	15	82.1	28.4	68.8	115.0	46.2
1964-1966	28	101.4	10.1	83.4	133.0	49.6	49	73.8	21.9	40.3	120.2	79.9

Table XIV continued

Year	Number	Mean	S.D.	Minimum value	Maximum value	Range	Number	Mean	S.D.	Minimum value	Maximum value	Range
					Fraser River							
			Red-fleshed females						Red-fleshed males			
1964	64	84.3	8.0	65.0	104.5	39.5	72	80.7	13.1	49.0	103.0	54.0
1965	174	80.2	9.8	59.0	106.0	47.0	175	71.0	14.6	34.7	101.0	66.3
1966	239	79.9	8.6	60.5	107.0	46.5	240	73.7	13.6	42.5	104.4	61.9
1964-1966	477	80.6	9.1	59.0	107.0	48.0	487	73.7	14.2	34.7	104.4	69.7
			White-fleshed females						White-fleshed males			
1964	79	84.3	7.2	71.5	103.0	31.5	49	82.7	12.4	53.0	101.5	48.5
1965	87	89.5	7.4	58.0	100.0	42.0	109	82.3	16.3	40.2	111.0	70.8
1966	108	88.7	7.0	65.9	103.0	37.1	128	78.9	17.9	32.7	108.0	75.3
1964-1966	274	89.1	7.2	58.0	103.0	45.0	286	80.9	16.5	32.7	111.0	78.3

Table XV. Average fork lengths (cm) of chinook salmon by sex, ages and flesh colours combined.

Year	Females						Males					
	Number	Mean	S.D.	Minimum value	Maximum value	Range	Number	Mean	S.D.	Minimum value	Maximum value	Range
					Nass River							
1964	22	93.2	9.4	62.7	108.0	45.3	46	71.3	14.5	41.5	101.5	60.0
1965	10	91.6	4.3	85.8	97.5	11.7	25	73.4	17.6	38.6	107.5	68.9
1966	25	94.2	7.7	74.6	108.2	33.6	61	58.2	16.5	34.4	112.8	78.4
1964-1966	57	93.0	7.9	62.7	108.2	45.5	132	65.7	17.4	34.4	112.8	78.4
					Skeena River							
1964	82	92.8	9.6	42.7	112.9	70.2	163	67.2	20.8	34.8	123.0	88.2
1965	55	93.0	7.8	78.4	113.5	35.1	124	69.1	20.1	39.1	125.0	85.9
1966	84	93.8	8.8	74.3	133.0	58.7	93	78.8	16.9	58.0	133.6	75.6
1964-1966	221	93.2	8.8	42.7	133.0	90.3	380	70.7	19.2	34.8	133.6	98.8
					Fraser River							
1964	143	87.0	7.9	65.0	104.5	39.5	121	81.5	12.8	49.0	103.0	54.0
1965	261	83.3	10.0	58.0	106.0	48.0	287	75.3	16.2	34.7	111.0	76.3
1966	347	82.6	9.1	60.5	107.0	46.5	368	75.5	15.4	32.7	108.0	75.3
1964-1966	751	83.7	9.3	58.0	107.0	49.0	776	76.4	15.5	32.7	111.0	78.3

Table XVI. Average fork lengths (cm) of chinook salmon by flesh colour, ages and sexes combined.

Year	Red fleshed						White fleshed					
	Number	Mean	S.D.	Minimum value	Maximum value	Range	Number	Mean	S.D.	Minimum value	Maximum value	Range
					Nass River							
1964	49	81.2	14.9	42.3	108.0	65.7	19	70.2	17.7	41.5	97.0	55.5
1965	26	77.9	17.8	38.6	103.5	64.9	7	85.1	14.9	65.5	107.5	42.0
1966	74	66.5	20.8	34.4	112.8	78.4	12	82.4	24.5	38.5	105.2	66.7
1964-1966	149	73.3	19.6	34.4	112.8	78.4	38	76.8	20.3	38.5	107.5	69.0
					Skeena River							
1964	221	75.3	21.1	34.8	123.0	88.2	24	80.4	25.8	40.3	120.2	79.9
1965	148	75.6	19.9	40.2	125.0	84.8	28	80.7	20.8	42.2	110.5	68.3
1966	151	85.1	13.2	58.0	133.6	75.6	24	94.5	17.5	68.8	133.0	64.2
1964-1966	520	78.2	18.6	34.8	133.6	98.8	76	85.0	22.3	40.3	133.0	92.7
					Fraser River							
1964	136	82.4	11.1	49.0	104.5	55.5	128	86.7	10.0	53.0	103.0	50.0
1965	350	75.6	13.3	34.7	106.0	71.3	196	85.5	13.5	40.2	111.0	70.8
1966	479	76.8	11.7	42.5	107.0	64.5	237	83.4	14.8	32.7	108.0	75.3
1964-1966	965	77.1	12.4	34.7	107.0	72.3	561	84.9	13.4	32.7	111.0	78.3

Table XVII. Average round weights (lb) of chinook salmon by sex and by colour, ages combined.

Year	Number	Mean	S.D.	Minimum value	Maximum value	Range	Number	Mean	S.D.	Minimum value	Maximum value	Range
					Nass River							
		Red-fleshed females						Red-fleshed males				
1964	15	26.80	7.83	8.0	40.0	32.0	26	14.68	7.21	2.5	32.0	29.5
1965	9	23.88	4.40	17.6	31.0	13.4	17	14.37	11.79	1.8	45.0	43.2
1966	19	25.93	6.68	13.2	38.4	25.2	55	7.49	6.72	1.5	45.0	43.5
1964-1966	43	25.80	6.66	8.0	40.0	32.0	98	10.59	8.59	1.5	45.0	43.5
		White-fleshed females						White-fleshed males				
1964	3	19.70	2.59	16.8	21.8	5.0	16	12.08	9.46	2.9	33.5	30.6
1965	1	34.20	-	34.2	34.2	0.0	6	21.26	12.0-	9.9	42.0	32.1
1966	6	31.35	3.99	24.5	35.5	11.0	7	11.59	13.61	1.6	38.5	36.9
1964-1966	10	28.14	6.71	16.8	35.5	18.7	29	13.86	11.32	1.6	42.0	40.4
					Skeena River							
		Red-fleshed females						Red-fleshed males				
1964	58	25.23	7.47	2.5	48.6	46.1	108	13.14	12.64	1.1	70.0	68.9
1965	45	24.62	7.10	14.0	50.0	36.0	100	12.95	9.93	1.0	53.0	52.0
1966	74	26.99	7.15	15.0	46.0	31.0	77	16.71	9.01	6.0	43.0	37.0
1964-1966	177	25.81	7.28	2.5	50.0	47.5	285	14.04	10.91	1.0	70.0	69.0
		White-fleshed females						White-fleshed males				
1964	7	40.44	8.40	26.8	50.2	23.4	10	20.67	22.01	5.2	70.0	64.8
1965	9	31.38	6.28	18.0	38.5	20.5	19	14.43	11.03	2.0	45.0	43.0
1966	10	37.53	9.01	6.0	43.0	37.0	15	26.84	15.29	10.5	52.0	41.5
1964-1966	26	36.18	8.10	18.0	50.2	32.2	44	20.08	16.08	2.0	70.0	68.0

Table XVII continued

Year	Number	Mean	S.D.	Minimum value	Maximum value	Range	Number	Mean	S.D.	Minimum value	Maximum value	Range
					Fraser River							
			Red-fleshed females						Red-fleshed males			
1964	64	21.11	5.85	8.0	36.5	28.5	72	19.72	8.92	4.1	40.0	35.9
1965	171	18.51	6.67	6.7	43.0	36.3	174	14.03	8.27	1.8	38.0	36.2
1966	239	18.10	6.00	7.4	43.2	35.8	239	15.29	8.30	2.6	41.5	38.9
1964-1966	474	18.65	6.30	6.7	43.2	36.5	485	15.51	8.57	1.8	41.5	39.7
			White-fleshed females						White-fleshed males			
1964	79	24.76	5.90	10.2	36.9	26.7	49	21.25	8.85	4.5	37.3	32.8
1965	87	24.94	5.28	6.7	43.0	36.3	109	21.43	10.95	2.6	49.9	47.3
1966	108	24.60	5.93	9.0	40.0	31.0	128	19.67	11.32	1.2	42.8	41.6
1964-1966	274	24.75	5.70	7.4	40.0	32.6	286	20.61	10.79	1.2	49.9	48.7

Table XVIII. Average round weights (lb) of chinook salmon by sex, ages and colours combined.

Year	Females						Males					
	Number	Mean	S.D.	Minimum value	Maximum value	Range	Number	Mean	S.D.	Minimum value	Maximum value	Range
					Nass River							
1964	18	25.62	7.66	8.0	40.0	32.0	42	13.69	8.13	2.5	33.5	31.0
1965	10	24.91	5.27	17.6	34.2	16.6	25	15.63	11.65	1.8	45.0	43.2
1966	25	27.23	6.51	13.2	38.4	25.2	62	7.95	7.74	1.5	45.0	43.5
1964-1966	53	26.24	6.67	8.0	40.0	32.0	129	11.31	9.28	1.5	45.0	43.5
					Skeena River							
1964	65	26.87	8.88	2.5	50.2	47.7	118	13.78	13.70	1.1	70.0	68.9
1965	55	25.91	7.40	14.0	50.0	36.0	124	13.15	10.14	2.0	53.0	51.0
1966	84	28.25	7.96	15.0	48.5	33.5	93	18.39	10.80	6.0	52.0	46.0
1964-1966	204	27.18	8.14	2.5	50.2	47.7	335	14.82	11.86	1.1	70.0	68.9
					Fraser River							
1964	143	23.13	6.13	8.0	36.9	28.8	121	20.34	8.9	4.1	40.0	35.9
1965	258	20.68	6.93	6.7	43.0	36.3	286	16.88	10.0	1.8	49.9	48.1
1966	347	20.12	6.69	7.4	43.2	35.8	367	16.82	9.68	1.2	42.8	41.6
1964-1966	748	20.89	6.76	6.7	43.2	36.5	774	17.39	9.75	1.2	49.9	48.7

Table XIX. Average round weights (lb) of chinook salmon by flesh colour, ages and sexes combined.

Year	Red fleshed						White fleshed					
	Number	Mean	S.D.	Minimum value	Maximum value	Range	Number	Mean	S.D.	Minimum value	Maximum value	Range
					Nass River							
1964	41	19.11	9.48	2.5	40.0	37.5	18	13.87	9.04	3.5	33.5	30.0
1965	27	17.38	10.73	1.8	31.0	29.2	9	18.98	13.43	9.0	42.0	33.0
1966	74	12.23	10.50	1.5	45.0	43.5	13	20.71	14.30	1.6	38.5	36.9
1964-1966	142	15.20	10.2-	1.5	45.0	43.5	40	17.24	11.7-	1.6	42.0	40.4
					Skeena River							
1964	167	17.34	12.4-	1.1	70.0	68.9	18	27.36	20.35	2.5	70.0	67.5
1965	153	16.24	10.24	1.0	50.0	49.0	28	19.88	12.56	2.0	45.0	43.0
1966	151	21.76	9.63	6.0	46.0	40.0	25	31.12	13.70	10.5	52.0	41.5
1964-1966	471	18.40	10.8-	1.1	70.0	68.9	71	25.73	14.9-	2.0	70.0	67.5
					Fraser River							
1964	136	20.38	7.64	4.1	40.0	35.9	126	23.79	6.78	4.5	37.3	32.8
1965	353	16.27	7.92	1.8	43.0	41.2	192	23.07	8.98	2.6	49.9	47.3
1966	479	16.73	7.33	2.6	43.2	40.6	237	21.99	9.58	1.2	42.8	41.6
1964-1966	968	17.08	7.59	1.8	43.2	41.4	555	22.77	8.7-	1.2	49.9	48.7

Table XX. Sex and flesh-colour ratios, by number and per cent.

No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Nass River - 1964						Nass River - 1965					
Red males		Red females		Total		Red males		Red females		Total	
30	61.2	19	38.8	49	100.0	17	65.4	9	34.6	26	100.0
White males		White females		Total		White males		White females		Total	
16	84.2	3	15.8	19	100.0	6	85.7	1	14.3	7	100.0
All males		All females		Total		All males		All females		Total	
46	67.6	22	32.4	68	100.0	23	69.7	10	30.3	33	100.0
All reds		All whites		Total		All reds		All whites		Total	
49	72.1	19	27.9	68	100.0	26	78.8	7	21.2	33	100.0
Skeena River - 1964						Skeena River - 1965					
Red males		Red females		Total		Red males		Red females		Total	
148	67.0	73	33.0	221	100.0	100	69.0	45	31.0	145	100.0
White males		White females		Total		White males		White females		Total	
15	62.5	9	37.5	24	100.0	19	67.9	9	32.1	28	100.0
All males		All females		Total		All males		All females		Total	
163	66.5	82	33.5	245	100.0	119	68.8	54	31.2	173	100.0
All reds		All whites		Total		All reds		All whites		Total	
221	90.2	24	9.8	245	100.0	145	83.8	28	16.2	173	100.0
Fraser River - 1964						Fraser River - 1965					
Red males		Red females		Total		Red males		Red females		Total	
72	52.9	64	47.1	136	100.0	175	50.1	174	49.9	349	100.0
White males		White females		Total		White males		White females		Total	
49	38.3	79	61.7	128	100.0	109	55.6	87	44.4	196	100.0
All males		All females		Total		All males		All females		Total	
121	45.8	143	54.2	264	100.0	284	52.1	261	47.9	545	100.0
All reds		All whites		Total		All reds		All whites		Total	
136	51.5	128	48.5	264	100.0	349	64.0	196	36.0	545	100.0

Table XX continued

No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Nass River - 1966						Nass River - 1964-1966					
Red males		Red females		Total		Red males		Red females		Total	
55	74.3	19	25.7	74	100.0	102	68.5	47	31.5	149	100.0
White males		White females		Total		White males		White females		Total	
7	53.8	6	46.2	13	100.0	29	74.4	10	25.6	39	100.0
All males		All females		Total		All males		All females		Total	
62	71.3	25	28.7	87	100.0	131	69.7	57	30.3	188	100.0
All reds		All whites		Total		All reds		All whites		Total	
74	85.1	13	14.9	87	100.0	149	79.3	39	20.7	188	100.0
Skeena River - 1966						Skeena River - 1964-1966					
Red males		Red females		Total		Red males		Red females		Total	
77	51.0	74	49.0	151	100.0	325	62.9	192	37.1	517	100.0
White males		White females		Total		White males		White females		Total	
15	60.0	10	40.0	25	100.0	49	63.6	28	36.4	77	100.0
All males		All females		Total		All males		All females		Total	
92	52.3	84	47.7	176	100.0	374	63.0	220	37.0	594	100.0
All reds		All whites		Total		All reds		All whites		Total	
151	85.8	25	14.2	176	100.0	517	87.0	77	13.0	594	100.0
Fraser River - 1966						Fraser River - 1964-1966					
Red males		Red females		Total		Red males		Red females		Total	
240	50.1	239	49.9	479	100.0	487	50.5	477	49.5	964	100.0
White males		White females		Total		White males		White females		Total	
128	54.2	108	45.8	236	100.0	286	51.1	274	48.9	560	100.0
All males		All females		Total		All males		All females		Total	
368	51.5	347	48.5	715	100.0	773	50.7	751	49.3	1524	100.0
All reds		All whites		Total		All reds		All whites		Total	
479	67.0	236	33.0	715	100.0	964	63.3	560	36.7	1524	100.0

Table XXI. Regression of round weight on dressed weight by sex (flesh colours combined), in pounds. Skeena River samples, 1964-1966.

Year	Females			Males		
	n	b	a	n	b	a
1964	64	1.2164	- 0.5169	114	1.1524	0.4755
1965	55	1.1395	0.922	122	1.1499	1.0300
1966	83	1.2443	- 1.5741	89	1.1391	1.2421
1964-1966	202	1.2050	- 0.4830	325	1.1465	0.0286

Table XXII. Regression of dressed weight on round weight by river and sex (flesh colours combined), 1964-1966, in pounds.

Year	Females			Males		
	n	b	a	n	b	a
			Nass River			
1964	18	0.8043	0.1885	42	0.8581	0.0134
1965	10	0.7800	1.5904	25	0.8595	0.0994
1966	25	0.7400	2.8856	60	0.8744	- 0.1351
1964-1966	53	0.7789	1.4521	127	0.8652	- 0.0545
			Skeena River			
1964	64	0.8124	0.6803	115	0.8663	0.0206
1965	55	0.8574	- 0.2877	122	0.8645	- 0.0210
1966	83	0.7928	1.5715	91	0.8739	0.1227
1964-1966	202	0.8163	0.7674	327	0.8693	0.0177
			Fraser River			
1964	143	0.7752	1.3929	121	0.8823	- 0.1413
1965	258	0.8085	0.9854	285	0.8613	0.2860
1966	118	0.7938	1.2402	125	0.8594	0.2668
1964-1966	518	0.7931	1.2050	531	0.8647	0.2128

Table XXIII. Regression formulae for deriving orbit-hypural length from fork length, and fork length from orbit-hypural length (mm units); by river, sex and flesh colour. Data for 1964-1966 combined.

A. $H.L._{mm} = a + b\ F.L._{mm}$

River	a	b	Sample size	Mean F.L.	Mean H.L.	a	b	Sample size	Mean F.L.	Mean H.L.
		Red Females					Red Males			
Nass	36.43	0.7702	46	926.0	749.6	7.82	0.7912	98	644.3	517.6
		White Females					White Males			
	6.56	0.8001	9	951.0	767.4	8.23	0.7845	27	688.5	548.4
		Red Females					Red Males			
Skeena	20.88	0.8009	192	919.5	757.3	28.43	0.7751	323	706.4	575.9
		White Females					White Males			
	314.44	0.5055	28	1014.0	827.0	17.12	0.7899	48	753.8	612.5
		Red Females					Red Males			
Fraser	25.73	0.7995	477	806.0	670.2	10.84	0.8083	487	737.4	606.9
		White Females					White Males			
	53.7335	0.7593	274	890.5	729.9	25.61	0.7747	285	808.2	651.7

B. $F.L._{mm} = a + b\ H.L._{mm}$

		Red Females					Red Males			
Nass	70.21	1.1416	46	926.0	749.6	4.90	1.2353	98	644.3	517.6
		White Females					White Males			
	36.59	1.1915	9	951.0	767.4	-7.78	1.2697	27	688.5	548.4
		Red Females					Red Males			
Skeena	47.91	1.1509	192	919.5	757.3	48.87	1.1416	323	706.4	575.9
		White Females					White Males			
	-86.28	1.3304	28	1014.0	827.0	-12.78	1.2515	48	753.8	612.5
		Red Females					Red Males			
Fraser	-13.33	1.2226	477	806.0	670.2	-4.71	1.2229	487	737.4	606.9
		White Females					White Males			
	10.06	1.2063	274	890.5	729.9	-22.86	1.2752	285	808.2	651.7

Table XXIV. Length (orbit-hypural) - weight (round) relationship for maturing female chinook salmon; Skeena and Fraser rivers, 1964-1966; flesh colours combined (in cm and lb).

Mid-length class cm	Number	Observed average weight lb	Calculated average weight lb	Difference lb
		A. Skeena River		
62.5	4	15.5	15.6	+0.1
67.5	13	19.7	19.1	-0.6
72.5	74	22.0	23.1	+1.1
77.5	62	27.7	27.5	-0.2
82.5	24	32.6	32.4	-0.2
87.5	17	40.9	37.9	-3.0
92.5	9	41.2	43.8	+2.6
	203			
log Round Weight (lb) = $\bar{6}$.8375 + 2.6311 log 0 - Hypural Length (cm)				
		B. Fraser River		
47.5	3	7.2	6.7	-0.5
52.5	24	8.3	9.0	+0.7
57.5	79	11.2	11.7	+0.5
62.5	89	14.7	14.8	+0.1
67.5	176	19.2	18.5	-0.7
72.5	213	23.5	22.7	-0.8
77.5	134	28.4	27.5	-0.9
82.5	26	33.4	32.8	-0.6
87.5	4	36.5	38.9	+2.4
	748			
log Round Weight (lb) = $\bar{6}$.1418 + 2.8715 log 0 - Hypural Length (cm)				

Table XXV. Length (orbit-hypural) - weight (round) relationship for maturing male chinook salmon; Skeena and Fraser rivers, 1964-1965; flesh colours combined (in cm and lb).

Mid-length class cm	Number	Observed average weight lb	Calculated average weight lb	Difference lb
		A. Skeena River		
27.5	3	1.4	1.4	0.0
32.5	16	2.6	2.2	- 0.4
37.5	29	3.2	3.4	+ 0.2
42.5	14	5.0	4.9	- 0.1
47.5	25	6.4	6.9	+ 0.5
52.5	28	8.8	9.3	+ 0.5
57.5	86	11.6	12.2	+ 0.6
62.5	43	15.0	15.6	+ 0.6
67.5	19	18.3	19.6	+ 1.3
72.5	19	22.8	24.2	+ 1.4
77.5	20	27.8	29.6	+ 1.8
82.5	13	36.7	35.6	- 1.1
87.5	12	43.6	42.4	- 1.2
92.5	5	61.2	50.0	-11.2
	332			

log Round Weight (lb) = $\bar{7}$.8650 + 2.9784 log 0 - Hypural Length (cm)

		B. Fraser River		
27.5	2	1.5	1.6	+ 0.1
32.5	10	3.0	2.5	- 0.5
37.5	29	3.5	3.7	+ 0.2
42.5	21	5.3	5.3	0.0
47.5	49	6.9	7.3	+ 0.4
52.5	107	9.3	9.7	+ 0.4
57.5	140	11.9	12.6	+ 0.7
62.5	92	15.6	15.9	+ 0.3
67.5	84	19.8	19.8	0.0
72.5	103	24.8	24.3	- 0.5
77.5	86	30.5	29.4	- 1.1
82.5	46	37.0	35.1	- 1.9
87.5	5	41.0	41.4	+ 0.4
	774			

log Round Weight (lb) = $\bar{6}$.2693 + 2.8375 log 0 - Hypural Length (cm)

Table XXVI. Regression of log Egg Count on log Orbit-Hypural Length (mm). Chinook salmon; Nass, Skeena and Fraser rivers, 1964-1966

River	Year	r	a	$S.E._a$	b	$S.E._b$	N	r	a	$S.E._a$	b	$S.E._b$	N	r	a	$S.E._a$	b	$S.E._b$	N
		Red-fleshed						White-fleshed						Red- and White-fleshed					
Nass	1964	0.6444	-0.3345	1.5594	1.4436	0.5417	12												
	1965	0.3892	0.7017	3.2307	1.0629	1.1248	7												
	1966	0.3872	1.4514	1.4379	0.8128	0.4996	17	0.7858	-6.9759	4.9126	3.7196	1.6900	5	0.4707	0.6828	1.3068	1.0809	0.4530	22
	1964-66	0.4654	0.6743	1.0172	1.0842	0.3535	36	0.4610	-1.6470	4.7288	1.8964	1.6321	7	0.4860	0.2564	0.9958	1.2311	0.3457	43
Skeena	1964	0.5865	-1.7877	0.9214	1.9375	0.3197	72	0.8370	-1.0894	1.3477	1.7285	0.4613	8	0.6603	-2.4400	0.8051	2.1667	0.2790	80
	1965	0.8442	-4.4030	1.9632	2.8418	0.6820	9							0.8980	-3.3374	1.1656	2.4708	0.4034	11
	1966	0.7149	-2.1996	0.6924	2.0859	0.2404	74	0.7084	0.3905	1.2568	1.2218	0.4303	10	0.7523	-2.5971	0.6211	2.2264	0.2153	84
	1964-66	0.6563	-2.0865	0.5471	2.0436	0.1899	155	0.7467	-0.3504	0.9037	1.4730	0.3092	20	0.7126	-2.5530	0.4768	2.2080	0.1652	175
Fraser	1964	0.6399	-0.5680	0.6658	1.5227	0.2341	63	0.5612	-0.4320	0.7262	1.4603	0.2538	74	0.5635	-0.1380	0.4909	1.3640	0.1721	137
	1965	0.8873	-1.8843	0.3776	1.9916	0.1336	62	0.3064	1.0304	1.3240	0.9500	0.4609	43	0.7240	-0.6159	0.4099	1.5346	0.1441	105
	1966	0.8158	-1.0937	0.3973	1.7188	0.1407	77	0.6582	-2.1478	1.2308	2.0566	0.4294	32	0.6856	-0.2780	0.4140	1.4223	0.1460	109
	1964-66	0.7933	-1.1673	0.2671	1.7392	0.0944	202	0.5227	-0.4362	0.5630	1.4609	0.1965	149	0.6526	-0.2638	0.2496	1.4117	0.0877	351

r = Correlation coefficient; a = Intercept; S.E. = Standard Error of Estimate; b = Regression Coefficient; N = Sample size.

Regression Formula: log Egg Count = a + b log O-Hypural length (mm)

Table XXVII. Calculated F. values for slope and elevation in comparisons of regression formulae for log egg count on log orbit-hypural length.

	Slope		Elevation		
	d.f.	F	d.f.	F	
A. Flesh Colour					
Fraser reds 1964 vs Fraser whites 1964	1,133	0.0192	1,134	11.0000	**
" " 1965 vs " " 1965	1,101	6.0227*	1,102	21.9347	**
" " 1966 vs " " 1966	1,105	0.7948	1,106	37.4102	**
" " 1964-66 vs " " 1964-66	1,347	1.7021	1,348	64.1063	**
B. Rivers					
Skeena reds 1964 vs Fraser reds 1964	1,131	1.1212	1,132	3.8333	*
" " 1966 vs " " 1966	1,147	1.8863	1,148	18.4318	**
" " 1964-66 vs " " 1964-66	1,353	2.2549	1,354	27.5686	**
C. Years					
Skeena reds 1964 vs Skeena reds 1966	1,142	0.1250	1,143	1.3968	
Fraser reds 1964 vs Fraser reds 1965	1,121	3.2045	1,122	1.3555	
" " 1964 vs " " 1966	1,136	0.6136	1,137	6.9318	**
" " 1965 vs " " 1966	1,135	2.0588	1,136	3.8857	*
" whites 1964 vs " whites 1965	1,113	1.0000	1,114	0.0377	
" " 1964 vs " " 1966	1,102	1.4489	1,103	0.2653	
" " 1965 vs " " 1966	1,72	3.0000	1,72	0.0350	

Probability levels: * denotes $0.05 \geqq P > 0.01$; ** denotes $P \leqq 0.01$