PROVINCE OF BRITISH COLUMBIA

REPORT

OF THE

COMMISSIONER OF FISHERIES

FOR THE YEAR ENDED DECEMBER 31ST, 1929

WITH APPENDICES

PRINTED BY
AUTHORITY OF THE LEGISLATIVE ASSEMBLY.

VICTORIA, B.C.:
Printed by CHARLES F. BANFIELD, Printer to the King's Most Excellent Majesty.
1930.

To His Honour ROBERT RANDOLPH BRUCE,
Lieutenant-Governor of the Province of British Columbia.

MAY IT PLEASE YOUR HONOUR:

I beg to submit herewith the Report of the Provincial Fisheries Department for the year ended December 31st, 1929, with Appendices.

SAMUEL LYNESS HOWE,
Commissioner of Fisheries.

Provincial Fisheries Department,
Commissioner of Fisheries' Office,
Victoria, British Columbia, December 31st, 1929.

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FISHERIES COMMISSIONER'S REPORT FOR 1929.

VALUE OF CANADIAN FISHERIES AND THE STANDING OF PROVINCES, 1928.

The value of the fishery products of Canada for the year 1928 totalled $55,050,973. During that year British Columbia produced fishery products of a value of $26,562,727, or 48 per cent. of Canada's total.

In 1928 British Columbia again led all the Provinces in the Dominion, as has been the case for many years, in the value of her fishery products. Her output exceeded in value that of Nova Scotia, the second in rank, by $14,880,732, and also exceeded that of all the other Provinces combined by $9,756,476.

The market value of the fishery products of British Columbia in 1928 was $3,298,385 greater than in the previous year, 1927, due largely to an increase in the salmon-pack.

The capital invested in the fisheries of British Columbia in 1928 was $32,926,325, or 56 per cent. of the total capital employed in Canada. Of the $32,926,325 invested in the fisheries of British Columbia in 1928, $11,964,987 was employed in catching and handling the catches and $20,961,338 invested in canneries, fish-packing establishments, and fish-reduction plants.

The number of persons engaged in British Columbia fisheries in 1928 was 18,994, or 24 per cent. of Canada's total of 78,219. Of the 18,994 engaged in British Columbia, 11,818 were employed in catching and handling the catches and 7,176 in packing, curing, and fish-reduction. The total number engaged in the fisheries in 1928 was 2,328 less than in the preceding year.*

The following statement gives in the order of their rank the value of the fishery products of the Provinces of Canada for the years 1924 to 1928, inclusive:—

Province.	1924.	1925.	1926.	1927.	1928.
British Columbia	$21,257,567	$22,414,618	$27,367,109	$23,264,342	$26,562,727
Nova Scotia	8,777,251	10,213,779	12,505,922	10,783,631	11,681,995
New Brunswick	5,383,509	4,798,589	5,325,478	4,406,673	5,001,641
Ontario	3,557,587	3,436,412	3,152,193	3,670,229	4,030,753
Quebec	2,283,314	3,044,919	3,110,964	2,736,450	2,996,614
Manitoba	1,232,563	1,466,939	2,328,803	2,039,738	2,240,314
Prince Edward Island	1,201,772	1,598,119	1,358,934	1,367,807	1,196,681
Alberta	339,107	458,504	749,076	712,469	725,050
Saskatchewan	482,492	494,882	444,288	503,609	563,533
Yukon Territory	18,773	15,370	17,866	12,090	51,665
Totals	$44,534,235	$47,942,131	$56,360,633	$49,497,038	$55,050,973

THE SPECIES AND VALUE OF FISH CAUGHT IN BRITISH COLUMBIA.

The total value of each of the principal species of fish taken in British Columbia for the year ended December 31st, 1928, is given in the following statement:—

Salmon	$17,345,670
Halibut	3,370,670
Herring, oil, meal, etc.	1,808,944
Cod, hake	367,829
Pilchard, oil, meal, etc.	2,563,137
Clams, abalones	135,795
Black cod	101,452
Crabs	33,868
Carried forward	$25,727,365

* As this report goes to press the Commissioner is in receipt of a preliminary report on the fishery products of the Province for the year 1929, issued by the Dominion Bureau of Statistics—R. H. Coats, Statistician—from which the following data are taken: The value of the fishery products of British Columbia in 1929 totalled $23,930,692, a decrease of $2,632,035 compared with production in 1928.

THE SPECIES AND VALUE OF FISH CAUGHT IN BRITISH COLUMBIA—*Continued.*

Brought forward	$25,727,365
Soles	36,276
Shrimps	14,280
Oysters	42,818
Flounders, brill	19,832
Red cod	21,396
Perch	12,389
Smelt	11,723
Sturgeon	6,338
Octopus	2,921
Skate	4,332
Oolachans	2,349
Whiting, bass, etc.	272
Trout	832
Whales	318,616
Fish-oils, grayfish, etc.	119,120
Fish-meals	173,920
Fish-fertilizer	24,856
Fur-seals	23,092
Total	$26,562,727

The above statement shows that the salmon-fisheries of the Province in 1928 produced $17,345,670, or 65 per cent. of her total fishery products. It was, owing to an increased catch, $3,091,867 greater than the salmon products of the preceding year.

The total halibut landings were marketed for $3,370,670. This was $470,663 less than in 1927. The herring-catch produced $1,808,944, substantially the same as in 1927. The catch of pilchards produced $2,563,137, a gain over 1927 of $724,270.

The foregoing data are derived from the "Fishery Statistics of Canada" for 1928.

THE SALMON-PACK OF THE PROVINCE IN 1929.

The salmon-pack of the Province in 1929 totalled 1,398,770 cases. It was 396,414 cases less than the average of the four preceding years. It consisted of 281,277 cases of sockeye, 17,765 cases of springs, 173,237 cases of cohoes, 477,853 cases of pinks, and 424,890 cases of chums, etc. The sockeye-pack was 29,004 cases less than the average of the preceding four years.

THE 1929 PACK BY DISTRICTS.

The Fraser River System.—The catch of all species of salmon in Provincial waters of the Fraser River system produced a total pack of 426,473 cases, as against 258,224 cases in 1928, 284,378 in 1927, 274,951 in 1926, and 276,855 in 1925. It was the largest pack made from those waters since 1913. The pack consisted of 61,569 cases of sockeye, 10,004 cases of springs, 40,520 cases of cohoes, 158,208 cases of pinks, and 144,159 cases of chums, etc.

The pack of sockeye was 26,184 cases greater than that made in 1925, the brood-year of this year's run. The pack, however, was not, as has been commonly stated, the largest made on the Fraser in recent years. It was exceeded by the pack of 1926 by 24,120 cases, and it only exceeded the pack of 1927 by 176 cases.

The catch of sockeye made in the State of Washington waters of the Fraser River system in 1929 produced a pack of 111,898 cases, substantially the same as in the brood-year 1925.

The combined catch of sockeye in the entire Fraser River system in 1929 produced a total pack of 173,467 cases. It was 26,059 cases greater than in the run's brood-year 1925 and the largest made in the whole system since 1913. In this connection it should be noted that 1929 came within the four-year cycle of former big-year runs—the years in which the sockeye run made the fishery of the Fraser famous. It should also be noted that for the first year since 1917 there was a good run of sockeye to the system in early July, and the catches made in that month were much the largest made in any July since 1917, also that the fish were large, fat, and in all other respects resembled the fish in the runs of the big years. As will be shown later, the early escapement of sockeye in 1929 was also greater and, as in the big years, the fish

that escaped ascended the Fraser to its headwaters. The July catch of sockeye in Provincial waters of the system produced a pack of 32,282 cases, out of a seasonal pack of 61,569 cases. Of the 32,282 cases, 12,428 were packed by the 13th of that month.

The following tabulation gives the weekly pack of sockeye made in Provincial waters of the Fraser system in 1929. It includes the sockeye caught in the traps in Juan de Fuca Strait and canned at Esquimalt:—

Week ending.	Cases.	Week ending.	Cases.
June 29	418	Sept. 14	1,474
July 6	5,920	Sept. 21	996
July 13	6,085	Sept. 28	604
July 20	3,992	Oct. 5	820
July 27	10,556	Oct. 12	340
Aug. 3	10,582	Oct. 26 (two weeks)	340
Aug. 10	9,395	Nov. 2	9
Aug. 17	4,449	Nov. 20 (final)	5
Aug. 24	2,690		
Aug. 31	3,026	Total	63,409
Sept. 7	1,708		

In their forecast of the sockeye run to the Fraser River system in 1930, Drs. Clemens stated that the run will be derived largely from the spawning of 1926. In that year there was an increase in the pack over that of 1922, mainly because of the appearance of a large run late in the season. There was a large escapement to Adams River, and there would seem to be every reason to expect a good return from that spawning. It will be of interest to see not only if the run does materialize, but if it occurs late in the season, as it did in 1926.

The pack of pinks—it was a year in which the pinks run in the Fraser—was the largest made from those waters in the past sixteen years. It was 55,672 cases greater than in 1927, the brood-year of this year's run.

The chum-pack of 144,159 cases was 48,947 cases less than in the record high year 1928, notwithstanding that it greatly exceeded that of all other years.

The Skeena River.—The salmon-pack of the Skeena River in 1929 totalled 220,245 cases, consisting of 78,017 cases of sockeye, 4,324 cases of springs, 37,678 cases of cohoe, 95,305 cases of pinks, and 4,908 cases of chums. The pack was the second smallest made on the Skeena for the last nine years. It was 90,457 cases less than the average in the four preceding years, but it was not a year in which the pinks run in abundance.

The catch of sockeye was especially disappointing. It was 50 per cent. less than the Department's forecast. Drs. Clemens, in a forecast of the sockeye run to the Skeena (*see* Report of 1928), wrote:—

"The run of 1929 will be derived from the seedings of 1924 and 1925. In 1924 the pack consisted of 144,747 cases and the samplings of fish in that year showed that the five-year-old fish made up 75 per cent. of the run. The report from the spawning-beds at both Lakelse and Babine Lakes states that large numbers of sockeye reached the streams and in general the runs were exceptionally good. The prospect of a large return of five-year-old fish in 1929 should therefore be good. In 1925 the pack amounted to 81,146 cases and the run was made up of 53 per cent. of four-year-old fish. The spawning-beds were reported as having been very well seeded. In view of these facts, it would seem that a large run, possibly producing a pack in the neighbourhood of 140,000 cases, may be expected."

The above quotation again demonstrates how little dependence can be placed on forecasts based on pack and spawning-bed records of brood-years. Years in which the catches and the seeding of the beds were large may be, and in this case were, followed by a poor return. The catches of the last few years on the Skeena are disturbing. It should be noted, however, that the Department's attempts to estimate the extent of the runs are based upon the assumption that conditions will remain relatively constant from year to year. As Drs. Clemens have pointed out in previous years, conditions do not and cannot remain absolutely uniform from year to year. In 1929 two factors at least have entered into the situation—namely, climatic conditions were extremely unfavourable for fishing, and the fishing boundary was moved 3 miles down-stream. It is impossible to evaluate these factors, but undoubtedly they to some degree reduced the catch and increased the escapement. Reports from the spawning-beds indicate an abundant seeding,

especially in the Babine area. It is evident that a more accurate system of assessing the escapement is required, and it is hoped that in the near future a very intensive study may be made in this river system which may result in developing a working-plan whereby, among other things, it will be possible to state the number of cases which may safely be taken in each year and at the same time allow an escapement sufficient to maintain a maximum production.

The run of sockeye to the Skeena in 1930, the report states, will be derived from the seedings of 1925 and 1926. In 1925 the pack consisted of 81,146 cases, and the samplings in that year showed that the five-year-old fish constituted 47 per cent. of the run. In 1926 the pack amounted to 82,360 cases and the four-year-old fish formed 70 per cent. of the run. In both years the spawning-beds of both the Lakelse and Babine areas were reported very well seeded. There would appear, therefore, to be reason to expect a fair run in 1930 and to believe that a pack of approximately 75,000 cases may be made.

The catch of pink salmon on the Skeena—it was not a year in which they run in abundance—produced a pack of 95,305 cases, over 50 per cent. greater than in the brood-year. The catch of chums was distinctly small; the catches in each of the last three years have been small.

Rivers Inlet.—The salmon-catch in Rivers Inlet produced a pack of 75,126 cases, consisting of 70,260 cases of sockeye, 342 cases of springs, 1,120 cases of cohoes, 2,386 cases of pinks, and 989 cases of chums, etc.

Notwithstanding that the catch was somewhat larger than in the three preceding years, it did not come up to the forecast, and again leaves considerable uncertainty as to conditions there. The annual pack varies over a wide range and the relative proportions of the four-year- and the five-year-old fish show marked variations from year to year. However, as Dr. Gilbert and the Drs. Clemens have pointed out, the runs to Rivers Inlet occur in five-year cycles. In their report for 1928 Drs. Clemens wrote:—

"The run of 1929 will be the product of the spawnings of 1924 and 1925. In 1924, according to the report from the spawning-beds, there was an exceptionally large escapement and the samplings in that year showed that five-year-old fish made up 56 per cent. of the run. The pack consisted of 94,891 cases. The report from the spawning-beds in 1925 indicated an excellent escapement, but in that year 77 per cent. of the run consisted of five-year-old fish and it is not expected that the progeny of these fish will appear until 1930. The four-year-old fish formed 23 per cent. of the run which produced the large pack of 159,554 cases. There may therefore be a return of a fair number of four-year-old fish in 1929. Taking these things into consideration, and also that the fact that the year 1929 belongs to the 1909–14–19–24 cycle, there would seem to be reasonable expectancy of a run which may produce a pack between 85,000 and 95,000 cases."

In forecasting the run to Rivers Inlet in 1930, Drs. Clemens state: "Since the year 1930 belongs to the cycle 1915–1920–1925, in which the five-year component has always been large—from 77 to 95 per cent.—we may look for a very large pack. Without taking the other brood-year, 1926, into account, the expectancy would be about 125,000 cases. In 1926 the pack was small—65,581 cases—and the seedings only fair, so the four-year-old fish probably cannot be counted upon to bring the total pack up to more than 150,000 or 160,000 cases."

The Nass River.—The 1929 catch of salmon on the "erratic Nass River" was again a very small one. It produced a pack of but 29,185 cases, the smallest recorded there in many years. It consisted of 16,077 cases of sockeye, 252 cases of springs, 10,342 cases of pinks, and 1,202 cases of chums, etc. As stated in their report for 1928, Drs. Clemens were unable to make a forecast of the 1929 run to the Nass. They said:—

"We simply state that in the past the packs of this five-year cycle have been consistently large, as the following figures show: 1909, 28,246 cases; 1914, 31,327 cases; 1919, 28,259 cases; 1924, 33,590 cases. In former years the late Dr. Gilbert pointed out on several occasions that large runs in the Skeena and Rivers Inlet seemed to be intimately associated with large percentages of five-year-old fish. It is interesting to note that in this cycle of the Nass the four-year-old component of the runs is very small. We have no figure for 1909, but in 1914 the four-year-olds constituted only 4 per cent. of the run; in 1919, 7 per cent.; and in 1924, 4 per cent.; while over a period of seventeen years the general average of this group is 11–12 per cent. Not only is the brood-year pack of 1919 larger, but, in addition, in that year Inspector Hickman reported the spawning-beds more extensively seeded than usual. In any other river system, except the Nass, these facts would indicate a very good return in 1929."

Vancouver Island.—The catch of salmon from the waters of Vancouver Island produced a total pack of 294,854 cases. As usual, it consisted largely of pinks and chum salmon. The

pack was comprised of 10,340 cases of sockeye (those taken in the traps in Juan de Fuca Strait being credited to the Fraser River), 35,504 cases of cohoe, 1,645 cases of springs, 74,001 cases of pinks, and 162,246 cases of chum, etc.

Smith Inlet.—The run of salmon to Smith Inlet in 1929 was surprisingly small. The catch produced a pack of but 11,014 cases, of which 9,683 cases were sockeye. It was much the smallest pack recorded there. The run consisted of fish derived from the brood-years 1924 and 1925. The seeding of the beds in 1924 was light and in 1925 heavy, as the following extracts from the spawning-bed reports of Fishery Officer Stone show. In summing up his report in 1924 he wrote:—

"In summing up the results of the inspection of this watershed, I am of the opinion that a moderate run only need be expected from the spawning of this season. The entire lack of those immense masses of sockeye which had possession of the spawning-beds in 1919–20 cannot but have its effect in curtailing the extent of the run of fish that will return four and five years hence."

His summary in 1925 reads: "In summing up the results of the inspection of the spawning-beds at Smith Inlet, I am of the opinion that the remarkable showing of sockeye on the beds will be reflected in a big run of fish from the eggs deposited this season. In size the run of the sockeye reached a high standard. The preponderance of males over females was very small."

The latter again shows that a good seeding of the spawning-beds may be followed by a poor return.

MILD-CURED SALMON.

The production of mild-cured salmon in the Province in 1929 totalled 3,016 tierces, containing averagely 825 lb., a total of 2,488,200 lb., valued at close to $500,000, 47 per cent. of which was tierced on the Skeena.

REPORTS FROM SALMON-SPAWNING BEDS.

During the year, as in former ones since 1901, the Department investigated conditions on the spawning-beds of the Fraser, Skeena, and Nass Rivers, and Rivers and Smith Inlets. The following is a brief summary of the reports, all of which will be found in full in the Appendix of this report:—

The Fraser River.—The inspection of the spawning areas of the Fraser was again made by Mr. Babcock, his twenty-seventh annual inspection. In addition to personal inspection, valuable data as to conditions were supplied by Major J. A. Motherwell, Chief Supervisor of Fisheries for the Province.

In a study of conditions of the salmon-spawning areas of the Fraser River, it should, Mr. Babcock states, be noted that the year came within the four-year cycle of former big runs. For the first year since 1917 there was a considerable run of sockeye in the Fraser system in early July and the escapement was larger than usual, and the fish that did escape in the early part of the season, as in former years, ascended the river to its headwaters.

Sockeye in numbers made their appearance at Hell's Gate Canyon, above Yale, in July and August. Water conditions there were favourable for their passage throughout the season. Sockeye in numbers were also reported as passing the rapids in the Fraser, above the mouth of Bridge River.

A greater number of sockeye reached Stuart and Chilko Lakes this year than in any year since 1917. The run to Quesnel and other headwater lakes was small.

The first sockeye reached Stuart Lake on July 17th and were in evidence every day up to the 30th. The fish were large and in fine condition, but unfortunately the Indians caught and smoked close to 9,000 of them, leaving few to spawn. This was the first year since 1919 in which the Indians have caught enough to smoke any of them. In connection with their appearance at Stuart Lake on July 17th, it is recalled that the first sockeye were noted at Hell's Gate on July 7th, and it is believed they were the fish which reached the lake on the 17th, indicating that they had made the ascent of over 2,000 feet elevation and travelled close to 450 miles in ten days' time.

Inspection of the spawning tributaries of Stuart Lake indicated that they were but little better seeded than in recent years, as the Indians appear to have caught most of the fish.

The number of sockeye that entered the Chilcotin River and passed to Chilko Lake was much greater than in any year since 1917. The first fish were reported on July 27th and were in evidence in the river up to August 24th and a few as late as September 7th. The Indians

caught close to 4,500. "A notable feature of the Indians fishing on the Chilko River this year," Mr. Babcock states, "was the fact that they dressed the fish at the place of capture, transported them to their houses in automobiles and trucks, and smoked them there." Fishery Officer Harvey, of the Dominion Service, detailed to the patrol of the river and lake, estimates that 70,000 sockeye reached the spawning areas of Chilko Lake this year. In view of the belief that very few sockeye spawned in Chilko Lake four years ago, the return this year of 70,000 is very surprising. It is also surprising, considering the run to Stuart and Chilko Lakes, that the run to Quesnel Lake was very small. Only one or two thousand are believed to have reached there.

Dominion Fisheries officials reported that upwards of 10,000 sockeye reached the entrance to Shuswap Lake. They spawned in Little River, the outlet of the main lake.

For the first time on record there was a pronounced decline in the number of sockeye that reached the Birkenhead River, at the head of the Harrison-Lillooet Lakes section, this year. Heretofore the run to this section, year after year, has shown but little variation. Heretofore it was the only section in the Fraser basin where the run of sockeye had not diminished in number. Superintendent Graham, who has for many years been in charge of the hatchery on the Birkenhead and collected the eggs there, reported that the sockeye run was very small; that they spawned 95 per cent. of the fish that reached this river and collected but 18,000,000 eggs; and that natural propagation in that section was "almost *nil*." The fish which reached the Birkenhead were unquestionably the product of the spawning there in 1925, when the return was large, the collection of eggs 40,000,000, and the river's beds abundantly seeded naturally.

In his summary of spawning conditions in the Fraser basin this year, Mr. Babcock states: "From the above it will be noted that while the number of sockeye that reached Chilko and Stuart Lakes was much larger than in any year since 1917, owing to Indians fishing the number that eventually spawned in any one lake section, with the exception of Chilko Lake in the Fraser basin, showed no increase over recent years; and that the number which reached the Birkenhead River, at the head of the Harrison-Lillooet section, and where they were not molested by Indians, was far less."

The Skeena River.—The inspection of the sockeye-salmon spawning areas in the Skeena River basin was again made by Fishery Officer Gibson. In his summary he states that the Babine Lake areas, the largest lake in British Columbia and the main spawning area of the Skeena, were well seeded, "although the pack in the lower river was not a large one, obviously there must have been a large escapement." He attributes the large escapement to an extension of the weekly closed season, wet weather and clear water, and the 3-mile shortening of the up-river fishing boundary. Due to the large escapement and spawning in the Babine, Officer Gibson expresses the opinion that there will be a big return in 1933 and 1934.

The Nass River.—The inspection of the spawning areas of the Nass was again made by Provincial Inspector of Fisheries C. P. Hickman. It was his twenty-second annual inspection. He found conditions more favourable than anticipated from the poor catch and pack of sockeye on the fishing-grounds. There was a light seeding in the early part of the season.

Rivers and Smith Inlets.—The inspection of the spawning areas of the Rivers and Smith Inlets runs was again made by Provincial Fishery Officer A. W. Stone. In summarizing the results of his inspection of the spawning areas of the Rivers Inlet run, he expresses the opinion that, due to cold wet weather during the fishing season, there was a larger escapement than was anticipated and that many of the beds were well seeded, though others but lightly seeded.

In his report on the beds of the Smith Inlet run Officer Stone states: "The poor sockeye run to Smith Inlet this year was foreshadowed in my report of 1924. The poor escapement in 1924 was followed by an extreme 'freshet'; combined they account for the very small pack this year, the smallest pack in sixteen years." He found the beds so lightly seeded this year that a larger return five years hence is not to be anticipated.

INDIAN FISHING ON SPAWNING AREAS.

On all the spawning areas of the rivers and lakes frequented by salmon the Indians were again active. Reports made to the Department were to the effect that the Indians captured above the commercial fishing limits and adjacent to spawning areas close to 225,000 salmon—173,000 from the Skeena, 18,000 from the Fraser, and 34,000 from the Nass. Their capture is a drain on the salmon runs that should be dispensed with by compensation in the way of other foods, such as canned pilchards or other food product rich in oil and iodine.

CONTRIBUTION TO THE LIFE-HISTORY OF THE SOCKEYE SALMON.

The fifteenth annual contribution to the series of papers on the life-history of the sockeye salmon, issued by the Department, which is contained in the Appendix of this report, is contributed by Drs. W. A. and Lucy S. Clemens. These detailed continuous records give the constituents of the age-classes, sex, weights, and lengths of the sockeye in each of the runs to the principal salmon-producing waters of the Province for the last sixteen years. They constitute one of the most detailed continuous records of any fishery. The following is a brief digest of the present paper:—

Of the runs of sockeye salmon to the four main river systems of the Province in 1929, that to the Fraser was the one which may be considered encouraging. The sockeye-catch in the Fraser River system produced a pack that was 26,059 cases greater than that made in 1925—the brood-year of the 1929 run—and the increase was made up entirely of the increased catch by Canadian fishermen. But more important from the standpoint of the future, the spawning escapement to the upper reaches of the Fraser basin was the largest since 1917.

The sockeye runs to the other three river systems all exhibited discouraging features. The pack at Rivers Inlet was below expectancy, apparently due to failure of the run of five-year-old fish. The pack on the Skeena River was much below expectancy, the result, probably, in part at least, of adverse weather conditions; as the escapement is reported to have been large, there is reason to believe that the maintenance of the run of the cycle is assured. Unfortunately the same cannot be said of the Nass River. The run there was a failure, the pack small and escapement light. This apparently indicates the failure of the 1929–1924–1919 cycle to maintain itself. Last year the decline in the 1928–1923–1918 cycle was recorded; and the year before, that of the 1927–1922–1917 cycle. It is evident that the Nass River sockeye situation demands serious consideration.

General Character of Fraser Run in 1929.

As the run of 1929 belongs to the cycle of former "big" years, it was anticipated with interest. The total pack for the entire system amounted to 173,467 cases, of which 61,569 cases were packed in British Columbia and 111,898 in the State of Washington. The reports from the upper spawning areas indicate an escapement very much better than any since 1917.

There were two noteworthy features in connection with the run this year: First, a large number of fish appeared in the early part of the season and apparently proceeded to the upper regions of the Fraser, including Stuart Lake; second, a considerable number of three-year-old individuals (grilse) appeared in the run. Reports of their appearance were received from the Swiftsure Bank; Sooke; Rosario Straits, and other waters in Washington; the fishing region of the Fraser; and from some of the spawning areas of the Upper Fraser.

These two occurrences appear not to be in any way connected with one another, but possibly to be indicative of different happenings. The first appears to indicate the possibilities of an increased run in 1933. Undoubtedly the larger run of this year is the result of the fairly large escapement in 1925. Referring to the report of the spawning-beds in that year, we find that the escapement to the Upper Fraser areas was larger than in any year subsequent to 1913. Improved runs were noted in Seton Lake, Chilcotin River, and the tributaries of the Nechako River, including Stuart, Takla, and other lake tributaries. The conclusion is reached that the great spawning areas of the Upper Fraser merely await adequate escapements to become as productive as ever.

The second occurrence—namely, of the number of grilse—may possibly presage a good run of four-year-old fish in 1930. In the early days of the Fraser fishery a large number of grilse always appeared in the year preceding the "big run." The practical disappearance of the grilse with the decline of the upper river runs would seemingly indicate that the development of the three-year-old fish was a characteristic chiefly of the upper basin races. In 1926 there was a large run of sockeye to the Shuswap Lake area; somewhere between three and six hundred thousand fish spawned there. It may be that the grilse of 1929 are the product of the spawning in Adams River in 1926 and are the forerunners of a good return in 1930. That run will be derived largely from the spawning of 1926. In that year the pack was larger than in 1922, largely because of a large run late in the season that resulted in an increased escapement to Adams River, already referred to, and there would seem to be good reason to expect a good return from the spawning. It will be of interest to see not only if the run does materialize,

but if it occurs late in the season, as it did in 1926. The cycle of 1918–1923–1926 has shown consistent improvement since the low pack of 1918, and it may continue.

Characteristics of Rivers Inlet Run.

In their study of the sockeye run to Rivers Inlet in 1928, Drs. Clemens pointed out that the data from that system are readily interpreted by accepting the theory that the cycle is pre-eminently a five-year one. Fair uniformity seems to exist in the tabulations of the packs. Within a given cycle packs are approximately the same size, and in like manner there is a fair degree of consistency in the relative percentages of the two age-groups. Correlating the two, it appears that (1) when the four-year-old fish are in the majority the packs are small, consisting of 50,000 to 68,000 cases; (2) when the five-year-old fish slightly exceed the four-year-old fish, the packs run from 85,000 to 95,000 cases; and (3) when the five-year-olds are greatly in excess, a pack of at least 120,000 cases is produced.

The year 1929 belongs to the third series, in which the five-year-old fish have always been slightly in excess of the four-year-olds and the packs have been approximately 85,000 to 95,000 cases. Hence the pack of 1929 of 70,260 cases has fallen below expectancy by from 15,000 to 20,000 cases. In addition, the percentages of the two age-classes are very different from those of the other years in this cycle. Instead of having the percentage of five-year-old two-years-in-lake type a little greater than that of the four-years-old two-years-in-lake, we find 19 and 81 per cent. respectively. Turning to Inspector Stone's spawning report to ascertain whether or not the pack indicates the full extent of the 1929 run, Drs. Clemens find that he reports extensive seeding of certain regions and very poor seeding in others. He is of the opinion that the pack would have been larger had not the cold, wet weather interfered with fishing during the early part of the season, thus permitting a greater escapement than would have occurred otherwise. We may judge, therefore, that the run probably was somewhat greater than the pack indicates. But they do not feel justified in concluding that the escapement as reported would have necessarily produced a pack as great as predicted, had the conditions been normal. But when we consider the percentages of the four- and the five-year-old fish we must remember that these are relative and not absolute. The point to emphasize is not the superabundance of the four-year-olds, but the failure of the five-year-olds in the run, by reason of which the proportion of the four-year-olds is exaggerated. In 1924 the pack of 94,891 cases was good and the escapement also good. Since the 5's formed 56 per cent. of the run, it seems reasonable to have expected a return greater than that of the 19 per cent. shown. After the spawning season in 1924 there was an unusualy high freshet, and when Inspector Stone made his inspection the following year he found the streams and rivers scoured out to such an extent that he expressed the fear that untold damage had been done to the eggs laid down in 1924, and that as a result the runs in 1928 and 1929 would be lessened. While the pack of 1928 was small, seemingly it was all that could be expected from the brood-years irregardless of the freshet. But, on the other hand, the percentage of five-year-old fish in the run of 1929 is so unexpectedly small that Drs. Clemens cannot pass it over without attempting to find a reason for it. It would appear, they state, that Inspector Stone's fears may have been well founded, and therein lies the explanation of the failure of the five-year-old fish. Whether this explanation be right or not, the fact remains that this component of the run has suffered depletion, and in 1934 additional prohibition measures should be in force in order to permit a very much greater escapement to the spawning-beds. In that way only can significant recuperation be hoped for.

When we examine, state Drs. Clemens, the pack of 159,554 cases and the spawning escapement of 1925, we find that they form the peak of the Rivers Inlet productivity. In commenting upon the seeding of that year, Mr. Stone said there should be "an unexampled return." Consequently the large percentage of four-year-old fish in the 1929 run is not surprising. The rest of the progeny of that escapement in 1925 would return in 1930 as five-year-olds. Since the year 1930 belongs to the cycle 1915–1920–1925, in which the five-year class has always been large—from 77 to 95 per cent.—we can look for a very large pack in 1930. Without taking the other brood-year, 1926, into account, the expectancy would be about 125,000 cases. In 1926 the pack was but 65,581 cases and the seeding only fair, so that the four-year-old fish probably cannot be counted upon to bring the total pack to more than 150,000 or 160,000 cases.

In dealing with the lengths and weights of individuals of the various age-groups in the 1929 Rivers Inlet run, Drs. Clemens call attention to the fact that a number of years ago the late

Dr. Gilbert commented on the fact that the Rivers Inlet sockeye were decreasing in size, and pointed out that the decrease was equally true of both sexes, and that although the tendency was more marked in the lengths, nevertheless it also showed in their weights. In order to find out to what extent this reduction in size might be taking place, Drs. Clemens made a tabulation of the average lengths and weights, combining them in three six-year groups, from which it is encouraging to note that the size reductions have not taken place steadily. As for length, a small but significant decrease of from 0.4 to 0.7 inch occurred between the general averages of 1912–1917 and 1918–1923 groups. Between the latter group and that of the 1924–1929 there has been no further reduction. As a matter of fact, there has been a slight increase in length. The history of the average weights is similar, although not as striking as that of the lengths. There has been a very small decrease, followed, in the five-year-old fish, by reversion towards the greater weight. Comparing the averages of 1929 with those of the 1924–1929 period, except for the length and weight of the four-year-old two-years-in-lake females and the weight of the five-year-old two-years-in-lake females, there is maintenance or increase in size.

Drs. Clemens state that the four-year-old Rivers Inlet sockeye have always been outstanding as an age-group in which the two sexes have been nearly identical in size. The general rule among sockeye is that the females are smaller than the males. But in this particular group the females are sometimes smaller, sometimes identical with, and sometimes larger than the males. In 1929, for the first time since 1923 for length, and 1924 for weight, the four-year-old two-years-in-lake females have been smaller than the males. These 1929 fish show that a similar condition may also exist in the five-year-old two-years-in-lake group. In that group in 1929 the females were 0.1 inch longer than the males. This is the first record of the kind for length, and there is only one like record for weight—that in 1927.

Characteristics of the Skeena River Run.

In dealing with the sockeye run to the Skeena in 1929, Drs. Clemens state that the pack amounted to 78,017 cases. "That was much below our predicted pack, but it does not necessarily indicate that the prediction was entirely astray and that the run to the Skeena was a comparative failure. Our attempts to estimate the extent of the runs are based upon the assumption that conditions will remain relatively constant from year to year. It has been pointed out in previous years that conditions do not and cannot remain absolutely uniform from year to year. In 1929 two factors at least have entered into the situation—namely, climatic conditions were extremely unfavourable for fishing and the fishing boundary was moved 3 miles farther downstream. It is impossible to evaluate these factors, but undoubtedly they acted in some degree in reducing the catch and increasing the escapement. The reports from the spawning-beds indicate an abundant seeding, especially in the Babine Lake area. Whether approximately 800,000 more fish reached the spawning-beds than would otherwise have done so cannot be determined. It is evident that a more accurate system of assessing the escapement is required, and it is hoped that in the near future a very intensive study will be made of the Skeena system, which may result in the development of a 'working-plan' whereby, among other things, it will ultimately be possible to state the number of cases which may safely be taken in each year and at the same time allow such an escapement as shall maintain the maximum of production."

The run of 1930, Drs. Clemens state, will be derived from the seedings of 1925 and 1926. In 1925 the sockeye-pack totalled 81,146 cases and the five-year-old fish constituted 47 per cent. of the catch. In 1926 the pack totalled 82,360 cases and the four-year-old fish formed 70 per cent. of the run. In both years the spawning-beds of both the Lakelse and Babine Lake areas were reported very well seeded. There would therefore appear to be reason to expect a fair run in 1930, a pack of approximately 75,000 cases.

The average lengths of all the age-groups, with the exception of those of the five-year-old two-years-in-lake group, are low, especially those of the four-year-old two-years-in-lake group, which are the lowest on record, with 22.9 inches for the males and 22.7 inches for the females. The average lengths of both sexes of the 5's group were but very slightly below the average of the past seventeen years.

The average weights of all the age-groups are fairly well maintained, except in the case of the four-year-old groups, where that of the males is the lowest on record at 4.9 lb.

Characteristics of the Nass River Run.

In dealing with the 1929 sockeye run to the Nass River, Drs. Clemens state that "while we have ceased to be surprised at any excessive variations in the extent of the sockeye-salmon run to the Nass River, nevertheless we cannot refrain from expressing great disappointment that the pack was so small. It consisted of only 16,077 cases. As was pointed out last year, 1929 belongs to the one cycle which has consistently yielded good packs in the past. Comparing this year's figures of 16,077 cases with those of the earlier years in this cycle—31,327 cases in 1914, 28,259 cases in 1919, and 33,590 cases in 1924—it is evident that the pack has decreased 50 per cent. If the escapement to the spawning-beds had been excellent, this small pack would be of minor importance. But Inspector Hickman reported that there was 'a fair run of sockeye during the early part of the season,' and also that 'the later run did not appear so good.' Consequently we have two indications of a poor run.

"Although in recent years it has been impossible to make predictions with any degree of certainty on the Nass, still one cannot fail to notice that the irregularities have always been in one direction—that of failure to reach normal expectancy. Looking back over the records of the last five years, which will be the brood-years of the next five years, there is not a single year in which we can ever hope to see improvement of present conditions. It is more likely that the packs will drop to even lower levels. In other words, if the present conditions continue, it is probably only a matter of a very few years before the sockeye of the Nass River will cease to be of any commercial value."

As far back as 1915 the late Dr. Gilbert suggested the possibility of the Nass run of sockeye being composed of two races. His opinion, Drs. Clemens state, was based on two facts: First, the run seems to be divided into early and late periods; and, secondly, that the late-running fish were of a conspicuously large size. Meziadin and Bowser Lakes are the only two known extensive spawning areas of the Nass River sockeye, but the inaccessibility of these lakes make a study of their populations most difficult. Each September Inspector Hickman visits the Meziadin watershed, and he has tried each year, since 1922, to gather material to further the study of the populations of these two lakes. He was able to take samplings of the Meziadin just below the falls and, by fishing a gill-net in the Nass above its junction with the Meziadin River, has attempted to intercept sockeye bound for Bowser Lake. Some years no sockeye have been netted there and in other years only a few, although the net has been operated continuously for a week each year. This is significant evidence that the Bowser Lake sockeye belong chiefly to the early period of the run. On the other hand, Inspector Hickman's actual observations at Meziadin Lake and Falls furnishes abundant evidence that sockeye of both early and late periods reach Meziadin Lake. That evidence shows that a smaller percentage of Meziadin sockeye spend one year in the lake, and a greater percentage stay two and three years than do the Bowser colony. The relative size of the individuals of the two populations show that the Meziadin fish are the larger, and are probably older as well as greater in size. The records indicate that the majority of these fish are six years old; similarly, the Bowser group correspond closely with those of the four- and five-year-old group.

Up to date the amount of material which has been available for the study of these two colonies is not sufficient to make conclusive generalization. However, Drs. Clemens state, from the material at hand it would appear that the majority of the Bowser Lake sockeye belong to the early period of the Nass run; that their early history is characterized by one or two years of fresh-water life; and that they are smaller and younger than the Meziadin sockeye. The fish comprising this latter colony make their way to Meziadin Lake during both the early and late periods of the run. The late-running fish usually spend the first two or three years of their lives in the lake and they are conspicuously larger in size.

The full text of Drs. Clemens's paper, together with its thirty-three tabulations, will be found in the Appendix of this report. It is the fifteenth contribution to the life-history of the sockeye salmon that has been published in these reports. They yearly become of more value.

FISH OIL AND MEAL PRODUCTION.

The production of fish oil and meal in the Province in 1929 shows a substantial reduction in oil and an increased production of meal. The twenty-nine reduction plants produced 2,962,205 gallons of oil and 19,402 tons of meal, as against 4,058,901 gallons of oil and 15,290 tons of meal in 1928.

The production from pilchard plants shows a decrease from 1928 of 1,364,278 gallons of oil and an increase in meal production of 1,128 tons. The figures show that the number of fish caught was larger than in 1928, but their oil content much less. The fish were very thin. Most of the fish were taken in the open sea, very few being taken in estuary waters.

HALIBUT LANDINGS IN 1929.

Halibut landings in the Province in 1929 totalled 29,629,700 lb., substantially the same as in 1928. Of that total, 20,599,200 lb. were landed by the United States fleet and shipped in bond and 9,030,500 lb. by Canadian vessels. Prince Rupert led all other ports with landings of 28,588,600 lb.

THE HALIBUT INVESTIGATION.

The investigation of the life-history of the Pacific halibut and the condition of the fishery was continued in 1929. The Commission has maintained its statistical observation of the fishery and has made progress in its studies of the life-history of the halibut. Conclusions drawn from the year's work confirm the previous recommendations made. They will be given in a series of reports which it is anticipated will be published in 1930. They will include the past history of the fishery, the rise and increase of the halibut fleets, its increase in efficiency and the spread to new banks, marking experiments, and statistics of the fishery, etc. The reports show the continued decline in the supply of halibut on the banks and the increasing seriousness of the situation. The Governments of Canada and the United States have not acted on the recommendations contained in the International Fisheries Commission's Report for 1928.

PILCHARD AND HERRING INVESTIGATION.

During the year the Provincial Government joined with the Dominion Government in an investigation to disclose the life of the pilchard and herring and the condition of those fisheries within Provincial waters. The investigation is being conducted under the supervision of Dr. W. A. Clemens, of the Biological Board of Canada, and John Pease Babcock, Assistant to the Commissioner of Fisheries for the Province. Dr. J. L. Hart has been made the Director.

Dr. Hart, with one or two temporary assistants, began the investigation in July. The work of the year must be regarded as preliminary. It has been directed chiefly to ascertaining the most profitable and speedy methods of procedure.

Pilchards.—Statistics of the catch of pilchards since 1917 have been tabulated. By extensive microscopic examination it has been confirmed that the age of pilchards cannot, as in the case of salmon, herring, and some other fishes, be determined by an examination of their scale-growth. Tests have been made to determine length distribution in the catches. It is hoped by an extension of the latter study that it may be determined whether there has been any marked decrease in the older fish in any fluctuations that may occur in future years. In the course of samplings of the catches in 1929 the sex of the fish was recorded. As the number of fish sampled was considerable and most of the fish were large-sized, it is interesting to note that close to 60 per cent. of the fish were females.

Previous to 1925 the catch of pilchards by British Columbia fishermen was small owing to the difficulty of finding a suitable method of marketing. It is evident from records of the catches that those engaged in the fishery conducted a number of experiments. Finding that there was a very limited market for fresh or canned pilchards, resort was made in 1925 to reduction of the fish for the production of oil and meal content. Several plants were installed that year. Their success led to rapid expansion. Many more plants were established and the fishing greatly extended. By 1928 upwards of $4,000,000 was invested in plants and gear and upwards of 1,000 men engaged. Up to 1924 the total catch of pilchards by British Columbia fishermen did not exceed 3,000,000 lb. The catch in 1925 totalled 32,000,000 lb. and thereafter was increased rapidly. In 1926 it totalled 96,900,000 lb.; in 1927, 136,858,000 lb.; and in 1928 it reached 161,000,000 lb.

In 1925 and 1926 fishing was conducted in estuary waters on the west coast of Vancouver Island. In 1927 limited catches were made in outside unsheltered waters. In 1928 and 1929 practically the bulk of the catch was made in those waters. As the pilchard-fishery of the Cornwall coast of England has a similar history, it seems probable that the British Columbia fishery will become more or less stabilized in this respect.

It is unnecessary to point out that definite conclusions cannot be drawn by a comparison of the early records of any fishery. Only by continued study can the trend of a fishery be shown. The investigation in hand is directed to that end.

Herring.—The investigation of the life-history of the herring and the condition of that fishery in the Province is also being jointly undertaken by the Dominion and the Province. As, fortunately, the pilchards appear in our waters much earlier than the herring and the pilchard-fishing is usually over before the herring come in, the investigation will be made under Dr. Hart and staff.

As has been previously indicated in the reports of this Department (1916), the most profitable approach of the investigation is that of determining the age-classes comprised in the catch of given years. Such study promises to disclose not only the stability of the runs, but is also an index of the success of spawning in given years. It is therefore to be regarded as fundamental in determining the causes of fluctuation in abundance.

Age and distribution in the catches of the closely related European herring (*Clupea harengus*) have been extensively studied by scale-reading, and W. F. Thompson, in his work for the Province in 1916, has shown that the same methods of age-determination were applicable to the British Columbia herring (*Clupea pallasii*). This method will be used in the present investigation.

Though fishing for herring in Provincial waters has been slow, it may be stated to have become stabilized in 1917. In that year the catch totalled 40,037,400 lb. In 1920 it advanced to 100,135,000 lb. and remained close to that amount each year up to and including 1923. In the years 1925 to 1929 it averaged 152,462,000 lb. The gain in the last few years may be due largely to an increased use of gear, and not due to increased abundance. The desirability of having the herring industry established on a basis that assures its continuance is evident. Accordingly the present investigation has been undertaken in the hope of gaining such an understanding as will enable us to adopt a system of exploitation which will assure its maintenance. And it is hoped that in time it may also be possible to forecast approximate estimates in advance of the season.

APPENDICES.

CONTRIBUTIONS TO THE LIFE-HISTORY OF THE SOCKEYE SALMON. (No. 15.)

By Wilbert A. Clemens, Ph.D., Director, Pacific Biological Station, Nanaimo, and Lucy S. Clemens, Ph.D.

INTRODUCTION.

Of the runs of sockeye salmon to the four main river systems of the Province, that to the Fraser River was the only one in 1929 which may be considered encouraging. The pack of this river was 26,059 cases more than that of 1925—the brood-year of the 1929 run—and the increase was made up entirely of increased catch by Canadian fishermen. But more important from the standpoint of the future was the spawning escapement to the upper reaches of the Fraser basin, reported as the best since 1917.

The runs to the other three river systems all exhibited discouraging features. The pack at Rivers Inlet was below expectancy, apparently due to failure of the run of five-year-old fish. It is suggested that severe freshets in 1925 were responsible.

The pack of the Skeena River run was much below expectancy, the result probably, in part at least, of adverse weather conditions interfering with fishing operations. The escapement is reported as large, so that in spite of the low pack there would seem to be reason to believe that the maintenance of the cycle is well assured.

Unfortunately the same cannot be said of the Nass River. The pack was a comparative failure and the escapement is reported as poor. This apparently indicates the failure of the 1929–1924–1919 cycle to maintain itself. Last year the decline of the 1928–1923–1918 cycle was recorded, and the year before, that of the 1927–1922–1917 cycle. It is evident that the Nass River sockeye situation demands serious consideration.

1. THE FRASER RIVER SOCKEYE RUN OF 1929.

(1.) General Characteristics.

In view of the fact that the run of 1929 belongs to the cycle of the former "big" years, it was anticipated with interest. The total pack for the Fraser River system amounted to 173,467 cases, of which 61,569 cases were packed in the Province of British Columbia and 111,898 cases in the State of Washington. The report from the upper spawning areas indicates an escapement very much better than any since 1917. It is therefore evident that the run of 1929 was very encouraging. The total pack was 26,059 greater than that of 1925. This increase was entirely in the Canadian pack (Table I.).

There were two noteworthy features in connection with the run of this year. In the first place, a large number of fish appeared in the early part of the season and, as far as can be ascertained, proceeded to the upper regions of the Fraser, even to the Stuart Lake area.

In the second place, a considerable number of three-year-old individuals (grilse) occurred in the run. Reports of the appearance of these were received from Swiftsure Bank; Sooke; Rosario Straits and other waters in Washington; the fishing region of the Fraser River; and from some of the spawning areas of the Upper Fraser.

These two occurrences appear not to be in any way connected with one another, but possibly to be indicative of different happenings. The first would seem to indicate the possibility of an increased run in 1933. Undoubtedly the larger run of this year is the result of the fairly large escapement in 1925. Referring to the report of the spawning-beds in that year, we find that the escapement to the Upper Fraser areas was larger than in any year subsequent to 1913. Improved runs were noted in Seton Lake, Chilcotin River, and the tributaries of the Nechako River, including Stuart, Takla, and other lake tributaries. The conclusion that the great spawning areas of the Upper Fraser merely await adequate escapements to become as productive as they ever were seems warranted.

The second occurrence—namely, of numbers of grilse—may possibly presage a good run of four-year-old fish in 1930. In the early days of the Fraser River fishery a large number of grilse always appeared in the year preceding the "big" run. The practical disappearance of the grilse with the decline of the upper river runs would rather indicate that the development of three-year-old fish was a characteristic chiefly of the upper river races. In 1926 there was a large run to the Shuswap area, where somewhere between three and six hundred thousand fish spawned. It may be that the grilse of 1929 are the product of the Adams River spawning of 1926 and are the forerunners of a good return there in 1930.

The run of 1930 will be derived largely from the spawning of 1926. In that year there was an increase in pack over that of 1922, largely because of the appearance of a large run late in the season. There was a large escapement to Adams River, already referred to, and there would seem to be every reason to expect a good return from that spawning. It will be of interest to see not only if the run does materialize, but if it appears late in the season, as did that of 1926. The cycle of 1918–1922–1926 has shown consistent improvement since the low pack of 1918 and it is hoped that the upward trend will continue.

(2.) Age-groups.

The material for this year's study consisted of data and scales from 1,512 sockeye salmon selected from May 1st to September 13th in forty-nine samplings. Unfortunately, the individuals of the 3_2 age-group (grilse) were not selected at random. While data are given for 262 such individuals, the collector estimates that they constituted about 3 per cent. of the run. Mr. C. F. Todd gave an estimate of approximately 2 per cent. at the cannery. In order that the results of this year may be reasonably comparable with those of other years, we have arbitrarily set the percentage of grilse at 2½ per cent. The approximate number of 3_2 individuals should therefore be thirty-two and the total sampling should be considered as 1,286.

The 4_2 age-group was the predominant one as usual, being represented by 991 individuals, or 77 per cent. The 5_2 group was the second largest with 153 individuals, or 12 per cent. The 5_3 group contained 100 individuals, or 8 per cent. The 3_2 group or grilse have been estimated as forming 2½ per cent., as stated above, and their number should therefore be thirty-two.

It has seemed of interest to tabulate the records of grilse from the year 1911 to 1929:—

Year.	Year.
1911—negligible.	1921— 5 individuals among 1,028 examined.
1912—approximately 21.5 per cent.	1922— 8 " " 892 "
1913—3 individuals among 2,580 examined.	1923— 4 " " 947 "
1914—0 " " 1,500 "	1924—15 " " 1,563 "
1915—none recorded.	1925— 7 " " 1,229 "
1916—approximately 10 per cent.	1926—24 " " 1,124 "
1917—none recorded.	1927— 0 " " 1,371 "
1918— "	1928—11 " " 1,004 "
1919— "	1929—32 " " 1,286 "
1920—3 individuals among 1,950 examined.	

(3.) Lengths and Weights.

The average lengths of both males and females in the 4_2 and 5_2 age-groups—namely, 23.7, 22.9, 25.5, and 24.3 inches respectively—are practically the same as that of their progenitors. In the 4_2 group they are identical with the average of the past ten years and in the 5_2 group almost so. The average lengths of the two sexes in the 5_3 age-groups—namely, 24.8 and 23.7 inches—are the highest on record.

The average weights of the males and females of the 4_2 age-group are 6 and 5.3 lb. respectively; of the 5_2 group, 7.2 and 6.3; and of the 5_3 group, 6.7 and 5.9. The average weights of the 4_2 group are slightly above those of their progenitors, while those of the 5_2 group are slightly below. The average weights of the 5_3 group are the highest on record.

The average lengths of the males and females of the grilse are 18.6 and 18.2 inches respectively, while the weights are 3.1 and 2.9 lb. respectively.

(4.) Distribution of the Sexes.

Taking the total number of individuals as 1,286, the total number of males was 624 and of females 662, percentages of 49 and 51 respectively. While the great majority of grilse are males, it is to be noted that in the sampling of 262 there were thirty-one females; that is, 12 per cent. of the grilse were females.

Table I.—Fraser River Packs, 1910–29, arranged in accordance with the Four-year Cycle.

B.C.	1910—	150,432	1914—	198,183	1918—	19,697	1922—	51,832	1926— 85,689
Wash.		248,014		335,230		50,723		48,566	44,673
Total		398,446		533,413		70,420		100,398	130,362
B.C.	1911—	58,487	1915—	91,130	1919—	38,854	1923—	31,655	1927— 61,393
Wash.		127,761		64,584		64,346		47,402	97,594
Total		186,248		155,714		103,200		79,057	158,987
B.C.	1912—	123,879	1916—	32,146	1920—	48,399	1924—	39,743	1928— 29,299
Wash.		184,680		84,637		62,654		69,369	61,044
Total		308,559		116,783		111,053		109,112	90,343
B.C.	1913—	719,796	1917—	148,164	1921—	39,631	1925—	35,385	1929— 61,569
Wash.		1,673,099		411,538		102,967		112,023	111,898
Total		2,392,895		559,702		142,598		147,408	173,467

Table II.—Fraser River Sockeyes, 1929, Vancouver Island Traps, grouped by Age, Sex, and Length, and by their Early History.

Length in Inches.	Number of Individuals.																
	4_2		5_2		5_3		6_3		3_1		4_1		3_2		4_3		Total.
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	
15½	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	1	.....	.....	4
16½	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	1	1	.....	5
17	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7	1	.....	.....	8
17½	1	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	17	5	.....	.....	24
18	2	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	50	9	.....	.....	62
18½	1	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	62	4	.....	.....	69
19	2	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	42	8	.....	.....	56
19½	2	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	29	1	.....	.....	34
20	5	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	11	1	.....	.....	19
20½	3	7	.....	1	1	.....	.....	.....	.....	.....	.....	.....	6	.....	.....	.....	18
21	2	12	1	2	.....	2	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	20
21½	6	16	2	1	1	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	27
22	10	53	3	4	.....	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	74
22½	33	93	3	2	1	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	136
23	68	128	5	8	7	5	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	222
23½	66	117	.....	5	4	8	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	201
24	105	65	6	7	1	10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	194
24½	68	25	7	8	7	4	.....	1	.....	.....	.....	1	.....	.....	.....	.....	121
25	51	4	6	9	6	6	.....	2	.....	.....	1	.....	.....	.....	.....	.....	85
25½	23	1	10	12	5	4	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	56
26	8	.....	4	6	10	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	29
26½	2	.....	12	4	5	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	24
27	.....	.....	10	.....	2	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	13
27½	.....	.....	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7
28	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2
28½	.....	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3
29	.....	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3
Totals	458	533	84	69	50	50	2	3	.....	1	1	2	231	31	1	.....	1,516
Ave. lengths	23.7	22.9	25.5	24.3	24.8	23.7	26.2	24.8	.....	23.0	25.0	24.0	18.6	18.2	16.5	.....	.....

Table III.—Fraser River Sockeyes, 1929, Vancouver Island Traps, grouped by Age, Sex, and Weight, and by their Early History.

Weight in Pounds.	Number of Individuals.																Total.
	4_2		5_2		5_3		6_3		3_1		4_1		3_2		4_3		
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	
1½	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	1	1	.....	4
2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	1	.....	.....	3
2½	2	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	47	12	.....	.....	64
3	5	8	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	105	11	.....	.....	130
3½	10	14	.....	2	.....	1	.....	.....	.....	.....	.....	.....	58	4	.....	.....	89
4	8	25	3	2	1	1	.....	.....	.....	.....	.....	.....	15	1	.....	.....	56
4½	16	61	4	5	1	3	.....	.....	.....	.....	.....	.....	1	1	.....	.....	92
5	46	139	5	7	6	5	.....	.....	.....	1	.....	.....	1	.....	.....	.....	210
5½	90	132	6	6	3	14	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	252
6	102	100	6	9	3	13	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	234
6½	81	31	8	9	9	3	1	1	.....	.....	1	1	.....	.....	.....	.....	145
7	56	18	10	7	11	7	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	110
7½	23	2	10	11	7	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	54
8	15	.....	7	6	6	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	35
8½	3	.....	6	1	2	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	13
9	1	.....	9	2	1	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	14
9½	.....	.....	4	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5
10	.....	.....	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5
10½	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
11	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
11½	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
12	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Totals	458	533	84	69	50	50	2	3	.....	1	1	2	231	31	1	.....	1,516
Ave. weights	6.0	5.3	7.2	6.3	6.7	5.9	7.5	6.5	.....	5.0	6.5	6.0	3.1	2.9	1.5	.....	.....

Table IV.—Fraser River Sockeyes, Percentages of the Year-classes from 1919 to 1929.

Year.	4_2	5_2	5_3	6_3	3_1	4_1	3_2	4_3
1919	70.5	20.3	3.4	0.9	3.1	1.8	.....	.....
1920	69.6	21.2	6.2	0.2	1.9	0.9	.....	.....
1921	78.1	14.6	4.1	0.7	0.5	2.0	.....	.....
1922	70.5	9.3	4.5	2.0	6.3	5.6	0.9	0.9
1923	67.1	10.8	3.9	1.2	6.7	9.9	0.4	0.0
1924	68.2	18.7	9.2	0.5	0.5	2.0	0.8	0.1
1925	67.9	24.9	3.4	0.2	2.2	0.0	0.6	0.8
1926	66.1	20.3	5.2	1.6	2.0	2.5	2.1	0.2
1927	84.6	7.5	3.0	0.8	1.9	2.2	.....	.....
1928	71.4	18.8	5.3	0.5	2.0	0.7	1.0	0.3
1929	77.3	11.9	7.8	0.4	0.1	0.1	2.5	0.1

Table V.—Fraser River Sockeyes, Average Lengths of Principal Classes from 1919 to 1929.

Year.	4_2		5_2		5_3		6_3		3_1		4_1	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
1919	24.1	22.8	26.1	25.1	24.2	22.7	25.8	23.5	22.6	22.2	25.0	24.3
1920	24.1	23.2	25.7	24.6	24.3	23.2	25.7	.....	23.3	21.8	25.5	24.3
1921	23.7	23.0	25.9	24.6	.....	.....	.....	.....	.....	.....	.....	.....
1922	24.0	23.0	25.8	24.1	23.5	22.7	25.4	24.3	23.0	22.6	25.5	24.2
1923	24.3	23.3	25.8	24.8	24.2	22.9	26.3	24.9	23.3	22.7	25.2	24.1
1924	23.8	22.8	24.9	23.9	23.7	22.7	24.3	.....	21.9	20.4	25.2	24.4
1925	23.5	22.9	25.8	24.6	24.0	22.0	.....	.....	22.5	21.7	.....	.....
1926	22.6	22.3	24.6	24.0	23.2	22.4	25.5	23.7	23.4	22.5	25.4	24.6
1927	24.1	23.1	26.1	24.6	21.7	22.0	25.3	24.6	23.4	22.2	25.1	24.5
1928	23.4	23.0	25.5	24.7	24.2	23.4	27.1	26.0	19.1	18.7	19.8	.....
1929	23.7	22.9	25.5	24.3	24.8	23.7	26.2	24.8	.....	23.0	25.0	24.0

Table VI.—Fraser River Sockeyes, Average Weights of Principal Classes from 1919 to 1929.

Year.	4_2		5_2		5_3		6_3		3_1		4_1	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
1919	6.1	5.1	7.2	6.5	5.7	4.5	6.5	5.3	5.3	4.8	6.8	6.1
1920	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1921	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1922	6.4	5.7	7.0	6.1	6.1	5.4	7.2	5.5	5.9	5.2	7.9	6.9
1923	6.6	5.8	7.8	6.9	6.0	5.2	7.3	6.5	6.2	5.3	7.3	6.5
1924	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1925	5.8	5.2	7.6	6.6	6.1	5.3	.....	.....	5.3	4.6	.....	.....
1926	5.2	4.9	6.2	5.7	5.4	4.8	7.4	5.7	6.1	5.4	7.3	6.6
1927	6.1	5.5	7.3	6.8	4.5	4.8	6.5	5.5	5.9	5.2	7.2	6.8
1928	6.0	5.5	7.4	6.9	6.5	5.7	8.6	8.0	6.4	5.4	8.0	6.6
1929	6.0	5.3	7.2	6.3	6.7	5.9	7.5	6.5	.....	5.0	6.5	6.0

2. THE RIVERS INLET SOCKEYE RUN OF 1929.

(1.) General Characteristics.

The pack of Rivers Inlet area for the year 1929 consisted of 70,260 cases. This figure is somewhat less than was expected.

Last year we pointed out that the data of this river system are most readily interpreted by accepting the theory that the cycle is pre-eminently a five-year one. Two tabulations were

made and served as the basis of the discussion which can be found in full in the report for 1928. For the purpose of reference we are giving the tables again with a brief statement of their meaning.

Table A.

Series 1.	1907,	87,874 cases;	1912,	112,884;	1917,	61,195;	1922,	53,584;	1927, 64,461.
Series 2.	1908,	64,652 cases;	1913,	61,745;	1918,	53,401;	1923,	107,174;	1928, 60,044.
Series 3.	1909,	89,027 cases;	1914,	89,890;	1919,	56,258;	1924,	94,891;	1929, 70,260.
Series 4.	1910,	126,921 cases;	1915,	130,350;	1920,	125,338;	1925,	159,554.	
Series 5.	1911,	88,763 cases;	1916,	44,936;	1921,	48,615;	1926,	65,581.	

Table B.

Series 1.	1912 (5 years)	79%	1917	67%	1922	18%	1927	17%
	(4 years)	21%		33%		82%		83%
Series 2.	1913	20%	1918	43%	1923	24%	1928	42%
		80%		57%		76%		58%
Series 3.	1914	65%	1919	54%	1924	56%	1929	19%
		35%		46%		44%		81%
Series 4.	1915	87%	1920	95%	1925	77%		
		13%		5%		23%		
Series 5.	1916	76%	1921	51%	1926	40%		
		24%		49%		60%		

In Table A the pack data have been arranged in series with five-year intervals; each series, or cycle, extends horizontally across the page. Table B is similarly arranged with a substitution of the relative percentages of the four- and five-year-old fish for the packs.

Fair uniformity seems to exist in series 2, 3, and 4. The former tabulation shows that within a given cycle packs are of approximately the same size, and, in a like manner, the latter table shows that there is a fair degree of constancy in the relative percentages of the two age-groups. Correlating the two sets of data, it appears that (1) when the four-year-old fish are in the majority the packs are small, consisting of 50,000 to 65,000 cases (series 2); (2) when the five-year-old fish slightly exceed the fours, the packs amount to 85,000 to 95,000 cases (series 3); and (3) when the five-year-olds are greatly in excess, then a pack of at least 120,000 cases is produced (series 4).

The year 1929 belongs in the third series, in which the five-year-old fish have always been slightly in excess of the four-year-olds and the packs have amounted to approximately 85,000 to 95,000 cases. Hence this year's pack of 70,260 cases has fallen below expectancy by from 15,000 to 20,000 cases. In addition, the percentages of the two age-classes are very different from those of the other years in this cycle. Instead of having the percentage of the 5_2's a little greater than that of the 4_2's, we have 19 and 81 per cent. respectively. Turning to Inspector Stone's report of the spawning-beds to ascertain whether or not the pack indicates the full extent of the 1929 run, we find that he reports extensive seeding in certain regions and very poor seeding in others. He is of the opinion that the pack would have been larger had not the cold, wet weather interfered with the fishing during the early part of the season, thus permitting a greater escapement than would have taken place otherwise. We may say, then, that the run probably was somewhat greater than the pack indicates. However, we do not feel justified in concluding that the escapement as reported would have necessarily produced a pack as great as predicted, had the fishing conditions been normal.

When we consider the percentages of the four- and five-year-old fish we must remember that these are relative and not absolute. The thing to emphasize is not the superabundance of the 4's, but the failure of the 5's, by reason of which the proportion of the 4's is exaggerated. In 1924 the pack (94,891 cases) was good and the escapement was good. Since the five-year-old fish formed 56 per cent. of the run, it seems reasonable to have expected a return greater than 19 per cent. After the spawning season in 1924 there was a freshet of unusual magnitude, and when Mr. Stone made his annual inspection the following year he found the streams and rivers scoured out to such an extent that he expressed the fear that untold damage had been done to the eggs and that the runs of 1928 and 1929 would be greatly impaired. While the pack of 1928 was small, seemingly it was all that could be expected from the brood-years irregardless of the freshet.

On the other hand, the percentage of five-year-old fish in this run of 1929 is so unexpectedly small that we cannot pass it over without attempting to find a reason for it. It would appear that Mr. Stone's fears may have been well founded and therein lies the explanation of the failure of the five-year-old fish. Whether this explanation be right or not, the fact remains that this component of the run has suffered severe depletion, and in 1934 additional prohibitive measures should be in force to allow a very much greater escapement to the spawning-beds. In that way, and in that way only, can significant recuperation be hoped for.

When we examine the pack (159,554 cases) and spawning escapement of 1925, we find that they form the peak of Rivers Inlet productivity. In commenting upon the seeding, Mr. Stone said there should be "an unexampled return." Consequently the large percentage of 4's in 1929 is not surprising. The rest of the progeny of this escapement will return as five-year-olds in 1930. Since the year 1930 belongs to the cycle 1915–1920–1925, in which the five-year component has always been large (from 77 to 95 per cent.), we can look for a very large pack. Without taking the other brood-year, 1926, into account, the expectancy would be about 125,000 cases. In 1926 the pack was small (65,581 cases) and the seeding only fair, so that the four-year-old fish probably cannot be counted upon to bring the total pack up to more than 150,000 or 160,000 cases.

(2.) Age-groups.

The material for the study of the 1929 run consisted of eleven samplings gathered over a period of five weeks extending from June 24th through July 31st. The total number of fish under consideration is 1,402. These are divided among the four age-groups which are characteristic of the runs to Rivers Inlet. The dominant groups are the 4_2 and 5_2, which are made up of fish that have lived one year in the fresh water and two or three in the sea, thus maturing at the end of their fourth and fifth years respectively. Two other age-groups, the 5_3 and 6_3, are also present. These fish migrate to sea at the end of their second year, and mature after two or three years in the ocean at the respective ages of five and six.

Ninety-five per cent. of the entire run of 1929 is accounted for by the dominant groups. The other two age-groups are never present in large numbers. Table VII. indicates how varied the relative proportions of the 4_2's and 5_2's have been over a period of years. The proportions for this present year are quite extreme—namely, 81 per cent. of 4's and 19 per cent. of 5's. As we have pointed out in the foregoing paragraphs, when the four-year-old fish greatly outnumber the 5's the packs are small.

(3.) Lengths and Weights.

Complete enumeration of the lengths and weights of the individuals of the various age-groups of the 1929 Rivers Inlet sockeyes is found in Tables VIII. and IX. A number of years ago Dr. Gilbert called attention to the fact that these Rivers Inlet fish were decreasing in size. He pointed out that the decrease was equally true for both sexes, and that although the tendency was more marked in the lengths, nevertheless it also showed in the weights. In order to find out to what extent this reduction in size might be taking place, we have made a tabulation of the average lengths and weights, combining them in three six-year groups, as follows:—

	1912–1917.	1918–1923.	1924–1929.
	Inches.	Inches.	Inches.
Four-year males	22.9	22.5	22.4
Four-year females	22.8	22.4	22.5
Five-year males	25.7	25.0	25.2
Five-year females	24.9	24.4	24.7
	Lb.	Lb.	Lb.
Four-year males	5.3	5.2	5.0
Four-year females	5.1	5.1	5.0
Five-year males	7.2	6.8	7.0
Five-year females	6.6	6.3	6.6

It is encouraging to notice that the size reductions have not taken place steadily. As for lengths, a small but significant decrease of from 0.4 to 0.7 inch occurred between the general averages of 1912–1917 and 1918–1923 groups. Between this latter group and that of the

1924–1929 there has been no further reduction. As a matter of fact, there has been a slight increase in length. The history of the average weights is similar, although not as striking as that of the lengths. There has been a very small decrease, followed, in the five-year-old fish, by reversion toward the greater weight. Comparing the averages of 1929 with those of the 1924–1929 period, we find, except for the lengths and weight of the 4_2 females and the weight of the 5_2 females, maintenance or increase in size.

The four-year-old Rivers Inlet sockeyes have always been outstanding as an age-group in which the two sexes have been nearly identical in size. The general rule among sockeyes is that the females are smaller than the males. But in this particular group the females are sometimes smaller, sometimes identical with, and sometimes larger than the males (Tables X. and XI.). This is the first year since 1923 for length, and 1924 for weight, in which the 4_2 Rivers Inlet females have been smaller than the males. These 1929 fish show that a similar condition may also exist in the 5_2 group. Here we find the females 0.1 inch longer than the males. It is the first such record for length and there is only one like instance (in 1927) for weight.

(4.) Distribution of Sexes.

Table XII. indicates the sex distribution in the principal age-groups of the Rivers Inlet sockeyes. Without exception, the males are more numerous than the females among the four-year-old fish and less numerous among the five-year-olds. The relative proportions of the 4_2 males and females in 1929 are interesting because they are respectively the lowest (57) and highest (43) percentages recorded for the group. The table shows that in this group there is a decided tendency toward equalization in the numbers of the two sexes. In the runs of earlier years the 4_2 males always formed 75 per cent. of the group, while in the last five years they have averaged 63 per cent. The relative numbers of the two sexes in the 5_2 group have not varied within such broad limits, but here, too, there is an indication of shifting proportions. This year the group is composed of 36 per cent. males and 64 per cent. females. Considering 1929 as a potential brood-year, it is fortunate that the number of 4_2 males is comparatively small, because this age-group forms 81 per cent. of the entire run. Had the four-year-old males been present in their usual proportion, the undesirable condition of males greatly exceeding females would have been produced. As it is, the total number of males of both classes (710) is not very much larger than that of the females (627) and the percentages are 53 and 47 respectively.

Table VII.—Percentages of 4_2 and 5_2 Age-groups, Rivers Inlet Sockeyes, in Runs of Successive Years.

Run of the Year.	Percentage, Four and Five Years old.	Brood-year from which derived.
1912 (112,884 cases)	5 yrs. 79% 4 yrs. 21%	1907 (87,874 cases). 1908 (64,652 cases).
1913 (61,745 cases)	5 yrs. 20% 4 yrs. 80%	1909 (89,027 cases).
1914 (89,890 cases)	5 yrs. 65% 4 yrs. 35%	1910 (126,921 cases).
1915 (130,350 cases)	5 yrs. 87% 4 yrs. 13%	1911 (88,763 cases).
1916 (44,936 cases)	5 yrs. 76% 4 yrs. 24%	1912 (112,884 cases).
1917 (61,195 cases)	5 yrs. 67% 4 yrs. 33%	1913 (61,745 cases).
1918 (53,401 cases)	5 yrs. 43% 4 yrs. 57%	1914 (89,890 cases).
1919 (56,258 cases)	5 yrs. 54% 4 yrs. 46%	1915 (130,350 cases).
1920 (121,254 cases)	5 yrs. 95% 4 yrs. 5%	1916 (44,936 cases).
1921 (46,300 cases)	5 yrs. 51% 4 yrs. 49%	1917 (61,195 cases).
1922 (60,700 cases)	5 yrs. 18% 4 yrs. 82%	1918 (53,401 cases).
1923 (107,174 cases)	5 yrs. 24% 4 yrs. 76%	1919 (56,258 cases).
1924 (94,891 cases)	5 yrs. 56% 4 yrs. 44%	1920 (121,254 cases).
1925 (159,554 cases)	5 yrs. 77% 4 yrs. 23%	1921 (46,300 cases).
1926 (65,581 cases)	5 yrs. 40% 4 yrs. 60%	1922 (60,700 cases).
1927 (64,461 cases)	5 yrs. 17% 4 yrs. 83%	1923 (107,174 cases).
1928 (60,044 cases)	5 yrs. 42% 4 yrs. 58%	1924 (94,891 cases).
1929 (70,260 cases)	5 yrs. 19% 4 yrs. 81%	1925 (159,554 cases).

Table VIII.—Rivers Inlet Sockeyes, Run of 1929, Grouped by Age, Sex, and Length, and by their Early History.

Length in Inches.	Number of Individuals.								Total.
	4_2		5_2		5_3		6_3		
	M.	F.	M.	F.	M.	F.	M.	F.	
19½	....	....	....	....	....	....	....	....	....
20	3	1	....	....	....	....	....	....	4
20½	12	4	....	....	1	....	....	....	17
21	45	28	....	....	1	....	....	....	74
21½	106	73	....	....	4	1	....	1	185
22	115	124	1	....	4	5	....	....	249
22½	85	90	2	4	1	1	....	....	183
23	63	79	1	6	2	4	....	....	155
23½	51	39	12	10	2	....	....	....	114
24	65	14	10	17	4	2	....	1	113
24½	40	7	13	21	4	....	1	5	91
25	22	1	15	19	2	....	1	1	61
25½	7	....	7	29	1	....	1	5	50
26	4	....	10	32	....	....	1	....	47
26½	....	....	7	14	....	....	....	2	23
27	....	....	4	9	....	....	....	5	18
27½	....	....	3	3	....	....	1	....	7
28	....	....	5	3	....	....	1	....	9
28½	....	....	1	....	....	....	....	....	1
29	....	....	....	....	....	....	....	....	....
29½	....	....	1	....	....	....	....	....	1
Totals	618	460	92	167	26	13	6	20	1,402
Ave. lengths	22.6	22.2	25.2	25.3	23.1	22.6	26.1	25.4	....

Table IX.—Rivers Inlet Sockeyes, Run of 1929, Grouped by Age, Sex, and Weight, and by their Early History.

Weight in Pounds.	Number of Individuals.								Total.
	4_2		5_2		5_3		6_3		
	M.	F.	M.	F.	M.	F.	M.	F.	
3	....	1	....	....	....	....	....	....	1
3½	9	5	....	....	2	....	....	....	16
4	107	93	....	....	3	1	....	....	204
4½	162	150	2	8	3	6	....	....	331
5	132	119	14	13	6	4	....	....	288
5½	78	64	16	17	4	1	....	2	182
6	68	20	15	24	4	1	....	3	135
6½	40	6	10	17	2	....	1	3	79
7	15	2	10	36	2	....	1	4	70
7½	6	....	8	25	....	....	2	3	44
8	1	....	6	14	....	....	1	2	24
8½	....	....	2	6	....	....	....	2	10
9	....	....	5	5	....	....	1	....	11
9½	....	....	3	1	....	....	....	1	5
10	....	....	....	....	....	....	....	....	....
10½	....	....	....	1	....	....	....	....	1
11	....	....	....	....	....	....	....	....	....
11½	....	....	1	....	....	....	....	....	1
Totals	618	460	92	167	26	13	6	20	1,402
Ave. weights	5.0	4.8	6.6	6.7	5.2	4.8	7.6	7.1	....

Table X.—Average Lengths in Inches of Rivers Inlet Sockeyes for Eighteen Years.

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

Table XI.—Average Weight in Pounds of Rivers Inlet Sockeyes for Fifteen Years.

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

Table XII.—Relative Numbers of Males and Females, Rivers Inlet Sockeyes, of the 4_2 and 5_2 Groups, 1915 to 1929.

Year.	Average Percentages.				Per Cent. Total Males.	Per Cent. Total Females.
	Four-year Males.	Four-year Females.	Five-year Males.	Five-year Females.		
1915	....	....	....	....	45	55
1916	74	26	40	60	52	48
1917	75	25	42	58	53	47
1918	74	26	49	51	66	34
1919	79	21	45	55	58	42
1920	74	26	48	52	49	51
1921	65	35	38	62	51	49
1922	66	34	38	62	61	39
1923	71	29	33	67	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	36	64	62	38
1928	63	37	30	70	51	49
1929	57	43	36	64	53	47

3. THE SKEENA RIVER SOCKEYE RUN OF 1929.

(1.) General Characteristics.

The pack of the Skeena River amounted to 78,017 cases. This was much below our predicted pack, but it does not necessarily indicate that our prediction was entirely astray and that the run to this river system was a comparative failure. Our attempts to estimate the extent of the runs are based upon the assumption that conditions will remain relatively constant from year to year. It has been pointed out in previous years that conditions do not and cannot remain absolutely uniform from year to year. In this year two factors at least have entered into the situation—namely, climatic conditions were extremely unfavourable for fishing and the fishing boundary was moved 3 miles down-stream. It is impossible to evaluate these factors, but undoubtedly they acted in some degree in reducing the catch and increasing escapement. The reports from the spawning-beds indicate an abundant seeding, especially in the Babine area. Whether approximately 800,000 more fish reached the spawning-beds than would otherwise have done so cannot be determined. It is evident that a more accurate system of assessing the escapement is required, and it is hoped that in the very near future a very intensive study will be made of this river system, which may result in the development of a "working-plan" whereby, among other things, it will ultimately be possible to state the number of cases which may safely be taken in each year and at the same time allow such an escapement as shall maintain the maximum of production.

The run of 1930 will be derived from the seedings of 1925 and 1926. In 1925 the pack consisted of 81,146 cases, and the samplings in that year showed that the five-year-old fish constituted 47 per cent. of the run. In 1926 the pack amounted to 82,360 cases and the four-year-old fish formed 70 per cent. of the run. In both years the spawning-beds of both the Lakelse and Babine areas were reported very well seeded. There would appear, therefore, to be reason to expect a fair run in 1930 and to believe that a pack of approximately 75,000 cases may be taken.

(2.) Age-groups.

Scales and data were secured from 1,817 fish collected from July 2nd to August 15th in fourteen samplings. The four-year-old fish (4_2) were again predominant, amounting to 1,133 individuals, or 62 per cent. The five-year-old fish (5_2) consisted of 456 individuals, or 30 per cent. The 5_3 and 6_3 groups were present in percentages of 6 and 2 respectively (Tables XIV., XV., and XVI.).

(3.) Lengths and Weights.

The average lengths of all the age-groups, with the exception of those of the 5_2 group, are low, especially those of the 4_2 group, which are the lowest on record, with 22.9 inches for the males and 22.7 inches for the females. The average lengths of both sexes of the 5_2 group are but very slightly below the average of the past seventeen years.

The average weights of all the age-groups are fairly well maintained, except in the case of the 4_2 groups, where that of the males is the lowest on record at 4.9 lb. and that of the females low at 4.7 lb. (Tables XVII., XVIII., XIX., and XX.).

(4.) Proportions of the Sexes.

In the 4_2 group the males were very slightly in excess in numbers over the females, but so nearly equal were the numbers that on a percentage basis they have been considered equal. In the 5_2 group the females slightly outnumbered the males with a percentage of 54. In the 5_3 and 6_3 groups the males occurred in greater numbers than did the females. The total number of males was 908 and of females 909 (Table XXI.).

(5.) Additional Material.

In addition to the fish recorded above, seven individuals were reported—namely, one female of the 6_4 age-group, length 24 inches, weight 5 lb.; and six male grilse (3_2 age-group), lengths 15 to 17 inches, weights 1½ to 2 lb. The latter were taken in a 2½-inch net.

Table XIII.—Percentages of 4_2 and 5_2 Age-groups, Skeena River Sockeyes, in Runs of Successive Years.

Run of the Year.	Percentage, Four and Five Years old.	Brood-year from which derived.
1912 (92,498 cases)	5 yrs. 43% 4 yrs. 57%	1907 (108,413 cases). 1908 (139,846 cases).
1913 (59,927 cases)	5 yrs. 50% 4 yrs. 50%	1909 (87,901 cases).
1914 (130,166 cases)	5 yrs. 75% 4 yrs. 25%	1910 (187,246 cases).
1915 (116,553 cases)	5 yrs. 64% 4 yrs. 36%	1911 (131,066 cases).
1916 (60,923 cases)	5 yrs. 60% 4 yrs. 40%	1912 (92,498 cases).
1917 (65,760 cases)	5 yrs. 62% 4 yrs. 38%	1913 (52,927 cases).
1918 (123,322 cases)	5 yrs. 59% 4 yrs. 41%	1914 (130,166 cases).
1919 (184,945 cases)	5 yrs. 69% 4 yrs. 31%	1915 (116,553 cases).
1920 (90,869 cases)	5 yrs. 82% 4 yrs. 18%	1916 (60,923 cases).
1921 (41,018 cases)	5 yrs. 24% 4 yrs. 76%	1917 (65,760 cases).
1922 (96,277 cases)	5 yrs. 19% 4 yrs. 81%	1918 (123,322 cases).
1923 (131,731 cases)	5 yrs. 34% 4 yrs. 66%	1919 (184,945 cases).
1924 (144,747 cases)	5 yrs. 75% 4 yrs. 25%	1920 (90,869 cases).
1925 (81,146 cases)	5 yrs. 47% 4 yrs. 53%	1921 (41,018 cases).
1926 (82,360 cases)	5 yrs. 30% 4 yrs. 70%	1922 (96,277 cases).
1927 (83,996 cases)	5 yrs. 31% 4 yrs. 69%	1923 (131,731 cases).
1928 (34,559 cases)	5 yrs. 43% 4 yrs. 57%	1924 (144,747 cases).
1929 (78,017 cases)	5 yrs. 33% 4 yrs. 67%	1925 (77,784 cases).

Table XIV.—Percentages of the Principal Year-classes, Skeena River Sockeyes, from 1916 to 1929.

Year.	One Year in Lake.		Two Years in Lake.	
	Four Years old.	Five Years old.	Five Years old.	Six Years old.
1916	34	38	13	18
1917	57	29	9	5
1918	51	34	9	6
1919	27	60	9	4
1920	15	71	6	8
1921	69	22	6	3
1922	70	16	12	2
1923	56	29	8	7
1924	23	69	7	1
1925	51	45	3	1
1926	62	26	9	3
1927	62	28	9	1
1928	51	39	7	3
1929	62	30	6	2

Table XV.—Skeena River Sockeyes, 1929, grouped by Age, Sex, and Length, and by their Early History.

Length in Inches.	Number of Individuals.								Total.
	4_2		5_2		5_3		6_3		
	M.	F.	M.	F.	M.	F.	M.	F.	
19	....	1	....	....	....	....	....	....	1
20	3	1	....	....	....	....	....	....	4
20½	15	7	....	....	....	....	....	....	22
21	32	25	....	....	....	2	....	....	59
21½	44	53	....	....	1	1	....	....	99
22	61	110	1	3	1	7	....	....	183
22½	93	134	2	5	7	7	....	....	248
23	86	111	2	10	8	8	....	3	228
23½	106	73	6	34	15	7	1	2	244
24	71	31	19	48	16	2	2	4	193
24½	45	10	14	61	9	....	1	3	143
25	10	3	51	55	6	1	6	3	135
25½	5	2	47	40	1	....	3	....	98
26	1	....	51	28	2	....	4	....	86
26½	....	....	29	9	....	....	1	....	39
27	....	....	13	2	....	....	2	....	17
27½	....	....	9	1	....	....	1	1	12
28	....	....	5	1	....	....	....	....	6
28½	....	....	....	....	....	....	....	....	....
Totals	572	561	249	297	66	35	21	16	1,817
Ave. lengths	22.9	22.7	25.5	24.7	23.8	22.8	25.5	24.3	....

Table XVI.—Skeena River Sockeyes, 1929, grouped by Age, Sex, and Weight, and by their Early History.

Weight in Pounds.	Number of Individuals.								Total.
	4_2		5_2		5_3		6_3		
	M.	F.	M.	F.	M.	F.	M.	F.	
3	....	1	....	....	....	....	....	....	1
3½	16	15	....	....	1	....	....	....	32
4	91	88	....	1	....	4	....	....	184
4½	133	208	3	9	8	9	1	1	372
5	153	150	6	33	15	11	....	4	372
5½	94	64	19	58	15	9	1	6	266
6	60	28	34	64	11	2	4	2	205
6½	21	6	58	61	9	....	5	1	161
7	3	1	47	35	4	....	5	1	96
7½	1	....	40	30	3	....	2	....	76
8	....	....	26	5	....	....	2	1	34
8½	....	....	11	1	....	....	....	....	12
9	....	....	4	....	....	....	1	....	5
9½	....	....	....	....	....	....	....	....	....
10	....	....	1	....	....	....	....	....	1
Totals	572	561	249	297	66	35	21	16	1,817
Ave. weights	4.9	4.7	6.8	6.2	5.6	4.9	6.8	5.7	....

Table XVII.—Average Lengths of Skeena River Sockeyes, 4_2 and 5_2 Age-groups, for Eighteen Successive Years.

Year.	Four-year Males.	Four-year Females.	Five-year Males.	Five-year Females.
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
1916	23.9	23.6	26.2	25.0
1917	23.6	23.2	25.5	24.7
1918	24.1	23.3	25.9	25.0
1919	24.3	23.4	25.7	24.8
1920	23.8	23.2	26.2	25.3
1921	23.8	23.1	25.2	24.2
1922	23.6	23.2	25.3	24.4
1923	23.7	23.1	25.5	24.5
1924	24.1	23.3	26.2	25.2
1925	23.6	22.8	25.6	24.7
1926	23.8	23.4	25.6	24.8
1927	23.9	23.3	25.7	24.8
1928	23.3	22.8	25.3	24.7
1929	22.9	22.7	25.5	24.7

Table XVIII.—Average Lengths of Skeena Sockeyes, 5_3 and 6_3 Age-groups, for Fourteen Successive Years.

Year.	Five-year Males.	Five-year Females.	Six-year Males.	Six-year Females.
1916	24.1	23.8	26.2	24.8
1917	23.9	23.8	25.4	25.0
1918	23.9	23.4	25.2	24.7
1919	24.3	23.4	25.8	24.7
1920	24.1	23.4	26.2	25.1
1921	24.2	23.4	24.9	24.2
1922	23.8	23.3	24.6	24.1
1923	23.9	23.2	25.6	24.4
1924	24.7	23.6	25.8	24.8
1925	24.1	23.3	25.8	24.8
1926	24.6	23.8	26.0	25.0
1927	24.1	23.5	25.2	24.9
1928	23.5	22.8	25.6	24.7
1929	23.8	22.8	25.5	24.3

Table XIX.—Average Weights of Skeena River Sockeyes, 4_2 and 5_2 Age-groups, for Sixteen Successive Years.

Year.	Four-year Males.	Four-year Females.	Five-year Males.	Five-year Females.
1914	5.9	5.3	7.2	6.3
1915	5.7	5.2	6.8	6.2
1916	5.4	5.1	7.1	6.3
1917	5.3	5.0	6.4	6.0
1918	5.8	5.3	6.9	6.4
1919	6.1	5.5	7.0	6.2
1920	5.6	5.1	7.2	6.4
1921	5.7	5.1	6.4	5.7
1922	5.4	5.1	6.5	5.7
1923	5.3	4.9	6.3	5.7
1924	5.6	5.0	7.0	6.3
1925	5.1	4.7	6.5	5.8
1926	5.3	5.1	6.5	5.8
1927	5.4	5.1	6.5	5.9
1928	5.0	4.6	6.4	5.8
1929	4.9	4.7	6.8	6.2

Table XX.—Average Weights of Skeena River Sockeyes, 5_3 and 6_3 Age-groups, for Fifteen Successive Years.

Year.	Five-year Males.	Five-year Females.	Six-year Males.	Six-year Females.
1915	5.9	5.2	6.6	6.0
1916	5.8	5.4	7.1	5.9
1917	5.5	5.2	6.3	5.8
1918	5.7	5.3	6.6	6.1
1919	6.1	5.4	6.9	6.3
1920	6.3	5.1	7.3	6.3
1921	5.8	5.1	6.0	5.6
1922	5.5	5.1	6.2	5.7
1923	5.3	4.8	6.3	5.4
1924	5.9	5.1	6.6	5.8
1925	5.5	4.9	6.9	5.4
1926	5.9	5.2	6.9	6.2
1927	5.4	5.0	6.0	5.8
1928	5.0	4.6	6.5	5.8
1929	5.6	4.9	6.8	5.7

Table XXI.—Percentages of Males and Females in each of the Different Year-groups, Skeena River Sockeyes, in a Series of Years.

Year.	4_2		5_2		5_3		6_3	
	M.	F.	M.	F.	M.	F.	M.	F.
1912	54	46	42	58	....	....	....	....
1913	69	31	47	53	....	....	....	....
1914	60	40	47	53	....	....	....	....
1915	55	45	45	55	....	....	....	....
1916	70	30	43	57	56	44	54	46
1917	65	35	48	52	65	35	58	42
1918	63	37	46	54	61	39	56	44
1919	53	47	46	54	52	48	45	55
1920	41	59	37	63	43	57	41	59
1921	44	56	44	56	50	50	43	57
1922	52	48	41	59	52	48	53	47
1923	60	40	37	63	56	44	40	60
1924	50	50	43	57	46	54	46	54
1925	57	43	42	58	45	55	47	53
1926	40	60	43	57	48	52	49	51
1927	45	55	41	59	47	53	56	44
1928	48	52	45	55	43	57	50	50
1929	50	50	46	54	65	35	57	43

4. THE NASS RIVER SOCKEYE RUN OF 1929.

(1.) General Characteristics.

While we have ceased to be surprised at any excessive variations in the extent of the sockeye-salmon run of the Nass River, nevertheless we cannot refrain from expressing great disappointment that the 1929 pack should be such a small one. It consisted of only 16,077 cases. As we pointed out last year, 1929 belongs to the one cycle which has consistently yielded good packs in the past. Comparing this year's figure of 16,077 cases with those of the earlier years in this cycle (31,327 cases in 1914, 28,259 cases in 1919, and 33,590 cases in 1924), it is evident that the pack has decreased 50 per cent. If the escapement to the spawning-beds had been excellent, this small pack would be of minor importance. But Inspector Hickman writes that there was "a fair run of sockeye during the early part of the season," and also that "the later run did not appear so good." Consequently we have two indications of a poor run.

Although in recent years it has been impossible to make predictions with any degree of certainty on the Nass, still one cannot fail to notice that the irregularities have always been in one direction—that of failure to reach normal expectancy. Looking back over the packs of the last five years, which will be the brood-years for the runs of the next five years, there is not a single year in which we can even hope to see improvement of present conditions. It is more likely that the packs will drop to even lower levels. In other words, if the present conditions continue, it is probably only a matter of a very few years before the sockeyes of the Nass River will cease to be of any commercial value to British Columbia. The only remedy would be drastic curtailment, if not complete cessation, of sockeye-fishing for a period of years.

(2.) Age-groups and Seasonal Changes during the Run.

The material for the study of the 1929 run consisted of sixteen samplings taken at random between the dates July 10th and August 16th. The total number of fish present in these samplings was 1,982. From the point of view of numbers this compares very favourably with former years, but unfortunately these fish do not represent as accurate a cross-section of the run as we have had heretofore. Through unavoidable circumstances there was a delay of two and a half weeks in starting the scale-collections, so that they are limited to approximately five weeks, whereas in the past they have extended over a period of from seven to eight weeks. In addition, the intervals between the collections are not spaced as regularly as in previous years. Consequently the analysis of this material for 1929 does not give us a complete picture of the run.

A glance at Tables XXIV. and XXVI., in which the age-groups are enumerated, shows that only four of the usual eight age-classes are present. Each year we have drawn attention to the fact that the Nass run is composed of eight age-groups which occur in definite seasonal succession. The sea-types (3_1's and 4_1's)—that is, those fish which go to sea as fry and return at the end of the third or fourth year—appear only during the early weeks of the run, chiefly in June. On the other hand, the oldest fish, the 6_3's, 6_4's, and 7's, are restricted to the later part of the run. The other three age-groups—namely, the 5_3's, 5_2's, and 4_2's—are present throughout the run. The 5_3 class is always dominant, but its strength varies from time to time, while the greatest numbers of the 5_2's and 4_2's are usually found during the second and third weeks of July. (*See* Table XXX.)

Looking again at Tables XXIV. and XXVI., it is not at all surprising that the 3_1 and 4_1 groups are absent, since no scale-collections were made during June, the particular month in which the sea-types are to be found. They are not represented even by a single individual in this 1929 material. The other two groups which are absent are the 6_4's and 7_4's. Here only one representative, a 6_4 female having a weight of 7½ lb. and a length of 27 inches, is found. The absence of these larger fish cannot be accounted for by lack of material. They run late, and since we have nearly twice as many samples as usual of the August part of the run, we would expect to find an increased rather than a diminished number of them. We can offer no explanation of their absence; we can simply state that, for some reason unknown to us, they are not present in the run of 1929. It is interesting to note that this fact is in accordance with Inspector Hickman's observation at Meziadin Falls, that the large, late-running fish were very scarce.

Turning now to Table XXII., we find the percentages of the principal age-groups as follows: 4_2's, 25 per cent.; 5_2's, 9 per cent.; 5_3's, 60 per cent.; and 6_3's, 6 per cent. These percentages, except possibly that of the last group, are very close to what they might have been, had the material been collected as in previous years. Since we are dealing with approximately the same number of fish as in former samplings, the absence of sea-types is probably made up by an increase in the numbers of the 4_2's, 5_2's, and 5_3's. But the total number of fish involved in this shifting cannot be great, for the sea-types have never been present in numbers exceeding a hundred. Consequently the effect on the percentages, which would be to raise them, has been so slight that it can be practically disregarded. In the case of the 6_3 group, we undoubtedly have a percentage which is higher than the one which might have resulted had the number of August scale-collections been less, and more in accordance with those of other years.

In comparing these 1929 percentages with those of the other years in this cycle—namely, 1914, 1919, and 1924—we are struck at once by their dissimilarity. This is especially true of the 4_2 group, where we have 25 per cent. against 4 per cent., 7 per cent., and 4 per cent. In addition, as one would expect, the percentage of the 1929 five-year-old fish is smaller than those of 1914, 1919, and 1925. There is considerable correspondence between the 1928 and 1929 percentages. In both of these years the four-year-old fish are more abundant and the five-year-old fish less numerous than the general averages of the groups over a period of years (Table XXIII.).

(3.) Lengths and Weights.

The size relationships of the Nass River sockeyes are dealt with in Tables XXV. and XXVII. Two racial characteristics should be pointed out in this connection. One of them is this: that each age-group has maintained its average length and weight from year to year, whereas in the other river systems there has been a slight lowering of the averages. In 1928 there was a small decrease in the lengths and weights of most of the Nass age-classes, but this year's figures show that the principal groups are more nearly holding their own. In fact, the average length and weight of the 5_3's, the dominant group, is above the general average. Tables XXVIII. and XXIX. have been compiled to illustrate the second racial size characteristic—namely, that there is a definite relation between ultimate age and size in the Nass sockeyes. They fall naturally into graded series, with the youngest fish, which are also the smallest, at one end of the series and the oldest and largest fish at the other end. In the Fraser and Skeena Rivers and in Rivers Inlet we do not find this correspondence. The number of years spent in sea-feeding, rather than ultimate age, seems to be the factor linked with size in these other river systems. For example, the 3_1's, 4_2's, and 5_3's, which have lived three years in salt water, are all practically the same size. Likewise, the 4_1's, 5_2's, and 6_3's, which have had four years in the sea, are all about the same size.

(4.) The Meziadin and Bowser Lake Sockeye Colonies.

As far back as 1915 the late Dr. Gilbert suggested the probability of the Nass run being composed of two races. His opinion was based on two facts: First, that the run seemed to be divided into early and late periods; and, secondly, that the late-running fish were of a conspicuously larger size.

Meziadin and Bowser Lakes are the only two known extensive spawning areas of the Nass River sockeyes, but the inaccessibility of these lakes makes a study of their populations most difficult. Each September Inspector Hickman visits the Meziadin watershed, and he has tried each year, since 1922, to gather material to further the study of the populations of these two lakes. He is able to take samplings of the Meziadin fish below the falls, and by fishing a gill-net in the Nass River above its junction with the Meziadin he has attempted to intercept sockeyes bound for Bowser Lake. Some years no sockeyes have been netted and other years only a few, although the net has been operated continuously for a week each year. This is rather significant evidence that the Bowser Lake sockeyes belong chiefly to the early period of the run. On the other hand, Inspector Hickman's actual observations at Meziadin Lake and Falls furnish abundant proof that sockeyes of both the early and late periods reach Meziadin Lake.

The analysis of the material which Mr. Hickman has gathered from year to year is summarized in Tables XXXI. and XXXII. The scales are badly absorbed on the margins and consequently can be read only for the number of years spent in fresh water. Concerning ourselves first with Table XXXI., we notice that in general a smaller percentage of Meziadin sockeyes spend one year in the lake and greater percentages stay two and three years than of the Bowser colony. We may make the generalization, then, that the sockeyes of the Bowser remain a shorter length of time in the lake than do those of the Meziadin.

The relative size of the individuals of the two populations is compared in Table XXXII. It shows that the Meziadin fish are the larger. These fish are probably older as well as greater in size. In 1926 we pointed out that, although we cannot read the ultimate age of these fish from their scales, we can arrive at their approximate age by comparing their average lengths with the average lengths of the various age-groups in the runs of the Nass proper (Table XXIV.). The Meziadin averages fall consistently in line with those of the 6_3 group and we may therefore conclude that the majority of these fish are six years old. Similarly, the Bowser averages correspond closely with those of the four- and five-year-old groups.

Last September Inspector Hickman was unsuccessful in his attempt to obtain Bowser Lake samplings. In Table XXXIII. are enumerated the lengths of the seventy-four sockeyes which he took at Meziadin Falls.

Up to date the total amount of material which has been available for the study of these two colonies is not sufficient to make conclusive generalizations. However, from the material at hand it would appear that the majority of the Bowser Lake sockeyes belong to the early period of the Nass run, that their early history is characterized by one or two years of fresh-water life, and that they are smaller and younger than the Meziadin sockeyes. The fish comprising this latter colony make their way to Meziadin Lake during both the early and late periods of the run. The late-running fish—that is, those fish which are dealt with in these paragraphs—usually spend the first two or three years of their lives in the lake, and they are conspicuously large in size.

Table XXII.—Percentages of Principal Age-groups present in the Nass River Sockeye Run from 1912 to 1929.

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 (36,037 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

Table XXIII.—Percentage of Principal Age-groups in Nass River Sockeye Run from 1912 to 1926 combined into Five-year Periods.

	One Year in Lake.		Two Years in Lake.	
	Four Years old.	Five Years old.	Five Years old.	Six Years old.
1912–16	11	22	62	5
1917–21	13	15	65	7
1922–26	11	7	77	5

Table XXIV.—Nass River Sockeyes, 1929, grouped by Age, Sex, and Length, and by their Early History.

Length in Inches.	Number of Individuals.								Total.
	4_2		5_2		5_3		6_3		
	M.	F.	M.	F.	M.	F.	M.	F.	
21	1	.....	.....	.....	.....	.....	.....	.....	1
21½	1	.....	.....	.....	.....	.....	.....	.....	1
22	9	8	.....	.....	.....	2	.....	.....	19
22½	4	32	.....	.....	1	4	.....	.....	41
23	30	78	.....	1	4	13	.....	.....	126
23½	42	49	.....	1	3	23	.....	.....	118
24	57	48	2	9	19	86	.....	.....	221
24½	30	26	2	18	30	143	.....	6	255
25	37	4	15	22	56	183	.....	9	326
25½	15	5	15	13	100	130	2	7	287
26	5	2	26	23	133	61	6	13	269
26½	3	.....	12	2	100	16	6	7	146
27	.....	.....	12	1	67	7	11	10	108
27½	.....	.....	8	1	13	.....	7	3	32
28	.....	.....	1	.....	1	.....	8	5	15
28½	.....	.....	3	.....	1	.....	5	4	13
29	.....	.....	.....	.....	.....	.....	1	.....	1
29½	.....	.....	.....	.....	.....	.....	1	.....	1
30	.....	.....	.....	.....	.....	.....	.....	1	1
Totals	234	252	96	91	528	668	47	65	1,981
Average lengths	24.1	23.5	26.1	25.2	25.9	24.9	27.2	26.2	.....

Table XXV.—Nass River Sockeyes, Average Lengths of Principal Classes from 1912 to 1929.

Year.	4_2		5_2		5_3		6_3	
	M.	F.	M.	F.	M.	F.	M.	F.
1912 (inches)	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	23.8	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

Table XXVI.—Nass River Sockeyes, 1929, grouped by Age, Sex, and Weight, and by their Early History.

Weight in Pounds.	Number of Individuals.								Total.
	4_2		5_2		5_3		6_3		
	M.	F.	M.	F.	M.	F.	M.	F.	
4	8	12	.....	.....	1	1	.....	.....	22
4½	12	38	.....	.....	5	19	.....	.....	74
5	40	85	.....	2	5	76	.....	1	209
5½	64	74	3	11	34	167	.....	4	357
6	61	31	13	19	98	223	1	13	459
6½	32	10	18	23	141	131	7	14	376
7	15	2	22	16	133	35	8	17	248
7½	2	.....	17	17	78	13	11	7	145
8	.....	.....	8	3	31	2	12	4	60
8½	.....	.....	8	.....	2	1	6	3	20
9	.....	.....	7	.....	.....	.....	1	1	9
9½	.....	.....	.....	.....	.....	.....	.....	.....	.....
10	.....	.....	.....	.....	.....	.....	1	1	2
Totals	234	252	96	91	528	668	47	65	1,981
Average weights	5.7	5.2	7.1	6.6	6.7	5.9	7.6	6.8	.....

Table XXVII.—Nass River Sockeyes, Average Weights of Principal Classes from 1914 to 1929.

Year.	4_2		5_2		5_3		6_3	
	M.	F.	M.	F.	M.	F.	M.	F.
1914 (pounds)	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

Table XXVIII.—Nass River Sockeyes, 1919–29, grouped by Age, Sex, and Average Lengths of Principal Age-groups.

Year.	Average Lengths in Inches of Groups.															
	Three Years old.		Four Years old.				Five Years old.				Six Years old.				Seven Years old.	
	3_1		4_2		4_1		5_2		5_3		6_4		6_3		7_4	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
1919	.....	.....	24.9	24.1	26.1	25.1	26.2	25.2	26.5	25.8	28.2	26.5	27.9	26.7	27.2	28.0
1920	.....	.....	24.0	23.4	.....	.....	26.3	25.0	26.7	25.9	26.6	26.7	27.4	25.9	.....	.....
1921	23.1	22.4	24.3	23.5	24.2	23.6	25.5	24.3	26.2	25.6	26.9	26.5	27.9	26.2	.....	.....
1922	.....	.....	24.2	23.4	24.5	23.5	25.6	24.6	25.7	25.0	26.2	25.4	28.0	25.9	.....	.....
1923	.....	.....	24.3	23.7	25.5	24.3	25.9	25.3	26.2	25.5	26.1	25.5	27.2	26.5	.....	.....
1924	.....	.....	24.7	23.8	.....	.....	26.2	24.9	26.3	25.4	27.1	26.4	28.0	25.4	.....	.....
1925	.....	.....	24.4	23.8	.....	.....	25.9	24.7	25.9	25.0	26.3	25.3	26.9	25.4	.....	.....
1926	23.7	22.3	24.9	24.1	24.5	24.0	26.1	25.3	26.1	25.3	26.7	25.8	27.9	27.0	28.2	27.0
1927	23.4	23.5	24.9	24.2	25.6	24.1	26.3	25.2	26.3	25.9	26.8	27.0	27.6	26.5	29.0	.....
1928	23.7	22.4	24.3	23.5	25.1	23.6	26.0	25.1	25.5	24.6	25.5	24.6	28.1	26.2	.....	.....
Ave. lengths..	.....	.....	24.5	23.8	25.1	24.0	26.0	25.0	26.1	25.4	26.6	26.0	27.7	26.2	.....	.....
1929	.....	.....	24.1	23.5	.....	.....	26.1	25.2	25.9	24.9	.....	.....	27.2	26.2	.....	.....

Table XXIX.—Nass River Sockeyes, 1919–29, grouped by Age, Sex, and Average Weights of Principal Age-groups.

Year.	Average Weights in Pounds of Groups.															
	Three Years old.		Four Years old.				Five Years old.				Six Years old.				Seven Years old.	
	3_1		4_2		4_1		5_2		5_3		6_4		6_3		7_4	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
1919	....	....	6.0	5.5	6.4	5.7	6.6	5.9	6.7	6.1	7.7	7.0	7.8	6.7	7.1	7.5
1920	....	....	5.6	5.2	....	....	7.4	6.3	7.4	6.7	7.6	6.9	7.9	7.0	....	....
1921	5.0	4.6	6.0	5.4	5.9	5.5	6.9	6.1	6.9	6.3	7.0	6.5	7.7	6.6	....	....
1922	....	....	5.9	5.4	6.1	5.5	6.8	6.2	6.8	6.3	7.5	6.3	8.1	6.6	....	....
1923	....	....	5.8	5.2	7.0	5.5	6.7	6.1	6.6	6.0	6.7	6.3	7.2	6.8	....	....
1924	....	....	5.9	5.4	....	....	7.2	6.1	6.8	6.1	7.3	6.5	8.0	6.5	....	....
1925	....	....	5.9	5.4	....	....	6.8	6.1	6.7	6.0	6.8	6.0	7.4	6.3	....	....
1926	5.5	4.5	6.0	5.4	5.9	5.7	6.9	6.2	6.7	6.0	6.8	6.2	7.8	7.1	7.7	7.3
1927	5.3	....	6.2	5.8	6.8	5.6	7.1	6.3	6.9	6.2	7.0	7.2	7.8	7.0	9.0	....
1928	5.4	4.7	5.6	5.0	6.9	5.5	7.0	6.2	6.2	5.5	6.3	5.4	8.1	6.6	....	....
Ave. weights	....	....	5.9	5.4	6.4	5.6	6.9	6.1	6.8	6.1	7.1	6.4	7.8	6.7	....	....
1929	....	....	5.7	5.2	....	....	7.1	6.6	6.7	5.9	....	....	7.6	6.8	....	....

Table XXX.—Number of Individuals of each Class of Nass River Sockeyes running at Different Dates in 1929.

Date.	4_2	5_2	5_3	6_3	6_4	Number of Individuals examined.
July 10	64	10	48	1	....	123
,, 12	66	8	45	5	....	124
,, 15	56	17	49	2	....	124
,, 18	53	14	58	....	....	125
,, 22	38	10	69	6	....	123
,, 25	39	20	62	2	....	123
,, 29	25	12	79	6	1	123
,, 31	17	16	84	6	....	123
Aug. 1	18	15	81	10	....	124
,, 2	22	15	81	7	....	125
,, 5	11	12	91	9	....	123
,, 9	18	8	85	13	....	124
,, 12	12	5	92	15	....	124
,, 13	9	11	88	16	....	124
,, 14	20	9	88	8	....	125
,, 16	18	5	96	6	....	125
Individuals	486	187	1,196	112	1	1,982

Table XXXI.—Percentages of Meziadin and Bowser Lake Runs, showing Different Number of Years in Fresh Water.

	Years in Lake.			No. of Specimens.
	One Year.	Two Years.	Three Years.	
Meziadin, 1922	....	80	20	10
Meziadin, 1923	13	84	3	63
Meziadin, 1924	....	76	24	160
Meziadin, 1925 (no collection)	....	....	....	....
Meziadin, 1926	2	93	5	43
Meziadin, 1927	6	94	....	85
Meziadin, 1928 (no collection)	....	....	....	....
Meziadin, 1929	10	89	1	74
Bowser, 1922	40	60	....	15
Bowser, 1923	33	64	3	41
Bowser, 1924	18	79	3	34
Bowser, 1925	16	80	4	45
Bowser, 1926	27	55	18	11
Bowser, 1927	*22	78	....	9
Bowser, 1928 (no collection)	....	....	....	....
Bowser, 1929 (no collection)	....	....	....	....

Table XXXII.—Average Lengths of the Meziadin and Bowser Lake Sockeyes for the Years 1924–29.

Year.	Meziadin Lake.		Bowser Lake.	
	M.	F.	M.	F.
1924	26.8	25.7	25.5	23.6
1925	.....	.....	23.8	23.3
1926	28.1	26.3	25.9	24.8
1927	27.1	25.8	24.7	23.7
1928	.....	.....	.....	.....
1929	27.0	25.3	.....	.....

Table XXXIII.—The Lengths of Individuals comprising the Meziadin Run of 1929.

Length in Inches.	Number of Individuals from Meziadin Lake.		Length in Inches.	Number of Individuals from Meziadin Lake.	
	M.	F.		M.	F.
23½	1	....	27½	7	1
24	....	6	28	1	1
24½	2	4	28½	2	....
25	1	8	29	3	....
25½	1	9	29½	1	....
26	4	5	Totals	37	37
26½	3	2			
27	11	1	Average lengths	27.0	25.3

THE SPAWNING-BEDS OF THE FRASER RIVER.

Hon. S. L. Howe,
Commissioner of Fisheries, Victoria, B.C.

SIR,—I have the honour to submit the following report of my twenty-seventh yearly inspection of the salmon fishing and spawning areas of the Fraser River, made during the season of 1929:—

In a study of conditions on the fishing and spawning grounds of the Fraser River system in 1929 it should be noted that the year came within the four-year cycle of former big runs. For the first year since 1917 there was a pronounced run of sockeye in the Fraser system in early July, and the catches made in that month were much the largest made in any July since 1917. The fish were larger and in other respects resembled those in the July runs of former big years. As will be shown later, the early escapement was also larger and the fish which escaped capture, as in former big years, ascended the Fraser to its headwaters.

SALMON-CATCH IN THE FRASER RIVER SYSTEM.

The catch of all species of salmon in the Provincial waters of the Fraser River system in 1929 produced a total pack of 426,473 cases, as against 258,224 cases in 1928, 284,378 cases in 1927, 274,951 cases in 1926, and 276,855 cases in 1925. It was the largest pack made in those waters since 1913. The pack consisted of 61,569 cases of sockeye,* 10,004 cases of springs, 40,520 cases of cohoes, 158,208 cases of pinks, and 144,159 cases of chums, etc.

The pack of sockeye was 26,184 cases greater than that made in the brood-year of this year's run, 1925. The pack of 1929 made in our waters was not, however, as has been stated, the largest made in recent years. It was exceeded by the pack in 1926 by 24,120 cases and it only exceeded the pack of 1927 by 176 cases.

The pack of pinks—it was a "pink" year—totalled 158,208 cases, the largest made in the last sixteen years. It was 55,672 cases larger than in its brood-year, 1927.

The chum-pack of 144,159 cases was 48,947 cases less than the record high pack of 1928, notwithstanding that it greatly exceeds all other years.

The catch of sockeye made in the State of Washington waters of the Fraser River system in 1929 produced a pack of 111,898 cases, substantially the same as in the brood-year 1925.

The combined catch of sockeye in the Fraser River system in 1929 produced a pack of 173,467 cases. It was 26,059 cases larger than in the brood-year 1925 and was the largest made since 1917.

The July sockeye-catch in Provincial waters of the system produced a pack of 32,282 cases, out of a total seasonal pack of 61,569 cases. Of the 32,282 cases July pack, 12,428 cases were packed up to the 13th instant. The July sockeye-catch in the State of Washington waters of the Fraser system was also larger than for many years—notwithstanding the statement made that, as an early run was not anticipated, many traps were not ready to operate until about the 15th. Had they been fishing, the American pack would have been larger and our pack presumably smaller.

The August catch of sockeye in Provincial Fraser waters produced a total pack of 32,142 cases. The run was light in September and produced a pack of but 4,782 cases. There was no late run in October and November such as occurred in 1926 and 1927.

THE SPAWNING AREAS OF THE FRASER RIVER BASIN.

As in the preceding twenty-six years, the inspections of the sockeye-salmon spawning areas of the Fraser River basin were made in August, September, and October. In addition to the information gained from personal observation, more valuable data were obtained through Major J. A. Motherwell, Dominion Chief Supervisor of Fisheries in the Province. He kindly furnished me with copies and extracts from the spawning-bed reports of his many assistants stationed throughout the Fraser basin. I am also indebted to members of the Provincial Police and to the many white and Indian residents on the Fraser and its many tributaries. The information obtained from such sources enabled me to form a more comprehensive view of conditions in most sections than was possible from my own observations, as owing to other duties I was

* The figures given here for sockeye are somewhat larger than those given in the Canners' Pack Statement—due to the fact that the latter does not credit the Fraser with the sockeye taken in traps in Juan de Fuca Strait and packed at Esquimalt, all of which were seeking the Fraser.

unable to cover the field as closely as in other years. I cannot give too much credit to Major Motherwell and his staff for assistance rendered.

Sockeye in numbers made their appearance at Hell's Gate Canyon, above Yale, in July and August. Water conditions there then and throughout the season were much more favourable than usual. None were delayed this year. But few sockeye were seen in Hell's Gate in September and October.

Reports made to Major Motherwell show that sockeye in considerable numbers made their appearance at the rapids in the Fraser, just above the mouth of Bridge River, in July and in August. The number that made their appearance at that point this season was greater than for many years. The July and August runs consisted of large fish in fine condition. Throughout the season water conditions were favourable for their passage.

Owing to the increased run at the above rapids a greater number of Indians fished there than usual. They came from Bridge River, Lillooet, D'Arcy, Shalalth, 22-Mile, and Hat Creeks. They caught and smoked during the season upwards of 3,000 sockeye and 1,092 springs.

Conditions of Spawning Areas.

A greater number of sockeye reached the lakes in the headwaters of the Fraser basin this year than in any year since 1917. The run to Stuart and Chilko Lakes was especially notable. On the other hand, the run to Quesnel was small.

Stuart Lake.—For the first time since 1917 a considerable number of sockeye entered Stuart Lake, and the Indians at the lake's outlet and at the mouths of several of the lake's tributaries made good catches. The first sockeye reached the lake July 17th and sockeye were in evidence every day until the 30th. The Indians caught 1,400 on the night of the 29th. A smaller run, consisting of smaller fish that were in poor condition, entered the lake August 2nd and ran until the 29th, but at no time was the run large. Indians fishing at the outlet of the lake and at the mouths of lake tributaries caught and smoked close to 8,000 sockeye. In addition to those which they smoked, it is estimated they used in a fresh state fully 1,000 fish, making a total catch of close to 9,000 fish. This was the first year in the last ten years in which the Indians have caught more than they used in a fresh state. In most of those years they did not catch any sockeye, due to the fact that there were no sockeye in those waters. On my reaching Stuart Lake on August 23rd the Dominion officer showed me their well-kept records and also some of the fish smoked by the Indians. They were large fish and typical in every way of the fish in the run of former big years.

In reviewing conditions at Stuart Lake, it is interesting to note that the first sockeye were reported as passing Hell's Gate Canyon on July 7th. If, as we believe, they were the same fish that reached the lake on the 17th, they made the run of close to 450 miles and climbed 2,200 feet in elevation in ten days. Elsewhere it has been shown that that rate of travel may be expected.

Inspection of the spawning tributaries of Stuart Lake by the Dominion fishery official failed to disclose any considerable number of sockeye on their spawning-beds, indicating that the Indians at the outlet and at the mouth of the tributaries caught most of the fish in the runs, and that the beds were but little, if any, better seeded than in recent years.

Chilko Lake Section.—The number of sockeye which entered the Chilko River this year was much larger than in any year since 1917. The first fish were reported at Farrells Bridge on July 27th. The Indians fishing there and at Hanceville Rapids, Alexis Creek, and Siwash Bridge between July 27th and August 24th caught close to 4,500. A few were being caught on September 7th. The Dominion fishery official on the Chilko reported that fewer Indians engaged in fishing this year, notwithstanding the increased run, than last year, when their catch reached a total of close to 1,900. For years prior to 1928 the Indians did not catch enough sockeye to smoke any of them. A notable feature of the Indians fishing in Chilko River this year was the fact that they dressed the fish at the place of capture and then, instead of smoking them there as usually is the case, they transported them to their houses in their own automobiles and there smoked them. Some of them used auto-trucks and others sedan cars to carry their fish.

Dominion Fishery Officer Harvey, who is assigned to patrol the Chilko River and Chilko Lake, estimates that 70,000 sockeye reached that lake this year and spawned there. In view of the belief that very few sockeye spawned in Chilko Lake four years ago, the return there this year of 70,000 to 80,000 fish was surprising, as surprising as the run to Stuart Lake. The

runs of sockeye to Stuart and Chilko Lakes this year show at least that a remnant of the big-year runs may still reach the Upper Fraser and could be greatly augmented by the suspension for a period of years of both commercial and Indian fishing.

Quesnel Lake.—Very few sockeye reached Quesnel Lake this year. Very few were seen to enter the lake. None are reported as having spawned in Mitchell River, the main tributary, and only 1,000 reported as having been seen in the Horsefly River, the other large tributary. Considering that for years after depletion was manifest the run to the Quesnel was much larger and more constant than to either Stuart or Chilko, their failure to run there as abundantly this year as to the two last named is the more surprising.

Bowron Lake.—Upwards of 1,000 sockeye are believed to have entered Bowron Lake this year and to have spawned in the river at the head of the lake. It was the best run for years, but not comparable with early years.

Seton Lake.—The first sockeye known to have entered the creek leading to Seton Lake this year were seen on August 13th. There was a scant run up to October 21st. The number estimated to have been seen there during the season totalled 700, of which 400 are said to have entered the lake and the others to have spawned at the outlet of the lake.

Shuswap Lake.—Dominion Fishery Overseer Shotton, who has been stationed in the Shuswap Lake area for many years, reported that approximately 10,000 sockeye reached that section this year. The run, he states, was much smaller than in each of the preceding four years. The run consisted of small fish. They spawned in Little River below the main lake. Few were reported from Adams River, where considerable numbers have spawned in the last few years, and even less in any other of the many fine spawning-streams of Shuswap Lake.

For the first time in many years Officer Shotton reported that a number of sockeye entered the North Thompson River this year, but unfortunately most of them were caught by Indians and they so seriously injured the remainder with their spears that few of them survived to spawn.

Birkenhead River.—For the first time on record there was a pronounced decline in the number of sockeye that reached the Birkenhead River, at the head of the Harrison-Lillooet Lakes section, this year. Heretofore the run to this section, year after year, has shown but little variation in its large numbers—the only section in the entire Fraser basin where the run has maintained its numbers has previously shown no decrease. Superintendent Graham, who has been for many years in charge of the hatchery on the river, and the collection of eggs there, reported that the run was small, that they collected eggs and milt from 9.· per cent. of the total run and obtained but 18,000,000 eggs, and that natural propagation in that section was "almost *nil.*"

The fish that reached the Birkenhead this year were unquestionably the product of the spawning there in 1925, when 40,000,000 eggs were collected and the beds of the river abundantly seeded naturally. The following record supplied by Major J. A. Motherwell shows the record of sockeye-eggs collected on the Birkenhead from 1925–29, together with the number of eggs shipped from the station for other waters and the number of fry planted at the station:—

Statement showing Collections and Distributions of Sockeye Eggs and Fry, 1925–29, Pemberton Hatchery.

1925–26.	
Collection in 1925	40,418,000
Distributions in 1926—	
Eggs—	
Skeena River Hatchery	10,080,000
Eagle River, Shuswap Lake	2,002,500
Morris Creek, Harrison River	2,040,000
Gates Creek, Anderson Lake	1,000,000
Fry—	
Birkenhead River, Lillooet Lake	21,600,000
Adie Lake, Lillooet Lake	660,000
Gates Lake, Anderson Lake	1,020,000

1926–27.

Collection, 1926	45,350,000
Distributions, 1927—	
Eggs—	
Skeena River Hatchery	15,001,000
Morris Creek, Harrison River	3,000,000
Eagle River, Shuswap Lake	2,700,000
Gates Creek, Anderson Lake	1,000,000
Fry—	
Birkenhead River, Lillooet Lake	18,935,000
Adie Lake, Lillooet Lake	500,000
Gates Lake, Anderson Lake	720,000
Gates Creek, Anderson Lake	1,295,000

1927–28.

Collection, 1927	37,000,000
Distributions, 1928—	
Eggs—	
Francois Lake, Fraser Basin	5,004,000
Horsefly River, Quesnel Lake	2,502,000
Skeena River Hatchery	6,000,000
Fry—	
Birkenhead River, Lillooet Lake	17,849,000
Adie Lake, Lillooet Lake	500,000
Gates Lake, Anderson Lake	1,360,000
Anderson Lake	816,000

1928–29.

Collection—	
At Hatchery, 1928	35,010,000
Received from Cultus Lake, 1928	200,000
Received from Harrison Lake, 1928	1,001,000
Distributions—	
Eggs—	
Skeena River Hatchery	10,010,000
Horsefly River	3,003,000
Gates Creek, Anderson Lake	300,000
Fry—	
Birkenhead River	18,800,000
Adie Lake, Lillooet Lake	510,000
Anderson Lake	680,000
Gates Lake, Anderson Lake	1,360,000

1929–30.

Collection	18,000,000

The above statement shows that of the 40,418,000 sockeye-eggs collected from the Birkenhead River in 1925—the brood-year of the 1929 run—15,122,500 eggs were shipped to other waters for distribution.

The runs of sockeye to Cultus, Pitt, and other minor waters in the extreme Lower Fraser basin showed little variation from those of recent years.

From the above it will be noted that while the number of sockeye that reached Chilko and Stuart Lakes was much larger than in any year since 1917, owing to Indians fishing the number that eventually spawned in any one lake section, with the exception of Chilko Lake in the Fraser basin, showed no increase over recent years; and that the number which reached the Birkenhead River, at the head of the Harrison-Lillooet Lakes section, and where they were not molested by Indians, was far less.

I am indebted to Major Motherwell for the following statement showing the number of salmon-eggs collected from the Fraser and other waters this year:—

SALMON-EGG COLLECTIONS, BRITISH COLUMBIA HATCHERIES, 1929.

Anderson Lake Hatchery—Sockeye	8,505,000
Babine Lake Hatchery—Sockeye	7,830,000
Cowichan Lake Hatchery—	
Spring	432,000
Cohoe	743,900*
Kennedy Lake Hatchery—Sockeye	7,095,000
Pemberton Hatchery—Sockeye	18,000,000
Pitt Lake Hatchery—Sockeye	5,315,000
Rivers Inlet Hatchery—Sockeye	20,074,000
Skeena River Hatchery—Sockeye	7,859,000
Cultus Lake Hatchery—	
Sockeye (from Harrison)	191,000
Sockeye (from Cultus)	8,710,285*

Respectfully submitted.

JOHN PEASE BABCOCK,
Assistant to the Commissioner.

Victoria, B.C., December 20th, 1929.

* As at December 14th.

THE SPAWNING-BEDS OF RIVERS INLET.

Hon. S. L. Howe,
Commissioner of Fisheries, Victoria, B.C.

SIR,—I have the honour to submit my report upon the inspection of the spawning-beds at Rivers Inlet for the year 1929.

Unusual interest was given to this inspection, since it would demonstrate to what extent the exceptional "freshet" which occurred in the late fall of 1924 may have had upon the deposit of eggs spawned in that year. How serious it was to the progeny of that portion of the run comprising the four-year sockeye was only too clearly illustrated last year, when not only a comparatively poor pack was put up, but the escapement to the spawning-beds proved to be far from satisfactory.

With a commercial pack this year of approximately 69,000 cases, there did not appear to be a very promising outlook that the spawn deposited on the beds in 1924, of that portion of the run comprising the five-year sockeye, would show any improvement, unless the cold, wet fishing season had sent the fish down below the nets and the greater number had escaped to the spawning-beds. The inspection showed that while some of the tributaries were well seeded, others showed very poor results.

Following the usual practice to inspect the early-running streams first, a start was made at the headwaters of the lake. Leaving Rivers Inlet Cannery on September 8th, we proceeded through and made camp at Indian River, one of the three tributaries at this point. The following day the inspection of the Cheo River was undertaken. In contrast to the wonderful showing of sockeye in the brood-years 1924–25 the run fell far below expectation; beyond a few sockeye observed on the gravel-beds between the mouth and the log-jam 3 miles up, the river was practically empty. Above the log-jam a fair run of sockeye consisting of small fish were busy spawning, males outnumbering the females two to one. With the exception of the log-jam referred to, the river was clear of all obstructions.

In the examination of the Washwash River I am able to record very satisfactory conditions. In contrast to the poor showing on the Cheo, this river contained a big run of sockeye. There were few fish to be seen between the mouth and the numerous log-jams a little way up, but beyond the obstructions the spawning-beds right up to the falls, 2 miles up, were literally covered with spawning fish, mainly sockeye. A big run of spring salmon also covered the beds near the falls, while carcasses littered the bars in all directions. It is one of the best showings not only of the run of sockeye, but also of the spring-salmon run, and compares very favourably with the return in the brood-years 1924–25. The males outnumbered the females two to one, and in size large and small sockeye were about equally represented. It is to be noted here that the small "grilse" are becoming more numerous each year, the total run being represented by at least 10 per cent. of this class of fish. The lower portion of this river near the mouth is in a deplorable state; log-jams cast up in all directions offer a severe impediment to the movement of the fish up-stream.

The Indian River, although restricted in spawning area, contained a fair run of sockeye. From the mouth up to the small log-jam none were to be seen, but above this obstruction were noted in very fair numbers, males outnumbering the females two to one. In size they did not bear a higher average than those seen on the Cheo. The small "grilse" were again in evidence in increased numbers in this river. No obstructions other than the one referred to impeded the movement of the fish up-stream.

The extremely low stage of the lake may have had an influence in the unsatisfactory state of the Cheo and Indian Rivers, and that later, with a downfall of rain and rise of the lake, would have the effect of sending more on to spawning-beds. Evidence was not wanting to show there were a lot of sockeye still out in the lake, by the continual breaking of water.

As it was too early to examine the other tributaries of the lake at this time, I returned to the cannery and later proceeded to Smith Inlet to inspect the spawning-beds there. On my return three weeks later, I learned from some of the Indians that since my visit to the spawning-beds at the head of the lake, another run of sockeye had taken possession of the beds, so I considered it advisable to once more examine them. The Indian and Cheo Rivers, however, did not show any improvement, but the Washwash bore every evidence of having received a late run of sockeye. They were spawning near the mouth in very large numbers and appeared to be much larger fish, males and females being about equally represented.

Sunday Creek, which lies about 5 miles from the head of the lake, contained a fair run of sockeye spawning along the gravel shore at the mouth. Exceptionally large sockeye predominated the run, the males and females being about evenly represented. Passing through the "Narrows" I found the spawning-beds covered with a fair number of both cohoe and sockeye salmon.

Examining the Sheemahant River, one of the most extensive spawning areas on the lake, difficulty was experienced in estimating the run owing to the discoloration of the water, but in passing up through the many rapids a fair number could be seen above the riffles depositing their ova, while close inshore many were observed breasting the current. The small creek 10 miles up contained a fair run of sockeye, but few had reached the falls 18 miles distant. A number of log-jams obstructed the river in several places, but did not prevent the fish from passing through. In size they showed a better average than the run to both the Indian and Cheo Rivers, males and females being about equally represented.

At Genesee Creek conditions could not be more satisfactory. On my way through to the head of the lake a week earlier I called in here, and the thousands schooled up at the entrance, and in the creek right up to the hatchery fence, presaged a run of unusual extent. It was demonstrated in no uncertain manner on my return. The "freshet" which had occurred a few days earlier had permitted thousands of sockeye to pass over the fence and on to the spawning-beds above. Here they were milling around and utilizing every available foot of gravel. Several deep pools contained black masses of fish all in the green stage. Males outnumbered the females at least three to one, and in size represented a greater average than those seen in the early-running salmon-streams at the head of the lake. Hatcherymen had made a very successful collection of eggs, when the "freshet" put a stop to their activities and compelled them to wait patiently until a later run arrived. In this they were not disappointed, for notwithstanding the big run that had already gone through, fresh numbers arrived, permitting them to fill their requirements for the hatchery. In extent the run of sockeye to this creek measures up to the high standard attained in 1914, and more so than 1925. Small "grilse" were again in evidence in increased numbers.

The usual muddy condition of the Machmell River, another large tributary of the lake, again prevented an accurate estimate of the run of sockeye, but a few scattered bodies lying on the bars testified to the spawning-beds having received a fair run, even if small. It is to the Nookins (or Nechants), a tributary to the Machmell River, that the sockeye prefer to go. In examining this stream I found a fair number had taken possession of the spawning-beds in Mink Creek a little way up, but the water was too milky in the main river to accurately estimate the run. They could be seen, however, close inshore breasting the current. Males outnumbered the females two to one, the majority being fish of under average size. The extremely favourable conditions noted here in the brood-years 1924–25 were entirely lacking, and I therefore do not look for a big return from this season's spawning. No log-jams obstructed the passage of the salmon up-stream.

Contrary to expectation, the run of sockeye to Asklum, situated about 10 miles down the lake from Genesee Creek, contained one of the poorest showings seen in years. The exceptionally fine spawning in 1924–25, the brood-years, warranted a better return, and I can only conclude that the "freshet" in the late fall of 1924 damaged the eggs to such an extent that the progeny comprising the five-year cycle were of a negligible quantity. With the exception of the spawning-beds near the mouth, where a fair number spawned, few sockeye were observed on the way up to the falls 5 miles distant. Large and small sockeye were about equally represented, males outnumbering the females two to one. Small "grilse" were again in evidence in the river. No log-jams interfered with the movement of the fish up-stream.

In contrast to the poor run at Asklum, the spawning-beds at Quap River, 6 miles farther down the lake, contained one of the biggest runs seen in years. The recent "freshet" had permitted the fish to pass over the hatchery fence, so that the main run, which under ordinary circumstances would have been held below the fence, were all above.

Passing up through to the head of the river, distant 5 miles, thousands upon thousands of sockeye lined the beds, while several large schools numbering thousands lay dormant in deep pools, all in the green stage. Grizzly bear were having a great feast upon the salmon, as was evidenced as I passed round a log-jam and came upon three of them busy pawing them out of the creek. On my return I made an examination of the shore-line at the mouth of the river, but

few sockeye were to be seen owing to the milky condition of the lake-water. That a late run came in after my visit there, I learned from Mr. Frank Tingley, Superintendent of the Dominion Hatchery, who stated that he had no difficulty in filling the hatchery with its full quota of 20,000,000 eggs. In size the fish represented a high average, males outnumbering the females at least two to one.

Crossing to the Dalley River, situated directly opposite, I found the spawning-beds full of sockeye. Littered all over the bars, where the high water had left them, were large numbers of dead fish, testimony to a very big run having arrived earlier. As I passed through to the falls 4 miles distant the same conditions prevailed; thousands of sockeye lined the beds. Even at this late stage of the spawning season numerous schools lay in the deep pools, all in the green stage. Large and small sockeye were evenly distributed, males outnumbering the females two to one. No log-jams impeded the movement of the salmon up the river. This stream was apparently not so affected by the small "grilse," since only an occasional few were seen. The run is identical with the fine showing which returned in the brood-years 1924–25.

Proceeding to the Hatchery Creek, a very fair run of sockeye had taken possession of the spawning-beds inside and many were to be seen spawning along the gravel-bars outside. They were fine specimens of the sockeye race and measured up to the high standard attained by those seen at Genesee and Quap Rivers, males and females being equally represented.

Passing down the Owikeno River, sockeye were to be seen breaking water in every direction and also around the Indian rancherie farther down. Indians informed me that according to their experience they considered it one of the biggest runs known for a number of years. In making their catches last year they had to make several drifts before obtaining sufficient for their winter's need, but it was not so this year. One cast of the net and their net was full. In size the sockeye were on the average small, the males outnumbering the females two to one. Proceeding down over the rapids spring salmon could be seen breaking all over this portion of the river, while farther down near the entrance chum salmon were much in evidence.

In summing up the results of the inspection of the spawning-grounds at Rivers Inlet, I am of the opinion that only fair returns may be expected from the spawning this year from the Indian, Cheo, Sheemahant, Nechants, and Asklum Rivers, but that abundance of sockeye may be expected from the Washwash, Genesee, Quap, Dalley, Hatchery Creek, and the spawning-beds situated at the head of the Owikeno River, and the gravel-beds surrounding the Indian rancherie, as a result of the extensive seeding. Cold, wet weather during the fishing season favoured the escapement to the spawning-beds, otherwise there would have been a greater depletion than has been shown. Providing climatic conditions are favourable to successful seeding, I look for a return equal in extent to that which returned this year.

In conclusion, I wish to express my appreciation for courtesies extended by Mr. Frank Tingley, Superintendent of the Dominion Hatchery, and the men at the spawning camps.

Respectfully submitted.

ARTHUR W. STONE,
Provincial Fisheries Overseer.

Rivers Inlet, B.C., November 12th, 1929.

THE SPAWNING-BEDS OF SMITH INLET.

Hon. S. L. Howe,
Commissioner of Fisheries, Victoria, B.C.

SIR,—I have the honour to submit my report upon the inspection of the spawning-grounds at Smith Inlet for the year 1929.

That the poor run of sockeye to Smith Inlet this year was foreshadowed was clearly shown in my report for 1924. No tests had been made over a period of years to ascertain the percentage of four- and five-year sockeye, as in the case of Rivers Inlet, but it was generally admitted that the run to this watershed was pre-eminently a five-year cycle. An interesting observation was made by Mr. Frank Nason, manager of the B.C. Packers' plant at Smith Inlet, that after studying facts and figures over a number of years regarding the size of the Smith Inlet sockeye he had come to the conclusion that they were predominately a five-year fish, and this is borne out to a very great extent by what actually transpired, regarding not only the size of the total sockeye-pack, but the consequent escapement to the spawning-beds this year.

In 1924 a poor escapement was followed by an extreme "freshet," and the combination of the two circumstances, I have every reason to believe, accounted for the smallest pack of sockeye in the sixteen years of my experience of that watershed having been put up. That the progeny of the year 1925, from which is derived the four-year sockeye, had little bearing in relation to the extent of the run is manifest. Not only were the sockeye of exceptional size generally, but had there been an extensive run of four-year fish the wonderful showing of sockeye on the spawning-beds in 1925 would have been reflected in a big return; this was not so, because, according to Mr. Nason, the only small fish packed at his cannery were those from Rivers Inlet.

Favourable weather conditions were experienced in the inspection; consequently every facility was afforded to examine them under ideal circumstances.

Leaving Smith Inlet Cannery on September 24th, we made camp at the Docee River, the overflow to the lake. An examination of this stream showed that the run of spring salmon was very good and compared favourably with other good years. In the clear water thousands were to be seen breasting the current, from the entrance right up to the lake. In size they averaged from 30 to 60 lb. in weight.

Proceeding up to Quay Creek, a distance of about 7 miles, I found the spawning-beds to be entirely absent of sockeye. None were to be seen inside or outside. On making camp at the Geluch River (or "Smoke-house Creek," as it is termed), situated at the head of the lake, it was found to be at its lowest stage; consequently no difficulty was experienced in obtaining an accurate estimate of the run. Passing up through to the falls next day a few sockeye were to be seen spawning, but in such small numbers as to be negligible. In one or two deep pools small schools were congregated, all in a green stage. Beyond this there appeared to be an utter absence of sockeye and I was beginning to think the run to this tributary was a failure, when in poling along the shore-line of the lake outside, thousands could be detected in the clear water schooled up, waiting for the necessary rain and rise of the lake to go on the spawning-beds. All appeared to be fine specimens of the sockeye race and of the same high average as those caught in the nets during the fishing season. Males outnumbered the females at least two to one. With the addition of those seen in the lake when they eventually arrive on the spawning-beds, a fair seeding may be expected, but it will not approach the exceptionally heavy return experienced here in the brood-years 1924–25, which I estimate to be at least 50 per cent.

The Delabah River, another fine sockeye-stream situated about 1½ miles from the head of the lake, on the north shore, was at an extremely low ebb. The lack of rain had reduced it to that stage where the sockeye, even if they had sufficient energy to move on to the spawning-beds, would find it difficult. About fifty swimming around at the entrance was the only evidence of life in this river, and it appeared as if this spawning area, too, would be a failure; but in rowing along the shore-line of the lake outside, four distinct schools were seen in the clear water, representing thousands of sockeye. Examining them closely, they were all fish of exceptional size and no doubt belonging to the five-year cycle. Males outnumbered the females two to one. The log-jam a little way up the river is assuming greater dimensions each year and requires attention. The gravel-bars are being thrown up to such an extent that the fish will find it difficult to find sufficient spawning-gravel except when the river is high, which is not often. The contrast to the wonderful showing of sockeye noted here in the brood-years 1924–25 was never more exemplified than this year. The run is at least 50 per cent. lower.

Returning down the lake, I had a look once more at the Docee River and noted several schools of cohoe salmon intermingled with the springs, while farther down in the lagoon other schools were coming in.

In summing up the results of the inspection of this watershed, I am of the opinion that a run of sockeye of about the same dimensions is all that can be anticipated from the spawning of this season. There was nothing to indicate from the numbers schooled up outside of the Geluch and Delabah Rivers that an exceptional seeding will take place when they arrive on the spawning-beds later.

In conclusion, I wish to express my thanks to Mr. Frank Nason, manager of the Wallace Fisheries Cannery at Smith Inlet, for courtesies extended to me.

Respectfully submitted.

ARTHUR W. STONE,
Fisheries Overseer.

Rivers Inlet, B.C., November 12th, 1929.

THE SPAWNING-BEDS OF THE SKEENA RIVER.

Hon. S. L. Howe,
Commissioner of Fisheries, Victoria, B.C.

SIR,—In obedience to your instructions, I beg to submit the following report on the sockeye-spawning beds of the Skeena River for the year 1929:—

I left Prince Rupert on the morning of August 31st and arrived at Terrace later the same day. The following morning I proceeded to Lakelse Lake and met Mr. Raven, the assistant at the hatchery. Lakelse Lake, on the east side of the Skeena River, and Kitsumgallum Lake, on the opposite side of the river, are the earliest spawning areas of the Skeena watershed. Lakelse Lake, the most important from a spawning view-point, is about 5 miles long and is reached by a good automobile-road from Terrace, the distance being approximately 13 miles. This lake abounds in cut-throat and rainbow trout and excellent fly-fishing can be had during the season. The four principal creeks on Lakelse are Williams, Schullabuchan, Granite, and Hot Springs, the largest being Williams, a swift-running water of about 30 miles in length. An up-to-date hatchery, located on Granite Creek, is operated by the Dominion Fisheries Department and is ably managed by Mr. Hearne, the Superintendent. Mr. Hearne was away during my visit and I am indebted to Mr. Raven for the following information:—

Sockeye were first noticed in the lake on June 10th, but artificial spawning by the hatchery crew did not begin until July 30th. By September 1st approximately 8,000,000 sockeye-eggs had been collected and it was anticipated that they would get a few thousands more. A visit to the creeks was rather disappointing, very few sockeye being seen; but, of course, it was rather late in the season to form an estimate of the run. In the lake at the mouths of Williams and Schullabuchan Creeks a good many sockeye were still to be seen breaking water, probably owing to a late run. Lakelse River, at the outlet of the lake, was teeming with pinks, the river being practically full of this variety.

In summing up the Lakelse area, I would say that the sockeye run this year was poor and disappointing, being below the average. One redeeming feature, however, was the apparent absence of "grilse" (or "runts," as they are commonly called), and also the decrease in the number of net-scarred fish in comparison with other years.

Returning to Terrace, I arrived at Burns Lake on the morning of September 3rd, and after outfitting, etc., reached Donald's Landing on Babine Lake on September 6th.

Babine Lake, incidentally the largest lake in British Columbia, is the main spawning area of the Skeena River sockeye. The lake is 113 miles long and is 26 miles north of the town of Burns Lake. The white population on the entire lake, which includes the Hudson's Bay store and hatchery, is less than a dozen people. The Indian population is a large one, however, which is increased during the sockeye run by Indians from Stuart and Bear Lakes.

On September 7th I visited 15-Mile Creek, which, as the name indicates, is about 15 miles from the head of the lake. This creek for a distance of about three-quarters of a mile from the lake is an ideal spawning-creek, the water being at an even depth the entire width of the creek and without a boulder or other obstruction to mar its beauty. There were quite as many sockeye in this creek as there were last year, which, as I stated then, was the best I had ever seen. The quality even surpassed that of last year, the sockeye being of a medium size and the runts not exceeding 2 per cent. 15-Mile Creek has always been noted for its runts and it was indeed gratifying to note the extraordinary decrease in the number of the little male sockeye this year. Near the mouth of the creek there were nine Stuart Lake Indian families fishing in the lake. They were catching in the neighbourhood of sixty sockeye per family each night. The average is two nets per family, the families consisting of nineteen adults and twenty-seven children. Their nets are 4½-inch extension measure, 18 meshes deep and 200 feet long. They are staked out at night and pulled in in the morning, the remainder of the day being spent in cleaning and drying the fish and repairing the nets. A Fishery Guardian is stationed at this creek, his duties being to prevent the Indians fishing during the weekly close season, fishing too near the mouth of the creek, and interfering in any way with the fish in the creek. Mr. Mulvany, the Guardian, informed me there was a big run to this creek on August 30th and that the Indians began fishing on September 1st. A check-up of the Indian smoke-houses and racks at a later date showed that approximately 8,000 sockeye had then been caught. In looking over the fresh-caught sockeye it was noted that about 75 per cent. were males, although no such difference was seen in the creek, the males being only slightly in excess of the females there.

September 8th was spent in inspecting Grizzly Creek, a small creek running into Beaver River at the head of the lake. Beaver River is not a sockeye-creek owing to its muddy bottom, but the sockeye go on through to Grizzly Creek, which is the earliest sockeye-spawning creek on the lake. There were not many live sockeye to be seen here, but, judging by the number of dead and decayed fish, the majority had already fulfilled their mission. In proof of this, on the gravelly patches where no sockeye were to be seen I uncovered some eyed eggs. The fish here were a little larger than in 15-Mile Creek, the sexes being in better proportion. Grizzly Creek is entirely free from molestation by the human element, but the tracks of bears, both black and grizzly, were to be seen all up and down the creek.

I returned to 15-Mile Creek on September 9th and inspected the creek up to the big falls, a distance of 2½ miles from the lake. Beyond the three-quarters of a mile stretch near the lake this creek is nothing but a series of falls, five in number, varying from 6 feet in height and culminating in a 40-foot drop at the big falls. A few sockeye were seen beyond the 12-foot falls, but none beyond the 18-foot falls. Many sockeye were seen in the few gravelly patches and among the boulders in the lower stretch, but it is obvious that a great many eggs must be lost owing to the rocky nature of the creek.

Leaving 15-Mile Creek at noon, I camped at Fulton River that night, but did not make the inspection at that time. On the morning of September 10th I left Fulton River and arrived at Babine Indian village that night. Next morning, in company with Mr. Guest, Fishery Guardian at that point, I inspected Babine River at the outlet of the lake for a distance of about 12 miles. It is on this 12-mile stretch of the slow-running river that the Babine Indians rely for their fish-supply, and naturaly it is a busy place during September. The entire Babine Indian population move down here and are located in thirty smoke-houses and tents, scattered here and there on both sides of the river. Seventy-five families, averaging two nets per family, were busily engaged harvesting the sockeye. The Dominion Government, through the Indian Department, supplies each family with a new net every two years. The nets supplied are 5 and ⅝ extension measure, 25 meshes deep and 200 feet long. I was informed that the Indians did not receive their new nets until August 26th. I was also informed that there was a big run of sockeye this year. The Indians would have been very happy but for the fact that there was also a record run of pinks to the Babine. The Indians do not care much for the pinks, and as the pinks do not enter the lake to spawn, the nets are naturally soon full of this variety. All the smoke-houses were well filled and would average 2,000 sockeye per family, exclusive of pinks or springs. It was noticed, however, that at least 50 per cent. of the sockeye had been speared. Several Indians were seen in boats on the lower and swifter water, very active in this method of catching sockeye. Although the boats are tied to the banks of the river, it is obvious that very few of the large sockeye will escape. It is a pity that this method is resorted to, but at that it is not surprising when one considers that the food of the Babine Indian consists of fish, preferably sockeye, three times a day. The sockeye are larger in size in Babine River than in 15-Mile or Grizzly Creeks, particularly so in the lower stretch of the river. Mr. Guest informed me that a few sockeye were caught in Babine River during the first week in May, which is something very unusual for Babine. From my own observations of Babine River, I would say that the sockeye run this year was a big one and equal to the best year I have seen.

The following day I arrived at the Dominion Government Hatchery, where I met Mr. Eaton, the Superintendent. This hatchery is ideally situated at the foot of Morrison Lake and the head of Hatchery Creek. This is a fair-sized creek about 2 miles in length. It is a wonderful sockeye-stream with an unlimited spawning area and was again well up to expectations. The sockeye here are of a good average size, many fine specimens of both sexes being seen. The males appeared to be a little more numerous than the females. Scarcely a runt was seen and there were very few net-scarred fish. The hatchery crew began spawning operations on September 9th and three days later had obtained 2,000,000 eggs. Although the majority were still green, Mr. Eaton did not anticipate any difficulty in filling his hatchery, which has an 8,000,000 capacity.

Mr. Eaton informed me that in the fall of 1927 he planted 750,000 eyed eggs in Salmon and Talho Rivers, and that during the early summer months this year a big escapement of sockeye-fry was seen leaving Morrison Lake. Five hundred thousand eyed eggs were planted in these creeks last year and it is expected that a good escapement will follow next year.

Leaving the hatchery, I returned to Fulton River and made an inspection the following morning. Five Indian families have a permanent camp at the mouth of this creek. They have

one big smoke-house among them which contained approximately 4,000 sockeye, their total catch. These Indians cultivate vegetable-gardens and are not such intensive fishers as the Babine Indians. Fulton River is about 5 miles in length and flows from Fulton Lake. It is by far the largest stream flowing into Babine Lake and has many fine spawning-beds. Two falls close to Fulton Lake, the largest having a 40-foot drop, are an effective barrier to the sockeye entering the lake. There was a splendid showing of sockeye on the whole stretch of this river, but the males appeared to be greatly in excess of the females in number. The good luck still held on my trip, as again there were few runts seen and only a few net-scarred fish.

I next called in at Pierre Creek, which also had a fine showing of sockeye. Pierre is an earlier-spawning creek, many spent and decayed fish being seen in the deep pools and on shallow gravelly bars. The males and females were more evenly balanced and there were some good large specimens of both sexes. Although Pierre is smaller than the average creek on Babine, it has a spawning area 5 miles in extent. This being the last point of interest, I returned to Burns Lake via Donald's Landing, arriving there on September 18th.

In summing up the Babine area, I am pleased to say that all the creeks, without exception, will be well seeded this year and will undoubtedly result in big runs in 1933 and 1934, particularly 1934, as the sockeye appear to be mostly five-year fish. Although the sockeye-pack was not a large one on the Lower Skeena, it is obvious that there must have been a large escapement to the spawning-grounds. The fishing is intensive from July 1st to 31st, so this large escapement can only be attributed to two or possibly three factors, namely: (1) Extended weekly close season; (2) wet weather and clear water, causing the fish to swim deep; (3) 3-mile shortening of the fishing boundary.

On September 20th, en route to Prince Rupert, I made the usual visit to Agwillgate Canyon, on the Bulkley River at Hazelton. A few sockeye are still caught by the Indians at this canyon, but nothing in comparison to the number caught in past years. This, no doubt, is the result of the Indians associating with the whites and being forced to become more industrious. While at Hazelton I was reliably informed that there also had been a very good run of sockeye up the Bulkley River and tributaries. Kispiox River, like Lakelse and Babine Rivers, was teeming with pinks.

I wish to state that I was accompanied on the trip by Mr. J. P. McMillan, of the B.C. Packers. He accompanied me throughout the whole trip, which made the inspection much more enjoyable. I understand it is the intention of the B.C. Packers from now on to gain first-hand information as to conditions on the spawning-grounds, and I hope that Mr. McMillan will be their representative again next year.

In conclusion, I wish to express my appreciation to the Hatchery Superintendents, Fishery Overseers and Guardians for information received and hospitality shown.

I have, etc.,

ROBERT GIBSON,
Fishery Overseer.

Prince Rupert, B.C., November 1st, 1929.

THE SPAWNING-BEDS OF THE NASS RIVER.

Hon. S. L. Howe,
Commissioner of Fisheries, Victoria, B.C.

SIR,—Having received instructions to make the annual inspection of the salmon-spawning areas of the Meziadin Lake district of the Nass River, I herewith submit the following report:—

Leaving Victoria on August 30th, I arrived at Stewart on the night of September 2nd. I there met Mr. A. E. Young, who makes the annual trip of inspection for the Dominion Fisheries Department. We proceeded to get our outfit together, made arrangements for pack-horses, and engaged two capable assistants for the trip. Leaving Stewart on September 7th, we made American Creek and stayed there for the night. On Sunday, September 8th, we packed on the trail and eventually reached the head of Meziadin Lake on Monday night. The next morning we assembled the canvas canoe and inspected the sockeye-spawning grounds at the head of the lake and its southerly shore as far as 5-Mile Point. Many spawning fish were to be seen on all of the usual beds. There was evidence of there having been a good early run of sockeye; many dead spent fish were to be seen floating in the lake and also on the lake-shore. The water in the lake was exceptionally high and remained so until our departure. On the 11th we inspected the northerly shore-line and spawning sockeye were to be seen in abundance. Conditions here were very good.

On September 12th we broke camp at the head of the lake and went down the lake in the canvas canoe. On the journey down many salmon were to be seen breaking, these being the fresh ones just arriving in the lake. No salmon were to be seen in either Hanna River or McLeod Creek, the sockeye always passing by these streams until they reach the head of the lake. The principal feeders to Meziadin Lake are the Beaver River and Surprise Creek, which waters are glacial. However, there are two small spring streams, one at each side of the lake, which are no doubt the attraction for the sockeye. We arrived at the Falls Cabin in the evening. On September 13th we inspected the upper and lower falls in the Meziadin River. Many sockeye and a few cohoe were congregated below both falls and salmon were passing through the fishway freely. On account of the large volume of water passing over the falls, the salmon at the lower fall were having greater difficulty in making the ascent, there being more salmon here than below the upper fall. This congestion was not serious, as they eventully all passed up.

On September 14th we went to the main Nass River above the Meziadin and set the net with the intention of obtaining specimens of sockeye passing farther up the Nass. On reaching the Nass we found it about half-flood, which made it practically impossible to fish the net effectively. We fished the net continually until the 21st, flood conditions prevailing all of the time. Our results were a few cohoe and steelhead, with no sockeye.

Mr. Young told me that he had received word from Mr. T. Boyd, Dominion Inspector of Fisheries, that there was something wrong with the fishway and that salmon were not passing through. I also received the same information from Indians at the mouth of the Nass. I have to report that the fishway is in first-class condition, there being no log-jams or any sign of deterioration. There was the usual growth of vegetation and brush around the crib-work, which we removed. The cement-work shows no sign of crumbling and the basins are in good shape. There is nothing to prevent salmon from passing up without any difficulty.

During the time we were at the falls a fresh run of large sockeye arrived. This was not a large run; the majority of them passed up in a few days. Cohoe salmon were coming in, but not in large numbers. Unless there is an increase in the run later on, the cohoe run will not be up to its usual standard.

On September 19th we inspected the spring-salmon spawning-grounds at McBride Rapids. As the spring salmon arrive earlier in the season it is only possible to observe the tail-end of the run. There were still some spawners on the grounds and a few dead spent fish were floating around. From observations this run was not up to expectations.

In the slack waters between McBride Rapids and the falls there is a splendid natural retaining area, about 2 miles long and 1 mile wide in places. Large schools of young salmon were to be seen rippling on the surface of the water in the evening. There is a large quantity of water-grass growing in the shallows out from the shore, which affords the young salmon protection from their enemies. Trout below McBride Rapids did not appear to be as plentiful as usual.

After having completed our work at the falls we left on our return journey on Sunday, September 22nd. Taking the northerly shore on our way up the lake, large quantities of spawning sockeye were seen. At the head of the lake we dried out the canvas canoe for packing. The pack-train arrived from town on the night of the 23rd and we got on the trail for home on the 24th, arriving in Stewart on the 26th.

During the trip weather conditions were splendid—brilliant sunshine every day. The sun in the daytime was very hot, which accounted for the high stage of the water owing to the melting ice on the glaciers. Trail conditions were greatly improved, the Government having built a new piece down the Beaver River and slashed out the old trail to Meziadin Lake. A new bridge is being built over Surprise Creek, which will be completed this fall.

Summary.—A summary of spawning conditions in the Meziadin watershed of the Nass River basin this year shows that there was a fair run of sockeye during the earlier part of the season, as was indicated by the number of spawning fish seen on the beds on September 10th and 11th. The later run did not appear so good, for while there were several hundred congregated at the falls on September 13th, they had practically all passed up by the time we left the falls on September 22nd. This included a fresh run of large-sized sockeye which arrived while we were in the field. The cohoe run, while just commencing, was not up to its usual standard, neither were there any signs to show that there had been a good run of spring salmon to the spawning area at McBride Rapids.

The fishway is in splendid condition, there being no sign of decay in the cement-work or dry-rot in the crib-work. Sockeye-scales were collected at Meziadin Falls, but none were obtained from the main Nass River. The stage of water in the lake was very high, and the Nass was in half-flood owing to the warm days and bright sunshine melting the glacial ice. On the whole, the sockeye escapement was far better than last year, but about two-thirds of the run of 1924.

Respectfully submitted.

C. P. HICKMAN,
Inspector of Fisheries.

PACK OF BRITISH COLUMBIA SALMON, SEASON 1929.

COMPILED FROM DATA FURNISHED BY THE B.C. SALMON CANNERS' ASSOCIATION.

Fraser River District.

Names.	Sockeyes.	Fancy Red Springs.	Standard Springs.	White Springs.	Bluebacks.	Steel-heads.	Cohoes.	Pinks.	Chums.	Grand Total (Cases).
J. H. Todd & Sons, Ltd.	3,480	.....	.....	.....	.....	.....	.....	.....	.....	3,480
B.C. Packers, Ltd.	33,062	.....	696	3,312	2,943	14	23,888	71,467	75,620	211,002
Canadian Fishing Co., Ltd.	11,541	.....	1,372	2,140	4,247	.....	8,252	42,089	40,237	109,878
Great West Packing Co., Ltd.	6,287	.....	36	247	512	.....	1,462	11,148	1,960	21,652
Independent Packers, Ltd.	101	.....	21	.....	.....	.....	256	3,120	282	3,780
Johnston Packing Co., Ltd.	3,233	623	.....	194	18	.....	1,065	8,554	2,825	16,512
Francis Millerd	3,865	324	233	806	4,240	39	5,597	21,830	23,235	60,169
Totals	61,569	947	2,358	6,699	11,960	53	40,520	158,208	144,159	426,473

Skeena River District.

B.C. Packers, Ltd.	35,518	.....	775	709	.....	.....	8,045	42,192	1,559	88,798
J. H. Todd & Sons, Ltd.	6,038	.....	388	32	.....	.....	18,706	8,256	728	34,148
Anglo-B.C. Packing Co., Ltd.	11,679	1,813	.....	.....	.....	.....	2,178	16,482	620	32,772
Canadian Fishing Co., Ltd.	9,884	.....	260	66	.....	.....	675	11,241	151	22,277
Cassiar Packing Co., Ltd.	6,258	.....	3	.....	.....	13	347	4,505	73	11,199
Skeena River Packing Co., Ltd.	4,973	.....	.....	.....	.....	.....	416	6,738	134	12,261
Chatham Sd. Fishing & Packing Co., Ltd.	3,667	77	137	64	.....	.....	7,311	5,891	1,643	18,790
Totals	78,017	1,890	1,563	871	.....	13	37,678	95,305	4,908	220,245

Rivers Inlet District.

Kingcome Packers, Ltd.	1,324	.....	.....	.....	.....	.....	.....	.....	.....	1,324
Francis Millerd	2,274	.....	.....	.....	.....	.....	.....	.....	.....	2,274
B.C. Packers, Ltd.	32,289	.....	76	148	.....	23	442	723	91	33,792
J. H. Todd & Sons, Ltd.	6,254	.....	.....	.....	.....	.....	192	232	33	6,711
Provincial Canning Co., Ltd.	5,409	.....	.....	3	.....	.....	214	1,145	793	7,564
Anglo-B.C. Packing Co., Ltd.	6,474	.....	.....	.....	.....	.....	112	98	32	6,716
Canadian Fishing Co., Ltd.	11,426	.....	33	58	.....	6	103	106	17	11,749
Independent Packers, Ltd.	4,810	.....	24	.....	.....	.....	57	82	23	4,996
Totals	70,260	.....	133	209	.....	29	1,120	2,386	989	75,126

PACK OF BRITISH COLUMBIA SALMON, SEASON 1929—*Continued.*

Smith Inlet District.

Names.	Sockeyes.	Fancy Red Springs.	Standard Springs.	White Springs.	Bluebacks.	Steel-heads.	Cohoes.	Pinks.	Chums.	Grand Total (Cases).
B.C. Packers, Ltd.	4,502	.....	.....	32	.....	4	112	577	51	5,278
Anglo-B.C. Packing Co., Ltd.	1,515	.....	.....	.....	.....	.....	57	97	10	1,679
Canadian Fishing Co., Ltd.	2,093	.....	.....	25	.....	4	55	106	35	2,318
Kingcome Packers, Ltd.	1,573	.....	18	3	.....	4	51	73	17	1,739
Totals	9,683	.....	18	60	.....	12	275	853	113	11,014

Nass River District.

B.C. Packers, Ltd.	5,884	.....	104	86	.....	.....	472	4,123	385	11,054
Anglo-B.C. Packing Co., Ltd.	5,587	78	.....	.....	.....	.....	317	3,468	225	9,675
Canadian Fishing Co., Ltd.	4,606	.....	17	67	.....	.....	413	2,751	602	8,456
Totals	16,077	78	121	153	.....	.....	1,202	10,342	1,212	29,185

Queen Charlotte Islands District.

B.C. Packers, Ltd.	.....	.....	.....	.....	.....	.....	859	767	3,206	4,832
Canadian Fishing Co., Ltd.	.....	.....	.....	.....	.....	.....	183	.....	8,876	9,059
Langara Fishing & Packing Co., Ltd.	.....	.....	.....	.....	.....	.....	913	113	1,078	2,104
Masset Canners, Ltd.	.....	.....	.....	.....	.....	.....	288	.....	641	929
Totals	.....	.....	.....	.....	.....	.....	2,243	880	13,801	16,924

Vancouver Island District.

B.C. Packers, Ltd.	3,701	.....	332	474	285	.....	15,458	30,246	87,169	137,665
J. H. Todd & Sons, Ltd.	.....	.....	.....	.....	.....	.....	9,628	13,347	842	23,817
Canadian Fishing Co., Ltd.	1,689	.....	274	156	100	2	3,397	16,034	18,060	39,712
Nootka Packing Co., Ltd.	.....	.....	.....	.....	.....	.....	3,935	23	24,195	28,153
Clayoquot Sound Packing Co., Ltd.	2,324	.....	.....	.....	.....	.....	1,334	.....	12,313	15,971
Quathiaski Canning Co., Ltd.	2,400	.....	27	13	2,989	834	.....	9,586	1,522	17,371
Deep Bay Packing Co., Ltd.	226	40	236	69	6,908	.....	1,069	4,765	9,436	22,749
Francis Millerd	.....	.....	24	.....	.....	.....	683	.....	8,709	9,416
Totals	10,340	40	893	712	10,282	836	35,504	74,001	162,246	294,854

Outlying Districts.

B.C. Packers, Ltd.	18,002	.....	156	527	.....	397	32,581	55,121	68,033	174,817
Anglo-B.C. Packing Co., Ltd.	2,203	.....	.....	.....	.....	.....	8,973	18,570	12,994	42,740
Canadian Fishing Co., Ltd.	14,067	.....	116	166	.....	164	8,182	53,982	11,049	87,726
Kingcome Packers, Ltd.	134	.....	39	16	.....	2	3,825	4,129	1,536	9,681
Klemtu Canning Co., Ltd.	925	.....	.....	.....	.....	.....	1,134	4,076	3,850	9,985
Totals	35,331	.....	311	709	.....	563	54,695	135,878	97,462	324,949

Districts.

Fraser River District	61,569	947	2,358	6,699	11,960	53	40,520	158,208	144,159	426,473
Skeena River District	78,017	1,890	1,563	871	.....	13	37,678	95,305	4,908	220,245
Rivers Inlet District	70,260	.....	133	209	.....	29	1,120	2,386	989	75,126
Smith Inlet District	9,683	.....	18	60	.....	12	275	853	113	11,014
Nass River District	16,077	78	121	153	.....	.....	1,202	10,342	1,212	29,185
Queen Charlotte Islands District	.....	.....	.....	.....	.....	.....	2,243	880	13,801	16,924
Vancouver Island District	10,340	40	893	712	10,282	836	35,504	74,001	162,246	294,854
Outlying Districts	35,331	.....	311	709	.....	563	54,695	135,878	97,462	324,949
Grand totals	281,277	2,955	5,397	9,413	22,242	1,506	173,237	477,853	424,890	1,398,770

STATEMENT SHOWING THE SALMON-PACK OF THE PROVINCE, BY DISTRICTS AND SPECIES, FROM 1914 TO 1929, INCLUSIVE.

Fraser River.

	1929.	1928.	1927.	1926.	1925.	1924.	1923.	1922.
Sockeyes	61,569	29,299	61,393	85,689	35,385	39,743	31,655	51,832
Springs, Red	3,305	1,173	7,925	12,783	7,989	2,982	3,854	10,561
Springs, White	6,699	3,909	10,528	20,169	25,701	4,648	4,279	6,300
Chums	144,159	193,106	67,259	88,495	66,111	109,495	103,248	17,895
Pinks	158,208	2,881	102,536	32,256	99,800	31,968	63,645	29,578
Cohoes	40,520	27,061	24,079	21,783	36,717	21,401	20,173	23,587
Bluebacks and Steelheads	12,013	795	10,658	13,776	5,152	1,822	15	817
Totals	426,473	258,224	284,378	274,951	276,855	212,059	226,869	140,570

	1921.	1920.	1919.	1918.	1917.	1916.	1915.	1914.
Sockeyes	39,631	48,399	38,854	19,697	148,164	32,146	91,130	198,183
Springs, Red	11,360	10,691	14,519	15,192	10,197	17,673	23,228	11,209
Springs, White	5,949	4,432	4,296	24,853	18,916	11,430	5,392	15,300
Chums	11,233	23,884	15,718	86,215	59,973	30,934	18,919	74,826
Pinks	8,178	12,839	39,363	18,388	134,442	840	138,305	6,272
Cohoes	29,978	22,934	39,253	40,111	25,895	31,330	43,514	43,504
Bluebacks and Steelheads	1,331	4,522	15,941	4,395	4,951	3,129	31	.....
Totals	107,650	136,661	167,944	208,857	402,538	127,472	320,519	349,294

Skeena River.

	1929.	1928.	1927.	1926.	1925.	1924.	1923.	1922.
Sockeyes	78,017	34,559	83,996	82,360	81,146	144,747	131,731	96,277
Springs	4,324	6,420	19,038	30,594	23,445	12,028	12,247	14,176
Chums	4,908	17,716	19,006	63,527	74,308	25,588	16,527	39,758
Pinks	95,305	209,579	38,768	210,081	130,079	181,313	145,973	301,655
Cohoes	37,678	30,194	26,326	30,208	39,168	26,968	31,967	24,699
Steelhead Trout	13	241	582	754	713	214	418	1,050
Totals	220,245	298,709	187,716	407,524	348,859	390,858	338,863	477,915

	1921.	1920.	1919.	1918.	1917.	1916.	1915.	1914.
Sockeyes	41,018	89,364	184,945	123,322	65,760	60,293	116,533	130,166
Springs	21,766	37,403	25,941	22,931	16,285	20,933	15,273	11,740
Chums	1,993	3,834	31,457	22,573	21,516	17,121	5,769	8,329
Pinks	124,457	177,679	117,303	161,727	148,319	73,029	107,578	71,021
Cohoes	45,033	18,068	36,559	38,759	38,456	47,409	32,190	16,378
Steelhead Trout	498	1,218	2,672	4,994	1,883	3,743	1,798	.....
Totals	234,765	332,887	398,877	374,306	292,219	223,158	279,161	237,634

STATEMENT SHOWING THE SALMON-PACK OF THE PROVINCE, BY DISTRICTS AND SPECIES, FROM 1914 TO 1929, INCLUSIVE—*Continued.*

Rivers Inlet.

	1929.	1928.	1927.	1926.	1925.	1924.	1923.	1922.
Sockeyes	70,260	60,044	65,269	65,581	*192,323	94,891	116,850	53,584
Springs	342	468	608	685	496	545	599	323
Chums	989	3,594	1,122	11,727	11,510	4,924	3,242	311
Pinks	2,386	16,546	671	12,815	8,625	15,105	10,057	24,292
Cohoes	1,120	868	2,094	7,286	4,946	1,980	1,526	1,120
Steelhead Trout	29	7	9	11	.....	.....	.....	82
Totals	75,126	81,527	69,773	98,105	217,900	117,445	132,274	79,712

	1921.	1920.	1919.	1918.	1917.	1916.	1915.	1914.
Sockeyes	48,615	125,742	56,258	53,401	61,195	44,936	130,355	89,890
Springs	364	1,793	1,442	1,409	817	1,422	1,022	566
Chums	173	1,226	7,089	6,729	16,101	20,144	5,387	5,023
Pinks	5,303	25,647	6,538	29,542	8,065	3,567	2,964	5,784
Cohoes	4,718	2,908	9,038	12,074	9,124	15,314	7,115	7,789
Steelhead Trout	97	.....	.....	.....	.....	.....	.....	.....
Totals	59,272	133,248	80,367	103,155	95,302	85,383	146,838	109,052

Smith Inlet.†

	1929.	1928.	1927.	1926.	1925.	1924.	1923.	1922.
Sockeyes	9,683	33,442	22,682	17,921	33,764	11,435	11,864	5,818
Springs, Red	18	108	270	73	33	47	13	.....
Springs, White	60	178	79	39	22	.....	.....	.....
Cohoes	275	230	2,990	164	44	21	78	25
Pinks	853	167	732	689	134	273	24	19
Chums	113	19	2,605	31	1	.....	.....	.....
Bluebacks and Steelheads	12	6	8	.....	.....	.....	.....	.....
Totals	11,014	34,150	29,366	18,917	33,998	11,776	11,979	5,862

Nass River.

	1929.	1928.	1927.	1926.	1925.	1924.	1923.	1922.
Sockeyes	16,077	5,540	12,026	15,929	18,945	33,590	17,821	31,277
Springs	352	1,846	3,824	5,964	3,757	2,725	3,314	2,062
Chums	1,212	3,538	3,307	15,392	22,504	26,612	25,791	11,277
Pinks	10,342	83,183	16,609	50,815	35,530	72,496	44,165	75,687
Cohoes	1,202	10,734	3,966	4,274	8,027	6,481	7,894	3,533
Steelhead Trout	.....	36	96	375	245	1,035	595	235
Totals	29,185	104,877	39,828	92,749	89,008	142,939	99,580	124,071

	1921.	1920.	1919.	1918.	1917.	1916.	1915.	1914.
Sockeyes	9,364	16,740	28,259	21,816	22,188	31,411	39,349	31,327
Springs	2,088	4,857	3,574	4,152	4,496	3,845	3,701	3,385
Chums	2,176	12,145	24,041	40,368	24,938	11,200	11,076	25,569
Pinks	29,488	43,151	29,949	59,206	44,568	59,593	34,879	25,333
Cohoes	8,236	3,700	10,900	17,061	22,180	19,139	15,171	9,276
Steelhead Trout	413	560	789	1,305	1,125	1,498	113	.....
Totals	51,765	81,153	97,512	143,908	119,495	126,686	104,289	94,890

* Including 40,000 cases caught in Smith Inlet and 20,813 cases packed at Namu.

† Previously reported in Queen Charlotte and other Districts.

STATEMENT SHOWING THE SALMON-PACK OF THE PROVINCE, BY DISTRICTS AND SPECIES, FROM 1914 TO 1929, INCLUSIVE—*Continued.*

VANCOUVER ISLAND DISTRICT.

	1929.	1928.	1927.	1926.	1925.	1924.	1923.	1922.
Sockeyes	10,340	14,248	24,835	25,070	10,895	15,618	12,006	15,147
Springs	1,645	2,269	6,769	5,222	5,664	283	138	886
Chums	162,246	303,474	220,270	174,383	127,520	165,161	120,520	108,478
Pinks	74,001	41,885	52,561	86,113	51,384	63,102	30,149	36,943
Cohoes	35,504	23,345	58,834	51,551	59,747	30,593	21,342	18,575
Steelheads and Bluebacks	11,118	5,249	10,194	5,383	4,832	2,510	7,097	5,495
Totals	294,854	390,470	373,463	347,722	260,042	277,267	191,252	185,524

QUEEN CHARLOTTE AND OTHER DISTRICTS.

	1929.	1928.	1927.	1926.	1925.	1924.	1923.	1922.
Sockeyes	35,331	59,852	60,533	62,383*	49,962	40,926	24,584	47,107
Springs	1,020	2,806	7,826	3,650	5,002	4,245	2,711	4,988
Chums	111,263	341,802	252,230	348,682	305,256	195,357	148,727	80,485
Pinks	136,758	438,298	36,481	380,243	120,747	141,878	146,943	113,824
Cohoes	56,938	58,455	47,433	47,183	40,269	26,031	29,142	31,331
Steelheads and Bluebacks	575	609	973	973	1,520	497	732	409
Totals	341,873	901,822	405,476	844,114	522,756	408,934	352,839	278,144

	1921.	1920.	1919.	1918.	1917.	1916.	1915.	1914.
Sockeyes	18,350	64,473	54,677	51,980	32,902	45,373	98,600	87,130
Springs	4,995	15,633	14,766	8,582	6,056	11,423	9,488	7,108
Chums	21,412	30,946	165,717	90,464	112,364	160,812	40,849	70,727
Pinks	14,818	247,149	110,300	201,847	112,209	143,615	83,626	111,930
Cohoes	18,203	33,807	35,011	42,331	30,201	70,431	48,966	43,254
Steelheads and Bluebacks	2,790	3,721	702	1,009	865	712	985	.....
Totals	80,568	395,728	381,163	404,793	294,597	432,366	313,894	320,168

TOTAL PACKED BY DISTRICTS IN 1914 TO 1929, INCLUSIVE.

	1929.	1928.	1927.	1926.	1925.	1924.	1923.	1922.
Fraser	426,473	258,224	284,378	274,951	276,855	212,059	226,869	140,570
Skeena	220,245	298,709	187,716	407,524	348,859	390,858	338,863	477,915
Rivers Inlet	75,126	81,527	69,773	98,105	217,900	117,445	132,274	79,712
Smith Inlet	11,014	34,150	29,366	18,917	33,998	11,776	11,979	5,862
Nass River	29,185	104,877	39,828	92,749	89,008	142,939	99,580	124,071
Vancouver Island	294,854	390,470	373,463	347,722	263,904	277,267	191,252	185,524
Other Districts	341,873	901,822	405,476	844,139*	522,756	604,745	352,839	278,144
Grand totals	1,398,770	2,035,629	1,360,634	2,065,190	1,719,282	1,745,313	1,341,677	1,285,946

	1921.	1920.	1919.	1918.	1917.	1916.	1915.	1914.
Fraser	107,650	136,661	167,944	210,851	402,538	127,472	320,519	349,294
Skeena	234,765	332,787	398,877	374,216	292,219	223,158	279,161	237,634
Rivers Inlet*	59,272	157,522	80,367	103,155	95,302	85,383	146,838	109,052
Smith Inlet	.....	.....	.....	.....	.....	.....	.....	.....
Nass River	51,765	81,153	97,512	143,908	119,495	126,686	104,289	94,890
Vancouver Island	69,528	84,170	267,293	389,815	325,723	.....	.....	.....
Other Districts	80,568	395,223	381,163	404,793	294,597	432,366	313,894	320,169
Grand totals	603,548	1,187,616	1,393,156	1,626,738	1,557,485	995,065	1,164,701	1,111,039

* Including 17,921 cases of sockeye packed at Smith Inlet.

STATEMENT SHOWING THE SOCKEYE-PACK OF THE ENTIRE FRASER RIVER SYSTEM FROM 1914 TO 1929, INCLUSIVE.

	1929.	1928.	1927.	1926.	1925.	1924.	1923.	1922.
Fraser River, B.C.	61,569	29,299	61,393	85,689	35,385	39,743	31,655	51,832
State of Washington	111,898	61,044	97,594	44,673	112,023	69,369	47,402	48,566
Totals	173,467	90,343	158,987	130,362	147,408	109,112	79,057	100,398

	1921.	1920.	1919.	1918.	1917.	1916.	1915.	1914.
Fraser River, B.C.	39,631	48,399	38,854	19,697	148,164	32,146	91,130	198,183
State of Washington	102,967	62,654	64,346	50,723	411,538	84,637	64,584	335,230
Totals	142,598	111,053	103,200	70,420	559,702	116,783	155,714	533,413

STATEMENT SHOWING THE SOCKEYE-PACK OF THE PROVINCE, BY DISTRICTS, 1914 TO 1929, INCLUSIVE.

	1929.	1928.	1927.	1926.	1925.	1924.	1923.	1922.
Fraser River	61,569	29,299	61,393	85,689	35,385	39,743	31,655	51,832
Skeena River	78,017	34,559	83,996	82,360	81,146	144,747	131,731	96,277
Rivers Inlet	70,260	60,044	65,269	65,581	192,323	94,891	116,850	53,584
Nass River	16,077	5,540	12,026	15,929	18,945	33,590	17,821	31,277
Vancouver Island	10,340	14,248	24,835	25,070	14,757	15,618	12,006	15,147
Other Districts	45,014	59,852	60,533	62,383	49,962	41,014	24,584	47,107
Totals	281,277	203,542	308,052	337,012	392,518	369,603	334,647	295,224

	1921.	1920.	1919.	1918.	1917.	1916.	1915.	1914.
Fraser River	39,631	48,399	38,854	19,697	148,164	32,146	91,130	198,183
Skeena River	41,018	89,064	184,945	123,322	65,760	60,923	116,553	130,166
Rivers Inlet	48,615	125,742	56,258	53,401	61,195	44,936	130,350	89,890
Nass River	9,364	16,740	28,259	21,816	22,188	31,411	39,349	31,327
Vancouver Island	6,936	6,987	6,452	6,243	9,639	9,223*	.....	.....
Other Districts	18,350	64,473	54,677	51,980	32,902	36,150	98,660	87,130
Totals	163,914	351,405	369,445	276,459	339,848	214,789	476,042	536,696

* Vancouver Island's pack not previously segregated.

STATEMENT SHOWING THE PILCHARD INDUSTRY OF THE PROVINCE, 1920 TO 1929, INCLUSIVE.

Year.	Total Catch.	Canned.	Used in Reduction.	Oil.	Meal.	Bait.
	Cwt.	Cases.	Cwt.	Gals.	Tons.	Bbls.
1920	88,050	91,929	.....	.....	.....	9,937
1921	19,737	16,091	.....	.....	.....	4,232
1922	20,342	19,186	.....	.....	.....	3,125
1923	19,492	17,195	.....	.....	.....	3,625
1924	27,485	14,898	.....	.....	.....	923
1925	318,973	37,182	220,000	495,653	2,083	4,045
1926	969,958	26,731	940,000	1,898,721	8,481	2,950
1927	1,368,582	58,501	1,310,000	2,610,120	12,145	1,737
1928	1,610,252	65,097	1,560,000	3,997,656	14,502	2,149
1929	1,753,739	98,797	1,680,920	2,633,378	15,630	1,808

PRODUCTION OF FISH OIL AND MEAL, 1920 TO 1929 (OTHER THAN FROM PILCHARD).

Year.	From Whales.			From other Sources.	
	Whalebone and Meal.	Fertilizer.	Oil.	Meal.	Oil.
	Tons.	Tons.	Gals.	Tons.	Gals.
1920	503	1,035	604,070	466	55,669
1921	-----	-------	----------	489	44,700
1922	326	230	283,314	911	75,461
1923	485	910	706,514	823	180,318
1924	292	926	645,657	1,709	241,376
1925	347	835	556,939	2,468	354,853
1926	340	666	468,206	1,752	217,150
1927	345	651	437,967	1,948	250,811
1928	376	754	571,914	3,205	387,276
1929	417	780	712,597	3,772	328,827

VICTORIA, B.C.:
Printed by Charles F. Banfield, Printer to the King's Most Excellent Majesty.
1930.

1825-730-1132