PROVINCE OF BRITISH COLUMBIA

REPORT

OF THE

PROVINCIAL FISHERIES DEPARTMENT

FOR THE YEAR ENDED DECEMBER 31ST, 1936

WITH APPENDICES

PRINTED BY
AUTHORITY OF THE LEGISLATIVE ASSEMBLY.

VICTORIA, B.C.:
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1937.

To His Honour E. W. HAMBER,
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, 1936, with Appendices.

GEORGE SHARRATT PEARSON,
Commissioner of Fisheries.

Provincial Fisheries Department,
Commissioner of Fisheries' Office,
Victoria, British Columbia.

Honourable George S. Pearson,
Commissioner of Fisheries, Victoria, B.C.

SIR,—I have the honour to submit herewith the Annual Report of the Provincial Fisheries Department for the year ended December 31st, 1936, together with appendices.

I have the honour to be,
Sir,
Your obedient servant,

GEO. J. ALEXANDER,
Assistant Commissioner.

JOHN PEASE BABCOCK, LL.D.

On October 12th, 1936, the Industry and the Provincial Department of Fisheries suffered the loss of Dr. John P. Babcock. Affectionately known as the Father of the Department, he devoted his active life to intelligent conservation of the fisheries of the Province and to using his unique knowledge in the service of the people of British Columbia. Failing health obliged him to lay aside the regular supervision in March, 1933, but until his lamented death he remained a close associate, a highly valued adviser, and a keenly and personally interested friend. In his thirty-one years of active service he gained general respect and admiration, and his contribution to the upbuilding of British Columbia's fishing industry will be lastingly appreciated.

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REPORT OF THE PROVINCIAL FISHERIES DEPARTMENT FOR 1936.

VALUE OF CANADIAN FISHERIES AND THE STANDING OF THE PROVINCES, 1935.

The value of the fisheries products of Canada for the year 1935 totalled $34,427,854. During that year British Columbia produced fisheries products to the value of $15,169,529, or 44 per cent. of Canada's total.

British Columbia in 1935 led all the Provinces in the Dominion in respect to the production of fisheries wealth. Her output exceeded that of Nova Scotia, the second in rank, by $7,316.630.

The market value of the fisheries products of British Columbia in 1935 was $64,806 less than in the previous year. There was a decrease in the value of salmon amounting to $302,767.

The capital invested in the fisheries of British Columbia in 1935 was $20,890,825, or nearly 48 per cent. of the total capital employed in fisheries in all of Canada. Of the total invested in the fisheries of British Columbia in 1935, $9,504,333 was employed in catching and handling the catches and $11,386,492 invested in canneries, fish-packing establishments, and fish-reduction plants.

The number of persons engaged in British Columbia fisheries in 1935 was 17,030, or 21 per cent. of Canada's total fishery-workers. Of those engaged in British Columbia, 10,965 were employed in catching and handling the catches and 6,065 in packing, curing, and in fish-reduction plants. The total number engaged in the fisheries in British Columbia in 1935 was 896 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 1931 to 1935, inclusive:—

Province.	1931.	1932.	1933.	1934.	1935.
British Columbia	$11,108,873	$9,909,116	$12,001,471	$15,234,335	$15,169,529
Nova Scotia	7,986,711	6,557,943	6,010,601	7,673,865	7,852,899
New Brunswick	4,169,811	2,972,682	3,061,152	3,679,970	3,949,615
Quebec	1,952,894	1,815,544	2,128,471	2,306,517	1,947,259
Ontario	2,477,131	2,147,990	2,089,842	2,218,550	2,852,007
Manitoba	1,241,575	1,204,892	1,076,136	1,465,358	1,258,335
Prince Edward Island	1,078,901	988,919	842,345	963,926	899,685
Saskatchewan	317,933	186,174	186,417	219,772	252,059
Alberta	153,897	153,789	144,518	245,405	225,741
Yukon Territory	29,550	20,060	17,100	14,625	20,725
Totals	$30,517,306	$25,957,109	$27,558,053	$34,022,323	$34,427,854

THE SPECIES AND VALUE OF FISH CAUGHT IN BRITISH COLUMBIA.

The total marketed value of each of the principal species of fish taken in British Columbia for the years 1931 to 1935, inclusive, is given in the following table:—

Species.	1931.	1932.	1933.	1934.	1935.
Salmon	$7,195,220	$7,586,479	$9,184,090	$12,402,042	$12,099,275
Halibut	1,373,679	960,166	1,391,941	797,390	860,349
Halibut-livers	----------	----------	----------	36,439	80,513
Herring	1,058,139	536,491	738,522	628,982	580,031
Pilchard	807,842	383,920	77,464	549,910	670,328
Cod, ling	242,911	172,029	215,796	324,669	382,490
Clams	111,690	89,848	52,699	33,402	61,886
Black cod	39,521	38,754	41,443	44,057	65,862
Crabs	27,914	16,832	34,296	32,325	44,525
Soles	25,372	25,936	27,737	34,921	30,808
Shrimps	15,778	19,988	19,609	17,758	25,492
Oysters	61,247	28,800	25,670	38,922	41,609
Abalones	4,266	----------	----------	2,400	----------
Flounders	4,894	3,923	5,208	5,216	3,773
Carried forward	$10,968,473	$9,863,166	$11,814,475	$14,948,433	$14,946,941

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

Species.	1931.	1932.	1933.	1934.	1935.
Brought forward	$10,968,473	$9,863,166	$11,814,475	$14,948,433	$14,946,941
Red cod	10,937	9,333	5,629	6,607	10,409
Perch	3,893	4,707	3,428	3,334	5,054
Smelt	14,928	7,084	4,916	8,423	9,578
Sturgeon	3,774	3,161	5,006	3,391	6,936
Octopus	1,156	1,336	1,048	1,406	1,094
Skate	4,271	2,748	2,483	2,872	3,363
Oolachans	477	470	771	1,134	1,110
Whiting	603	135	1,180	207	170
Trout	----------	544	1,062	----------	----------
Grayfish, etc.—					
Oil	62,648	4,629	13,783	26,272	23,744
Meal	13,256	7,018	26,299	45,597	22,924
Fertilizer	10,272	----------	----------	----------	----------
Whales	----------	----------	110,030	183,738	105,360
Fur-seals	7,004	4,885	7,060	547	1,671
Miscellaneous	7,181	----------	4,301	2,374	31,175
Totals	$11,108,873	$9,909,116	$12,001,471	$15,234,335	$15,169,529

Previous to 1934 the totals for halibut included landings at British Columbia ports by United States vessels, whereas for 1935 the United States landings are excluded from the statistics.

VALUE OF BRITISH COLUMBIA'S FISHERIES IN 1936 SHOWS INCREASE OF OVER $2,000,000 ABOVE 1935.*

The value of production of the fisheries of British Columbia in 1936 was $17,231,534, compared with $15,169,529 in 1935. These totals represent the value of the product as marketed, whether for consumption fresh or as canned, dried, etc. British Columbia is the leading Province of the Dominion with respect to fisheries production, its wealth lying in the abundant product of its salmon-fishery. In 1936 the product of this fishery had a value of $13,387,344, the chief item being canned salmon, with a value of $11,128,636. The number of cases (48 lb. to the case) of canned salmon produced was 1,881,025, an increase over the preceding year of 352,003 cases, while in value there was an increase of $1,474,739. British Columbia canned salmon finds markets in all parts of the world—in 1936 the exports totalled 50,847,800 lb. (roughly, 1,059,329 cases), valued at $7,394,632, while the countries of destination numbered 66, the larger part going to British Empire countries.

Following the salmon-fishery, but with much smaller values of output, are the herring and halibut fisheries, the former with a value of $1,142,397 and the latter with $1,039,879. Both of these kinds show increases in catch and in marketed value, compared with the preceding year. The principal products of the herring-fishery are the dry-salted product and meal and oil. All of the halibut caught was sold for consumption fresh, and there has of recent years developed a considerable demand for halibut-livers, which in 1936 had a marketed value of $96,311. The products of the pilchard-fishery are chiefly meal and oil, and the catch of whales is used in the manufacture of similar items.

The total quantity of fish of all kinds taken by British Columbia fishermen during the year 1936 was 4,896,753 cwt., with a value at the point of landing of $7,503,880, compared with a catch of 4,041,788 cwt., and a value of $8,082,355 in 1935.*

CAPITAL EQUIPMENT AND EMPLOYEES.

IN PRIMARY OPERATIONS.

Capital.—The amount of capital represented by the vessels, boats, nets and other gear, piers and wharves, etc., used in the primary operations of catching and landing the fish, during the year 1936, is shown as $9,829,892, compared with $9,504,333 in the preceding year. The

* NOTE.—These figures are taken from the Advance Report on British Columbia Fisheries, Dominion Department of Statistics.

chief items, in order of value, are gasoline-boats, sailing and gasoline vessels, collecting boats and scows, and salmon drift-nets.

Employees.—The number of fishermen employed during the year was 11,393, of which 66 are credited to the steam-vessels, 1,326 to the sailing and gasoline vessels, 9,529 to the boats, and 472 to the packers and collecting-boats.

In Fish Canning and Curing.

Capital.—There were 91 fish canning and curing establishments in operation in the Province in 1936, with a total capital investment valued at $12,376,841, compared with 91 establishments valued at $11,386,492 in the preceding year. The salmon-canneries, which numbered forty-six, are credited with $9,228,852, or 75 per cent. of the total capital investment in that year.

Employees.—The establishments furnished employment during the season of operations for a total of 6,426 persons—3,769 male and 2,657 female. Compared with the preceding year, an increase of 361 is shown in the total number. The period of greatest employment in the canning and curing branch of the fisheries industry is from May to November, both months inclusive.

THE CANNED-SALMON PACK FOR BRITISH COLUMBIA IN 1936.

The total pack of canned salmon in British Columbia for the season 1936 amounted to 1,864,503 full cases. This is an increase of 335,481 cases over the pack of 1935 and is the largest annual pack since 1930, when 2,221,819 cases were canned. The 1936 pack is 361,961 cases greater than the average for the ten-year period 1927–36.

The 1936 pack consisted of 414,809 cases of sockeye, 29,853 cases of springs, 1,068 cases of steelheads, 229,750 cases of cohoes, 591,535 cases of pinks, and 597,488 cases of chums. Included in the cohoe-pack are 29,516 cases of bluebacks.

Analysing the pack by species in the order named, the sockeye-pack, amounting to 414,809 cases, is 64,365 cases greater than the pack of this species in the previous year, and is the largest pack of sockeye in British Columbia since 1930 and is 90,052 cases greater than the average for the ten-year period 1927–36, inclusive. In considering these figures, due allowance must be made for the very small pack at Rivers Inlet due to a strike of fishermen in this area.

The pack of spring salmon, amounting to 29,853 cases, is 7,933 cases greater than in the previous year and exceeds the pack of this species in 1934 by 77 cases.

While steelheads are trout and not salmon, a few caught incidental to salmon-fishing are canned each season and on this account the figures are included in the figures of the canned-salmon pack.

The cohoe-pack amounted to 229,750 cases. This figure includes 29,516 cases of bluebacks and is only 1,742 cases less than in 1935, which year set a record for this species.

There were packed 591,535 cases of pink salmon in 1936, as compared with 514,966 cases in 1935 and 436,354 cases in 1934. The chum-salmon pack in 1936, amounting to 597,488 cases, exceeded that of 1935 by 187,884 cases and is 84,307 cases greater than in 1934.

THE BRITISH COLUMBIA CANNED-SALMON PACK BY DISTRICTS.

Fraser River System.

The Canadian pack of Fraser River sockeye in 1936 amounted to 184,854 cases, which is the largest pack put up on the Canadian side of the line since 1914, when the Canadian pack amounted to 198,183 cases. For comparison with the Canadian pack of this species on the Fraser in more recent years the following figures are quoted:—

	Cases.
1930	103,692
1931	40,947
1932	65,769
1933	52,465
1934	139,238
1935	62,822

The large increase in the Canadian pack should be encouraging to Canadian fishermen and canners, particularly when it is realized that up to quite recently American fishing-gear caught

by far the larger percentage of the total. The percentages, in round numbers, taken by American and Canadian gear during the past ten years are as follows:—

	American. Per Cent.	Canadian. Per Cent.
1927	61	39
1928	68	32
1929	64	36
1930	78	22
1931	68	32
1932	55	45
1933	71	29
1934	72	28
1935	47	53
1936	25	75

Mention was made in this report for 1935 that the larger percentage taken by Canadian gear in that year may have been the result of the elimination of trap-fishing in the State of Washington. There would now seem to be no doubt that the restriction of this gear has reacted favourably to the Canadian fishermen, but Canadians have still a long way to go to fully equalize the catches over the past years, especially when due consideration is given to the size of the Fraser River pack in the early years as compared with recent past years.

Another factor which without doubt has been of material assistance in increasing the Canadian catch in 1936 was the increase in numbers in that portion of the run which habitually reaches the Fraser through Johnstone Strait. In 1936 unquestionably a greater number of sockeye found their way to the Fraser through Johnstone Strait than is usually the case.

The 1936 run of sockeye to the Fraser produced a total combined Canadian and American pack of 244,359 cases. Based on a four-year cycle, this run is the result of the spawning of 1932, in which year the total pack amounted to 146,957 cases. The run in 1936 was much larger than anticipated, as conditions on the spawning-grounds in 1932 and the size of the run that year did not indicate a larger return than in 1932.

Another feature of the 1936 run of sockeye to the Fraser worth noting was the excellent quality of the fish when taken in the commercial gear. The fish were all in prime condition, being of fine colour, firm, and very fat. This characteristic was maintained during the duration of the run. Apparently the run proceeded up-river almost as soon as they arrived, as the actual time spent in the commercial fishing area was short, as will be seen from the accompanying table showing the pack by weeks:—

Week-end Totals of Fraser River Sockeye packed at Fraser River Canneries and in the State of Washington.

Date.	British Columbia.	Washington.	Total.
1936.	Cases.	Cases.	Cases.
Week ending—			
July 4	----------	35	35
„ 11	----------	75	75
„ 18	1,646	761½	2,407½
„ 25	16,468	1,676½	18,144½
Aug. 1	19,569	20,473	40,042
„ 8	62,675	13,041	75,716
„ 15	15,382	7,154½	22,536½
„ 22	11,409	7,325½	18,734½
„ 29	4,680	2,901½	7,581½
Sept. 5	2,469	6,055	8,524
„ 12	2,411	5½	2,416½
„ 19	2,445	----------	2,445
„ 26	1,408	----------	1,408
Oct. 3	979	----------	979
„ 10	2,618	----------	2,618
„ 17	17	----------	17
„ 24	8	----------	8

Due to the excellent quality of this run of sockeye, which compared favourably with the quality of the sockeye which formerly composed the " big year," it was suggested that the 1936 run was probably seeking the spawning-grounds at the upper reaches of the watershed. Examination of these spawning-grounds as reported by the Federal Fisheries Officers indicates conclusively that this was not the case. For a detailed report on the salmon-spawning grounds in the various districts the reader is referred to the " Report of the Salmon-spawning Grounds, 1936," by Major J. A. Motherwell, Chief Supervisor of Fisheries, published in the Appendix to this report. We wish to acknowledge Major Motherwell's courtesy in supplying us with this information.

Spring Salmon.—The canned pack of this species on the Fraser River in 1936 amounted to 15,126 cases, compared with 9,401 cases in 1935, but was 1,092 cases less than in 1934 and was 121 cases greater than the average for the past five years. Reports from the spawning-grounds indicate greater numbers of spring salmon on the beds than during recent past years.

Cohoe Salmon.—The cohoe-pack in this district in 1936 amounted to 28,716 cases. This is 3,766 cases greater than in 1935 and 17,324 cases more than in 1934. The 1936 cohoe-pack in the Fraser District is the largest since 1930, when 53,464 cases were packed, and is 9,561 cases above the average over the past five years.

Pink Salmon.—The pink-salmon run occurs in this district only every alternate year. There was no run of this species in 1936.

Chum Salmon.—The Fraser River District produced a pack of chums in 1936 amounting to 31,565 cases, compared with 8,227 cases in 1935, 104,092 cases in 1934, 34,391 cases in 1933, and 14,948 cases in 1932. The pack figures for this species are not necessarily indicative of the size of the run, as large numbers of chums find a market in a frozen and salted condition. Spawning-ground reports indicate that chum salmon were found in greater numbers than in recent years on all grounds in District No. 1 which are frequented by this variety.

In comparing the figures for the Fraser River pack of 1936 with previous years, the reader's attention is drawn to a change made in allocating the pack figures for 1936. Previous to this year all Johnstone Strait caught sockeye were credited to the Vancouver Island District. In order that each principal watershed might be credited with the proper amount regardless of where the fish were caught, the Provincial Department of Fisheries in 1936 required the canners to submit a return showing the location where the fish were taken, together with the quantities of the various species canned. The response has been 100 per cent., and as a result the Department is now able to present figures more truly indicative of the production of the various salmon-producing rivers. In the figures quoted above for Fraser River sockeye 23,153 cases caught in Johnstone Strait are included. Prior to 1936 all Johnstone Strait sockeye were shown in the Vancouver Island District pack.

The Skeena River.

The total canned-salmon pack on the Skeena in 1936 amounted to 218,634 cases. This is 48,214 cases greater than in 1935, but is 65,462 cases less than in 1934. The 1936 pack of all varieties on this river exceeds the five-year average by 169 cases, but is 22,601 cases less than the average over the past ten years.

The Skeena pack was composed of 81,973 cases of sockeye, 4,551½ cases of springs, 33 cases of steelheads, 25,390 cases of cohoe, 91,389 cases of pinks, and 15,297½ cases of chums.

Sockeye Salmon.—The sockeye-pack in 1936 was the largest on the Skeena since 1931, when 93,023 cases were packed. It is 29,094 cases greater than in the year previous and is 22,787 cases more than for the five-year average, and is also more than the average for the ten-year period 1927–36 by 10,184 cases. The Skeena sockeye-pack in 1936 was largely derived from the 1932 cycle-year, with which it compares favourably.

Reports from the spawning-beds indicate that a heavy seeding took place under favourable conditions, which augurs well for this cycle four years hence.

Spring Salmon.—The pack of this variety on the Skeena in 1936, amounting to 4,551 cases, was slightly in excess of that for the previous year, when 4,039 cases were canned. The packs in recent past years were: In 1934, 8,300; 1933, 3,297; 1932, 28,269 cases. It is pointed out that the pack figures for spring salmon are not necessarily indicative of the amount caught, nor of the size of the run, as large quantities of this variety find a ready market as fresh, frozen,

mild-cure, etc. Major Motherwell reports the supply of springs on the spawning-beds as being quite satisfactory, especially in the Ecstall River.

Cohoe Salmon.—There were 25,390 cases of cohoe canned on the Skeena in 1936. This was 1,892 cases more than the year previous, but is 29,066 cases less than in 1934 and 14,506 cases less than 1933, the cycle-year, when the pack amounted to 39,896 cases. As cohoe also find a considerable market through the frozen-fish trade, the remarks in respect to spring-salmon figures apply also to cohoe. The quantities of cohoe found on the spawning-beds of the Skeena in 1936 are reported to be better than for several years.

Pink Salmon.—The canned pack of this variety was 91,389 cases, which was 9,521 cases greater than the year previous, but was 34,774 cases less than in 1934, the cycle-year. The year 1936 falls in the cycle of big years for this variety on the Skeena and it was hoped that the pack would have been larger. Apparently large numbers escaped the fishing-gear, however, as spawning-bed reports indicate a heavy escapement to beds in the lower watershed superior to that of the preceding cycle-year.

Chum Salmon.—The pack of chums amounted to 15,297 cases, compared with 8,122 cases in 1935, 24,388 cases in 1934, 15,714 cases in 1933, and 38,549 cases in 1932. The chum-pack on the Skeena varies over a wide range from year to year, no doubt due in some measure to the demand from foreign markets. Reports from the spawning-grounds indicate a heavy run for this area, although large quantities do not use the Skeena River spawning-grounds.

The Nass River.

The total pack of all varieties of salmon canned on the Nass River in 1936, amounting to 139,575 cases, is the largest pack in any year since 1924, when 142,939 cases of all varieties were canned. The 1936 pack consisted of 28,562 cases of sockeye, 2,167 cases of springs, 496 cases of steelhead trout, 11,842 cases of cohoe, 75,887 cases of pinks, and 20,620 cases of chums.

Sockeye Salmon.—The comparatively large pack of sockeye in this district, amounting to 28,562½ cases, again demonstrates the very erratic nature of the runs to the Nass. The pack in 1936 is the product of 1931; the pack in that year amounted to 16,929 cases and in that year reports from the spawning-beds did not indicate a good return in 1936. The pack in 1936 is 9,785 cases greater than the average for the five-year period 1931–36 and is 13,167 cases more than the average for the five-year period 1927–31.

The following table gives the average sockeye-packs on the Nass for the last three five-year cycles:—

	Cases.
1922–27	23,512
1927–31	15,395
1931–36	18,777

The 1936 pack of 28,562 cases is 139 cases less than that of 1934, in which year the pack was the largest since 1924, when 33,590 cases were packed.

In addition to the favourable pack of sockeye, reports from the spawning-beds indicate an adequate escapement. In the Meziadin Lake District the officers report greater numbers on the spawning-beds than for the past fifteen or twenty years and a heavy escapement to the watershed above Meziadin Lake.

Spring Salmon.—This variety is never a large factor in the Nass River pack, although the 1936 pack of 2,167 cases was 324 cases above the ten-year average for this variety. The run to the spawning-beds is reported to have been quite satisfactory.

Cohoe Salmon.—The cohoe-pack on the Nass amounted to 11,842 cases, compared with 21,810 cases in 1935, 9,935 cases in 1934, and 3,251 cases in 1933. The 1936 pack is 3,766 cases above the average for the past ten years. The numbers of cohoe found on the spawning-beds is reported as considerably greater than four years ago and the escapement heavy.

Pink Salmon.—The pink-pack of 75,887½ cases in 1936 was the largest since 1930, when 79,967 cases were canned, and would indicate that this cycle is returning to former levels. The pack for this variety in previous cycles was as follows: 1934, 32,964 cases; 1932, 44,629 cases; 1930, 79,976 cases; 1928, 83,183 cases; and in 1926, 50,815 cases.

Federal officers inspecting the spawning-grounds report that this variety reached the spawning-grounds in large quantities, both in the Nass River proper and in the streams tributary to Portland and adjoining inlets.

Chum Salmon.—The chum-salmon pack on the Nass in 1936, amounting to 20,621 cases, must be considered as a large one when viewed in relation to the size of former packs in this district. It was the largest pack of chums on the Nass since 1925, when 22,504 cases were packed, and exceeds the ten-year average by 13,675 cases, while the escapement to the spawning-grounds is reported large and greater than in recent years.

Rivers Inlet.

The total Rivers Inlet pack in 1936, amounting to 72,011½ cases of all varieties, was one of the smallest on record. The pack consisted of 46,351 cases of sockeye, 581 cases of springs, 19 cases of steelhead trout, 7,122 cases of cohoe, 6,432 cases of pinks, and 11,505 cases of chums.

Sockeye Salmon.—The sockeye-pack of 46,351 cases was the smallest pack in this inlet in many years. The small pack, however, was not due to a scarcity of fish, but to a fishermen's strike which completely stopped all fishing from July 6th to 23rd. The run in 1936 was derived from the spawning-cycle 1931 and 1932, and, while this cycle is not the heaviest producer, the run in 1936, it was anticipated, would produce a pack in the neighbourhood of 75,000 to 80,000 cases. On account of the cessation of all fishing during the main run, the fish had an unobstructed passage to the spawning-beds and, as might be expected, a heavy spawning took place. Unfortunately a heavy freshet, the heaviest in many years, occurred, which will undoubtedly have destroyed many of the eggs deposited. This unfortunate circumstance may have the effect of considerably lessening the pack which otherwise might have been expected four and five years hence.

Spring Salmon.—This variety is never a large factor in Rivers Inlet and the pack of 582 cases corresponds favourably with past seasons.

Cohoe Salmon.—The cohoe-pack, never large in this inlet, amounted to 7,123 cases, compared with 8,375 for the year previous, 4,852 cases in 1934, and 3,446 in 1933; while 7,062 cases were canned in 1932.

Spawning-bed reports indicate the escapement better than usual in this area, but the supply on the spawning-beds was not as great as might be desired.

Pink Salmon.—Rivers Inlet is considered chiefly as a sockeye area and other varieties canned here are largely caught incidental to the sockeye-fishery. The pink-pack in 1936 amounted to 6,432 cases, compared with 4,554 cases the year previous and 2,815 cases in 1934, the cycle-year. The numbers found on the spawning-grounds are reported to justify the conclusion that the runs are being maintained.

Chum Salmon.—The remarks contained in the foregoing paragraph in respect to pinks apply also to chums, and the pack of this variety, amounting to 11,505 cases, is a large one, the largest since 1926, when 11,727 cases were canned.

Smith Inlet.

The strike at Rivers Inlet extended to this neighbouring sockeye-fishing ground, resulting in similar disastrous results from the point of view of production, only 14,888 cases of all varieties being canned. The total pack in 1935 amounted to 49,928 cases and 41,256 cases in 1934, while the pack in 1933 was 71,714 cases.

Sockeye Salmon.—The sockeye-pack, which is the principal variety canned in this inlet, amounted to 12,788 cases. As was the case in Rivers Inlet, the small pack was not due to scarcity of fish but to a strike of fishermen. Judging from the size of the packs in previous years falling in the same cycle, a pack of between 25,000 and 35,000 cases may be considered reasonable expectation. Reports from the officers inspecting the spawning-beds are to the effect that large numbers were observed spawning under favourable conditions. This should prove beneficial for future runs of this cycle.

Spring Salmon.—Springs are never a factor in Smith Inlet, 30 cases only being canned in 1936.

Cohoe Salmon.—This species is not fished in Smith Inlet, but a few are taken incidental to sockeye-fishing. There were 310 cases canned in 1936.

Pink Salmon.—Pink salmon are not canned to any extent in this inlet, although in recent past years as many as 20,000 cases have been packed in a season. The pack in 1936 amounted to 65 cases.

Chum Salmon.—There were 1,653 cases of chums canned on Smith Inlet in 1936, the pack of this variety amounting to 12,427 cases in 1935 and 15,548 cases in 1934. Reports from the spawning-grounds indicate satisfactory seeding for all varieties except pinks, which were not quite as well seeded as usual.

Queen Charlotte Islands.

Salmon-canning activities in the Queen Charlotte Islands is confined almost exclusively to pinks and chums; other varieties are canned only incidental to these. The total packed in these islands in 1936 amounted to 178,891 cases, mostly pinks and chums, although cohoe accounted for 19,920 cases. The total pack of all varieties in 1935 amounted to 93,301 cases, while in 1934 the pack was 100,041 cases.

Pink Salmon.—Pink salmon appear in the waters adjacent to the Queen Charlotte Islands every alternate year, the runs coinciding with the even-numbered years. The run in 1936 was the result of the spawning in 1934. In that year the pack amounted to 53,398 cases, while in 1936 the run produced a pack of 89,355 cases. While this is not so large a pack of this variety as was usual in the cycle-years previous to 1930, it nevertheless is most encouraging when considered in conjunction with the escapement to the spawning-grounds, and when it is recalled that the run was almost a complete failure in 1932, when only 2,415 cases were canned, while the pack in 1930 amounted to 224,902 cases.

Major Motherwell reports that, apart from an odd stream, the escapement was excellent.

Chum Salmon.—The chum pack in 1936 amounted to 69,304 cases in this district, compared with 86,298 cases in 1935, while the packs for 1934 and 1933 were 38,062 cases and 6,988 cases respectively. Reports from the spawning-grounds indicate that the supply of spawning chums was greater than usual.

Other Varieties.—There were 19,920 cases of cohoe, 227 cases of springs, and 85 cases of sockeye canned in Queen Charlotte Islands canneries in 1936.

Central Area.

This includes the area from Cape Calvert to the Skeena River and adjacent waters exclusive of Rivers Inlet. The total production of canned salmon of all varieties in 1936 amounted to 420,496 cases, as against 295,433 cases in 1935. The increase is mainly due to the large pack of pinks, which amounted to 246,378 cases in 1936. Other varieties making up the total were 27,499 cases of sockeye, 830 cases of springs, 45,824 cases of cohoe, 99,592 cases of chums, and 373 cases of steelhead trout.

Sockeye Salmon.—The sockeye-pack of 27,499 cases was 4,918 cases less than in the year previous, but was 7,061 cases greater than in 1934. The fishermen's strike at Rivers and Smith Inlets interrupted for a time sockeye-fishing in a part of this area and no doubt reduced somewhat the size of the pack. Notwithstanding this, however, the 1936 pack was 1,870 cases above the average for the past five years.

Reports from the various spawning-grounds in this area indicate a good escapement under favourable weather conditions at all points, except to the streams on the west coast of Banks Island. Major Motherwell advises in this regard that precautions will be taken in the cycle-year to see that a reasonable percentage of the return of fish pass unmolested to the spawning-grounds.

Pink Salmon.—The pack of pinks in this area, amounting to 246,378 cases, is most encouraging. This is the largest pack since 1930, when 376,084 cases were canned, and is 89,042 cases greater than in the cycle-year 1934. The pack in 1936 was also 111,050 cases greater than the five-year average 1932–36.

The escapement to the spawning-grounds is reported as being good in most streams in this area, with the possible exception of Bella Coola area, where the spawning is reported as only fair and not equal to the brood-year.

Chum Salmon.—The chum-pack amounted to 99,592 cases, which is slightly lower than in recent past years. Previous years' packs were: 1935, 125,953 cases; 1934, 117,309 cases; 1933, 128,602 cases; and 166,653 cases in 1932. The size of the chum-pack is conditioned somewhat by the demand for this variety when canned and this factor no doubt lessened the pack somewhat.

The escapement is reported as having been heavy in all the principal spawning areas in this district. In the Bella Coola area, however, unusually heavy freshets occurred after spawning, destroying large quantities of eggs, which will necessitate special precautions being taken in the cycle-year.

Cohoe Salmon.—There were 45,842 cases of cohoe canned in the Central Area in 1936. This was a better than average pack for this variety, 41,831 cases having been packed in 1935, while the pack in 1934 was 53,850 cases and 33,471 cases in 1933.

A good escapement to the spawning-grounds is indicated by reports from the Federal officers.

Other Varieties.—There were 830 cases of springs and 373 cases of steelhead trout also packed in this area.

VANCOUVER ISLAND.

The total canned-salmon pack credited to Vancouver Island District amounted to 559,746 cases. This is the largest pack yet recorded and exceeds the previous year's large pack by 90,319 cases. The increase is reflected in the figures for all varieties, with the exception of springs. The 1936 pack was composed of the following: 32,696 cases of sockeye, 6,340 cases of springs, 90,625 cases of cohoe, 82,028 cases of pinks, 347,951 cases of chums, and 105 cases of steelhead trout.

Sockeye Salmon.—The total sockeye-pack credited to Vancouver Island District of 32,696 cases was 9,768 cases greater than in the previous year and is the largest pack for many years. It exceeds the pack of 1932 by 5,085 cases and is 6,914 cases above the average for the last five years.

Reports from the numerous spawning-beds indicate that the needs of conservation are being satisfactorily taken care of.

Spring Salmon.—The pack of this variety, amounting to 6,340 cases, was slightly less than the year previous, but was greater than in 1934 and 1933—the respective packs for the three previous years being: 1935, 6,525 cases; 1934, 1,630 cases; 1933, 4,875 cases. Due to the importance of this variety in the fresh, frozen, and mild-cure trade, the quantity canned must not be taken as an indication of availability.

Cohoe Salmon.—This species canned amounted to 90,625 cases in 1936. This figure includes 29,516 cases of bluebacks taken in the Gulf of Georgia. The pack was less than in the year previous, when 104,366 cases were canned, but is nevertheless a large pack of this variety for this district.

Pink Salmon.—The pack of pinks amounted to 82,028 cases, compared with 54,526 cases in 1934, the cycle-year. The 1936 pack was less than in 1935, when 191,627 cases were canned, but must be considered as satisfactory when compared with previous years in the same cycle.

Chum Salmon.—The chum-pack credited to Vancouver Island in 1936 amounted to 347,951 cases, which must be considered a large pack. The packs for the previous four years were as follows: 1935, 143,960 cases; 1934, 210,239 cases; 1933, 96,642 cases; 1932, 70,629 cases. In the case of chums large quantities also find a market in the salt- and frozen-fish trade, which somewhat affects the size of the canned pack. The foreign demand for canned chums is also an important factor which must be considered.

In considering the detailed figures for the various species of salmon canned in the several districts in the Province, due consideration must be given to the numbers reaching the many spawning-grounds. Inspection of the spawning-beds is made each year by the Fishery Officers of the Federal Department. The reader is referred to the detailed "Report on the Salmon-spawning Grounds, 1936," by Major J. A. Motherwell, published in the Appendix to this report.

OTHER CANNERIES (PILCHARD, HERRING, SHELL-FISH).

Pilchards.—The canning of pilchards on the west coast of Vancouver Island was continued in 1936 at about the same level as in the previous year, although a greater number would probably have been canned if fishing conditions had been more suitable during the time the fish were in the best canning condition. Production of canned pilchards in 1936 amounted to 35,007 cases, while in 1935 27,184 cases were canned. In connection with the canning of pilchards, it is interesting to note that this valuable food-fish is now being offered to the public

in a variety of canned sizes, which should no doubt have the effect of encouraging a wider distribution.

Herring production in 1936 amounted to 20,914 cases, compared with 26,143 cases canned in 1935.

Shell-fish.—Shell-fish are canned in British Columbia to some extent, but the production is never large. There were canned in 1936 1,869 cases of crabs, compared with 1,748 cases the year previous; 12,173 cases of clams, compared with 10,212 cases in 1935; and 3,601 cases of oysters, compared with 2,246 cases of oysters in 1935. There were no shrimps canned in British Columbia in 1936.

REVIEW OF BRITISH COLUMBIA'S SALMON-CANNING INDUSTRY.

There were forty-six salmon-canneries licensed to operate in British Columbia in 1936, which is three more than were operated the year previous and three less than in 1935.

The canneries operated in the various districts were as follows:—

Queen Charlotte Islands	4
Nass River	3
Skeena River	8
Central Area	4
Rivers Inlet	6
Smith Inlet	2
Johnstone Strait	4
Fraser River and Lower Mainland	11
West Coast of Vancouver Island	4

A comparison by districts with the previous year shows that there were in 1936 three more canneries operating in Queen Charlotte Islands; one less on the Skeena River; one less in the Central Area; one more in the Fraser and Lower Mainland area; and one more on the West Coast of Vancouver Island.

The year 1936 was the cycle-year for pinks in Queen Charlotte Islands, which no doubt accounts for the increased activity in that district. One cannery on the Skeena changed hands, the new owners operating only as a fish-camp, but fishing the full complement of gear and canning the product at other canneries in the district. One less cannery operating in the Central Area is accounted for by similar action on the part of the owners as mentioned above for Skeena River. On the Lower Mainland the one additional cannery over the number operated in 1935 was operated only for a short season during the run of chums in the fall of the year. On the West Coast the extra cannery was due to the purchase of a non-operating cannery by new owners and its removal to a new site farther up the coast.

In addition to the canneries operated as such, and further to the remarks contained in the above paragraph, attention is drawn to the growing practice of closing down operating canneries and consolidating the canning operations in fewer plants, retaining a net-crew at the non-operating cannery, and fishing that non-operating cannery's full complement of gear, but canning the product of several canneries' gear in one operating cannery. This tendency is no doubt an attempt on the part of the operator to lower production costs, but in so doing the operator should assure himself that the slight saving thus gained is not at the expense of impaired quality.

From the view-point of quantity canned, the 1936 season must be considered as generally satisfactory. The grand total packed was 335,481 cases greater than the year previous. The increase is reflected in the totals of all varieties, with the exception of cohoe, but it must be remembered that the pack of cohoe, amounting to 231,492 cases in 1935, was the largest pack of this variety ever canned in British Columbia. The 1936 pack was only 1,742 cases less.

The season opened in District No. 2 on June 28th, and, while the weather was not conducive to good fishing, nevertheless by July 3rd all districts reported gill-net fishing as being good. On Monday, July 6th, the Rivers Inlet gill-netters went out on strike. Sockeye prices offered in all districts except Rivers Inlet were 45 cents per fish, while 40 cents was being paid for Rivers Inlet sockeye, the operators claiming that due to the smaller size and poorer quality of Rivers Inlet sockeye they were forced to sell their Rivers Inlet pack at prices considerably lower than what they received for standard-quality goods, thus forcing them to pay less for the lower-grade Rivers Inlet fish. After fishing a week the Rivers Inlet fishermen went on strike,

asking 50 cents per sockeye. Negotiations between the fishermen and operators failed, and on Friday, July 10th, the operators notified the fishermen that not more than 40 cents could be paid, and unless fishing recommenced on Sunday, July 12th, the operators would have to seriously consider closing down entirely.

In the meantime the strike had spread to Smith Inlet, Knight Inlet, the Namu area, all gill-net areas, and the Alert Bay and Butedale seine-boats also went out. Fishing continued on the Skeena and Nass Rivers.

On Wednesday, July 15th, the operators met the strike committee at Rivers Inlet and explained their inability to meet strikers' demands. The strike committee notified the operators that they could not discuss anything but 50 cents for sockeye. The operators then proposed that the men return to work immediately at a guaranteed minimum price of 40 cents and that the question of a higher price be submitted to the Commissioner of Fisheries for arbitration.

During the time negotiations were taking place the salmon run was passing unmolested to the spawning-grounds and on Friday, July 17th, sufficient numbers had reached the spawning-grounds to warrant the Chief Supervisor announcing that the weekly close season at Rivers and Smith Inlets would be dispensed with for the balance of the run as the escapement was excellent.

Later on Wednesday, July 15th, the operators asked the Commissioner of Fisheries for arbitration under the "Fisheries Act" on the understanding that the fishermen immediately commence fishing without further loss of time, guaranteeing a minimum price of 40 cents for all sockeye taken and, in the event that the Arbitration Board award was higher, to abide by the award. On July 16th the operators' proposal was submitted to the Strike Committee by the Commissioner of Fisheries, asking the fishermen to name a representative if the proposal was acceptable. The offer of arbitration was rejected by the strike committee on July 18th.

In the meantime numerous fishermen were commencing to leave the inlets, and as negotiations had broken down completely the operators commenced preparations for closing down the canneries for the balance of the season.

The seine-fishermen at Alert Bay had in the interval returned to work, as had the majority of the seiners at Butedale.

On July 23rd seventy-odd boats from Namu commenced fishing in Rivers Inlet and, while these boats did very well, the season was too far advanced to warrant reopening those canneries which had closed down. Two canneries remained open during the balance of the sockeye season.

There is no doubt that but for this interruption of fishing the pack on Rivers Inlet would have been in the neighbourhood of close to 100,000 cases and that Smith Inlet would also have produced a normal pack. While the interruption of fishing in other districts due to the strike was much less than at Rivers and Smith Inlets, the result must be a considerably reduced pack, lessening the value of British Columbia's fisheries proportionately and causing a heavy loss to both fishermen and operators.

Probably the most outstanding feature of the salmon season in 1936 was the exceptionally heavy catches of sockeye made in the Fraser River. These large catches were not anticipated and numerous theories have been advanced as to the reason. Whether these theories are correct or not need not be dealt with at this time. The Canadian fishermen's share of the Fraser River run in 1936 was very much larger than in previous years. There is no doubt that the elimination of the traps in Puget Sound has in some measure lessened the numbers taken in United States waters, which has left a larger proportion available to Canadian gear. On the other hand, there is always a portion of the Fraser River run of sockeye which makes its way to the river by way of Johnstone Strait, and from the records of catches made in Johnstone Strait in 1936, it would appear that a larger proportion proceeded to the Fraser River by way of Johnstone Strait than is usually the case. The effect has been most beneficial from the standpoint of Canadian fishermen and canners.

HALIBUT PRODUCTION.

Owing to the fact that total halibut landings from Areas No. 2 and No. 3 are fixed by the International Commission at 46,000,000 lb. annually and that very little is landed from Areas No. 1 and No. 4, there is little opportunity for wide variation in the total catch figures from year to year. In 1936 the total landings from Areas No. 2 and No. 3 amounted to 48,175,466

lb., compared with 46,060,000 lb. from these two areas in the year previous. The total landings from all areas in 1936 amounted to 48,874,672 lb., compared with 47,350,000 lb. in 1935. Previous to 1935 very little, if any, halibut was caught in what is known as Area No. 1. In 1935, however, this area produced 1,290,000 lb. while in 1936 this area is credited with 699,206 lb.

Canadians are most interested in the quantities landed by all vessels in Canadian ports and the quantity taken by Canadian vessels. Notwithstanding the fact that total landings in 1936 were 1,524,672 lb. greater than in 1935, the total landed in Canadian Pacific ports in 1936 was less than in 1935 by 336,655 lb; the figures for 1935 were 17,127,000 lb., while in 1936 16,790,345 lb. were landed. One factor which no doubt had an adverse effect on Canadian landings was a complete tie-up of all train service out of the port of Prince Rupert for several weeks during the height of the halibut season. This tie-up, which was caused by a bad wash-out, no doubt diverted many American vessels to Seattle which would ordinarily have landed some of their trips in Prince Rupert.

The total Pacific catch by Canadian vessels in 1936 again shows an increase over 1935 by 383,213 lb. The total Canadian catch in 1935 amounted to 10,206,000 lb., while in 1936 the Canadian catch was 10,589,213 lb. Expressed in percentage of the total, however, the Canadian catch is somewhat less than in the year previous, amounting to nearly 22 per cent., while in 1935 Canadian vessels caught 28.4 per cent. of the total.

Based on the unweighted average prices paid for all Canadian landings at Prince Rupert, the prices paid to Canadian fishermen again show a continued upward trend. The average price calculated on the above basis in 1934 was 5 cents per pound. In 1935 the average was 5.6 cents and in 1936 it was 6.2 cents. Attention is called to the fact that these prices are the unweighted average prices of all Canadian landings in the port of Prince Rupert and should be used only as indicating the trend.

Halibut-livers continue in demand by the pharmaceutical houses as a valuable source of concentrated vitamins. In consequence of the increased demand, prices paid in 1936 were again higher than in the year previous; the price received in 1936 was 45 cents per pound, against 40.75 cents in 1935 and 12 cents in 1932. Halibut-livers have now become a source of considerable revenue to the fishermen, whereas previously they were thrown away. The total amount landed by the Canadian and American fleets in 1936 was 943,000 lb., producing a revenue of $424,350, compared with 1935, when 891,000 lb. were produced, valued at $363,082.

MILD-CURED SALMON.

The market for Canadian mild-cured salmon has during the past few years been most discouraging and, as a result, production figures have declined drastically. Whereas in 1934 the production amounted to 4,447 tierces, in 1935 there were packed 2,775 tierces. Production in 1936 was again curtailed, resulting in a pack of only 1,642 tierces. Five plants operated in 1936, the same number as in 1935.

DRY-SALT SALMON.

In 1936 the production of dry-salt salmon was again controlled by the British Columbia Salt-fish Marketing Board, which is a scheme set up under the Federal Government's " Marketing Act." The Board was composed of members representative of the industry under a chairman appointed by the Deputy Minister of Fisheries, Ottawa, the purpose of regulation being to keep production in line with market demands and thereby secure a reasonable price for the product. On the whole, the results may be considered to have been most beneficial, but a ruling by the Privy Council has since been handed down which is to the effect that the " Marketing Act " was *ultra vires* Federal jurisdiction. This will result no doubt in a return to conditions prevailing in this branch of the industry previous to 1935—unless the operators are able to effect some sort of voluntary control in the light of the experience gained in the past two seasons. The reader is referred to the 1936 report of the British Columbia Salt-fish Board, which is published in the Appendix to this report, covering the operations of the Board regulating dry-salt salmon and herring.

In 1936 there were thirty-one salmon dry-salteries licensed to operate, the same number as in the year previous. These plants produced 8,190 tons of dry-salt salmon, as compared with 8,474 tons in 1935 and 4,675 tons in 1934.

DRY-SALT HERRING.

Dry-salt herring production was again in 1936 under the control of the British Columbia Salt-fish Marketing Board. This branch of the industry is still experiencing difficulties, due largely to the unsettled conditions in China, to which country the product is exported. Production has fallen from a high of over 50,000 tons a few years ago to a low of 14,983 tons in 1935. The records of the Department show that in 1936 there were 16,457 tons produced. British Columbia is capable of supplying a much larger pack without endangering the stocks, but substantial increases in the size of the pack should not be anticipated until conditions in the Orient are materially improved.

There were eighteen herring dry-salteries licensed to operate in 1936, not all of which actually operated.

The reader is referred to the report of the British Columbia Salt-fish Marketing Board, published in the Appendix to this report, for details of the marketing of this product.

FISH OIL AND MEAL.

The production of fish meal and oil in this Province has attained proportions of a major branch of British Columbia's fishing industry. Contrary to general belief, the fish-meal manufactured in British Columbia plants is not used as fertilizer, but is used altogether as a supplementary food for feeding to domestic animals—cattle, hogs, poultry, etc. The oil similarly produced finds a market in various manufacturing industries, largely in making soaps, paints, linoleum products, etc. In recent years, however, a continuously increasing amount is being used to feed poultry and other live stock, for which it is most valuable due to its vitamin content. Plants have been established to refine the raw oil and there is now a continuous supply of guaranteed vitamin-tested oil available.

Pilchard Reduction.—The pilchard-fishery is conducted principally on the west coast of Vancouver Island. This fishery, which was formerly confined largely to the inlets, has now developed into what may properly be called a deep-sea fishery. While some fish are still taken in inside waters when available, a large portion of the catch is taken far out on the open ocean. This change has been brought about by the introduction of new, large, modern vessels equipped with powerful Diesel engines and capable of operating in comparatively rough water. The fishermen, too, have by experience improved their methods in many ways, which has added greatly to the general success of this branch of the industry.

Fishing commenced very spotty, the fish appearing in very small scattered schools, and by September 10th the total production was slightly lower than at this date the year previous, notwithstanding one additional plant operating at this time. Production continued below that of 1935 throughout the season. In addition to lower production of raw fish, the yield of oil per ton was considerably less than usual due to the lean condition of the fish. Pilchards became very hard to locate off the west coast later in the season, but quantities were later caught in the Namu-Bella Bella area. This is the first time that pilchards have been taken in these localities in any quantity.

Eight reduction plants were licensed to operate for pilchards in 1936, one more than in 1935. The total production of meal in 1936 was 8,561 tons, compared with 8,666 tons in 1935. The eight plants produced 1,271,144 imperial gallons of oil in 1936, as against 1,634,592 gallons from seven plants in 1935.

Whale Reduction.—Two whaling-stations were in operation in 1936, whereas only one operated in 1935. A total of 376 whales were captured, compared with 202 in 1935 and 350 in 1934, in which latter year two stations were also operated. The 376 whales produced 332 tons of meal, 687 tons of fertilizer, and 763,740 gallons of oil, compared with 211 tons of meal, 354 tons of fertilizer, and 426,722 gallons of oil in 1935. Of the 376 whales killed in 1936, 311 were sperms.

Herring Reduction.—Herring were permitted to be reduced to meal and oil in 1936 in definitely limited quantities. By agreement with the Federal Minister of Fisheries, the Chief Supervisor of Fisheries for the Federal Government, the director of the Pacific Biological Station, and the Assistant Commissioner of Fisheries for British Columbia were instructed to set catch-limits for the various sub-districts in District No. 3. In the East Coast area the limit was set at 25,000 tons, while for the West Coast area the total allowed was 40,000 tons. The West Coast was divided into sub-districts and allotted catch-limits as follows: Barkley

Sound, 15,000 tons; Clayoquot Sound, including Sydney Inlet, 5,000 tons; Nootka, including Esperanza Inlet, 10,000 tons; Kyuquot, 10,000 tons; Quatsino, 5,000 tons. The catch-limit for Barkley Sound was increased to 20,000 tons later in the season, as it was found that the run of herring to this area was very heavy and that the increase would in no way endanger the future supply.

Herring caught on the East Coast of Vancouver Island are nearly all used in the dry-salt trade; small quantities only find a market for canning and as frozen bait. On the West Coast the only outlet for herring in quantity in recent years is through their reduction to meal and oil. Only two salteries operated in Barkley Sound in 1936 and these operations were very limited.

Considerable activity in herring-fishing was manifest in 1936 in District No. 2 in the vicinity of Namu, Bella Bella, and Ocean Falls areas. This district has never been fished extensively for herring, so that little is known regarding its potentialities. No catch-limits have been placed on fishing in this district, but close observations are being maintained.

Nine plants were licensed to operate in 1936; seven of these were located on the West Coast of Vancouver Island and one at Prince Rupert. The total production of herring-meal in 1936 was 10,340 tons, compared with 5,313 tons by five plants in 1935. Oil produced in 1936 amounted to 786,742 gallons, as against 328,639 gallons in 1935.

Miscellaneous Reduction.—Fish oil and meal is also produced in lesser quantities in several plants operating on other than whales, pilchards, and herring—principally on dogfish and cannery waste. Five plants were licenced to operate in this category in 1936. Total production amounted to 2,857 tons of meal and 356,464 gallons of oil. Six plants operated in 1935, producing 2,226 tons of meal and 260,387 gallons of oil.

CONDITION OF BRITISH COLUMBIA SALMON-SPAWNING GROUNDS.

Owing to the discontinuance by the Department of making personal inspections of the various salmon-spawning areas, we are indebted to Major Motherwell, Chief Supervisor of Dominion Fisheries, who conducted these investigations, for furnishing us a copy of his report. His courtesy in supplying us with these reports is gratefully acknowledged.

Major Motherwell's report on the condition of the British Columbia salmon-spawning grounds will be found in the Appendix to this report.

CONTRIBUTIONS TO THE LIFE-HISTORY OF THE SOCKEYE SALMON (DIGEST).

In the Appendix to this report, Drs. W. A. and Lucy S. Clemens contribute the twenty-second paper on the life-history of the sockeye salmon. They point out that the runs to the four main river systems—namely, the Fraser, Skeena, and Nass Rivers and Rivers Inlet—were relatively good, producing comparatively large packs and good escapements.

The Fraser River Sockeye Run.—The authors refer to the peculiar features in connection with the Fraser River run of 1936—namely, the large size of the pack, the high proportion of the catch in Canadian waters, the large catches in the Johnstone Strait area, and the small catches in the Strait of Juan de Fuca and Washington Sound—but point out that lack of adequate data prevents an adequate explanation of these peculiarities. The sampling was made from fish obtained as usual from the traps at Sooke, but was somewhat smaller than in previous years. The dominant 4_2 age-group comprised 83 per cent. of the sample; the 5_2, 11.7 per cent.; and the 5_3, 4 per cent. The grilse (3_2) were represented by only six individuals, while the sea-types (3_1 and 4_1) were entirely absent. The average size of the fish was large, particularly in respect to weight.

The distribution of the sexes was peculiar, in that the males constituted only 43 per cent. and thereby forming the lowest percentage on record.

Rivers Inlet Sockeye Run.—In connection with the data for Rivers Inlet, Drs. Clemens emphasize the fact that the sampling was inadequate to give a complete picture of the run to this area. Owing to a strike among the fishermen, samples were secured only from July 24th to August 4th, and while the data have been compiled in the usual way, they should be used with caution in making comparisons with other years or with other river systems.

The following points are shown in connection with the run of the twelve-day period: (1) the 4_2 and 5_2 age-groups were approximately equally represented; (2) the 4_2 fish were

small both as to length and weight, while the 5_2 fish were small as to length only; (3) there was a great preponderance of females.

Skeena River Sockeye Run.—The authors refer to the pack of 81,973 cases as a decided improvement over those of recent years and as an apparently reasonable one in view of the reports of good escapements. The run was composed predominately of four-year-old fish (67 per cent.). The lengths and weights of the fish in all the age-groups were above the averages of the past years of record, indicating fish of relatively large size. The females were greatly in excess of the males, constituting 62 per cent.

Nass River Sockeye Run.—Again the Nass River sockeyes have defied prediction and produced an exceptionally good run, which provided a pack of 28,562 cases and apparently a very satisfactory escapement. The 4_2 fish as usual formed the major age-group (67 per cent.). As in the cases of the Fraser and Skeena Rivers, the fish were large, particularly in respect to weight, and the females greatly outnumbered the males.

Concerning the runs of 1937, the authors indicate that for the two southern areas fairly good returns may be expected, but for the two northern rivers the prospects are rather for relatively small returns.

INTERNATIONAL FISHERIES COMMISSION, 1936.

The International Fisheries Commission, established by treaty between Canada and the United States, continued to perform its duties—the investigation of the life-history of the halibut and the investigation and regulation of the fishery.

Canadian representation on the International Fisheries Commission was changed during the year. Dr. John Pease Babcock, Chairman, and Dr. William A. Found, Deputy Minister of Fisheries for Canada, who had served as Commissioners from the formation of the Commission, resigned. The vacancies were filled by the appointment of Mr. George J. Alexander, Assistant to the Commissioner of Fisheries for British Columbia, and Mr. A. J. Whitmore, Chief of the Western Division of the Department of Fisheries of Canada. Mr. Alexander was elected Chairman to succeed Dr. Babcock.

The long and distinguished career of Dr. John Pease Babcock ended with his death at Victoria, B.C., on October 12th. Dr. Babcock was a leading advocate of the rational use of our fishery resources and of scientific research as a means to that end, principles which he consistently applied as Chairman of the Commission. His death is felt as a heavy loss by his many friends and associates in fishery-work.

Fishing regulations for 1936 were altered in several respects from those of the preceding year. The opening of the fishing season was set for March 16th, two weeks later than in 1935. The boundaries of Areas 1 and 4 were changed, so that Area 1 included all waters south of Willipa Harbour and Area 4 the waters of the Aleutian Islands and the Bering Sea. Dory-fishing was prohibited in Areas 1 and 2. The setting of a separate date of closure for the spawning-grounds between Ocean Cape and Cape St. Elias was discontinued and December 1st was set as the date of closure of all grounds not previously closed.

The boundaries of Areas 2 and 3, their catch-limits of 21,700,000 and 24,300,000 lb. respectively, the complete closure of the Masset and Timbered Islet nurseries, the closure of Area 1 at the same time as Area 2, and the closure of Area 4 with which ever of Areas 2 and 3 closed later, were continued as in 1935.

Although the fishing season was opened two weeks later and the voluntary catch-curtailment programme was continued, the catch-limits of both Areas 2 and 3 were attained earlier than in 1935. This was due to the strike which in 1935 delayed the beginning of fishing until about April 1st, to a greater intensity of fishing in both areas, and to a considerable increase in abundance in Area 3 in 1936. Areas 1 and 2 were closed at midnight of August 10th, with catches of approximately 699,000 and 23,336,000 lb. respectively. Area 3 was closed at midnight of November 3rd with a catch of approximately 25,704,000 lb. Area 4, from which no halibut was landed in 1936, was closed at the same time. The catch from Area 3 exceeded the limit for the first time since the inauguration of regulation by limitation of catch.

The close contact with the halibut industry, which has contributed largely to the success of the Commission, was maintained as in previous years. On November 21st meetings with the vessel-owners and fishermen and a public hearing were held in Prince Rupert. On

December 22nd a meeting with the Conference Board, composed of representatives of the fishing fleets at the different ports, was held in Seattle. At the meetings and hearing the purpose and progress of the Commission's investigations and the effects of regulation were explained and the problems of the fleets were discussed.

The scientific investigations of the Commission were continued as required by treaty. They include the current collection and analysis of statistical and biological data and form a system of observation of the changes occurring as a result of regulation and a necessary basis for the continued intelligent control of the fishery.

The investigations reveal that the abundance of fish, as indicated by the catch per unit of gear fished, is 50 per cent. higher in Area 3 and about 70 per cent. higher in Area 2, which includes the banks off the coast of British Columbia, than it was in 1930, the last year of unrestricted fishing. The rate of recovery of the stocks as a result of the present degree of regulation is slackening off. The maximum has apparently not yet been reached, but the annual increase is now at times temporarily overshadowed by the variations in catch due to changes in natural conditions.

The work of following the effects of regulation upon the production of spawn in Area 2 was continued. The materials collected in the net-hauls taken in the vicinity of Cape St. James during the winter of 1935–36 were sorted in the laboratory and new materials were collected in the same region during the winter of 1936–37. Halibut-eggs are still scarce, though their abundance in that region during the winter of 1935–36 was about twice as great as in the preceding winter. An increase in the production of spawn, the first step in the rebuilding of the fishery, is definitely taking place.

The increases in abundance and in the production of spawn to date are due not to an increase in the number of fish entering the fishery, but to the better utilization of the fish already in existence at the time regulation began. The reduction in the rate of removal, due to regulation, has allowed those fish to live longer on the average and to reach a larger size, and has permitted a greater proportion of them to reach maturity before capture.

An increase in the number of young fish is necessary to rebuild the stocks to a higher level of productiveness, the ultimate aim of the Commission. The beginning of such an increase is believed to be imminent and special attention is being devoted to investigations by which the improvement may be detected when it occurs.

Three new scientific reports, Nos. 9, 10, and 11, were published dealing with the following subjects: *Life-history of the halibut.* (2) *Distribution and early life-history,* by William F. Thompson and Richard Van Cleve; *Hydrographic Sections and calculated currents in the Gulf of Alaska, 1929,* by Thomas G. Thompson, George F. McEwen, and Richard Van Cleve; and *Variations on the meristic characters of flounders from the Northeastern Pacific,* by Lawrence D. Townsend. Their contents were outlined in the report for 1935.

A series of non-technical *circulars* were begun by the Commission to inform the fishermen, vessel-owners, and dealers regarding the results of the Commission's investigations and of other matters relating to the halibut and to the regulation of the fishery. Four circulars were issued: *The halibut commission, its legal powers and function,* by Edward W. Allen; *Science and the halibut,* by G. J. Alexander; *The Canadian halibut fleet,* by A. J. Whitmore; and *The American halibut fleet,* by Frank T. Bell. The contents of the first are clearly indicated by its title. The second summarizes the scientific basis on which the regulation of the halibut-fishery rests. Circulars 3 and 4 give the results of studies of the economic effects of regulation upon the halibut fleets of Canada and the United States respectively.

The third circular, *The Canadian halibut fleet,* shows that as a direct result of regulations the halibut live longer and reach a larger size and more valuable grade before capture. The increase in abundance of fish and an increase in the number of boats fishing have reduced the length of the fishing season. In spite of this reduction, the total halibut-catch per boat in the Canadian fleet has increased. The Canadian share of the total landings from both Areas 2 and 3 has increased. Moreover, the shorter season has enabled the vessels to engage in other activities and thereby to supplement their earnings from halibut. The earnings of the Canadian fleet have risen more than general prices from 1932 to 1936, and when halibut prices again reach the pre-depression level the Canadian fleet should be in a much better financial position than formerly.

THE CANADIAN HALIBUT FLEET.

The reader will find in the Appendices of this report a reprint of Circular No. 3 of the International Fisheries Commission. This circular is by A. J. Whitmore, one of the Canadian Commissioners, and points out the remarkable improvement in the halibut banks, particularly in Area 2, and indicates the beneficial effects which this has had on the Canadian fleet.

An examination of the figures quoted shows that the value of halibut landings by the Canadian fleet has risen from a total of $268,655 in 1932 to $745,657 in 1936. It is also pointed out that this increase in revenue has been contributed to by a general recovery in prices, by the increase in the price of halibut-livers, by the increased proportion of first-class fish as a result of regulation, by better prices for the lessened proportion of second-class fish, and by an increase in the total amount landed by the Canadian fleet.

The figures quoted show that the Canadian fleet has increased its share in the total catch from Area 2 from 30 per cent. in 1931 and 1932 at the beginning of regulation to 40 per cent. in the years 1934, 1935, and 1936. It is also shown that the Canadian catch from Area 3 has been doubled; whereas before regulation it took from 600,000 to 700,000 lb., in the last two years it has taken an average of 1,500,000 lb.

The circular points out how the regulations of the International Fisheries Commission have been most beneficial to this fishery, and in particular to the Canadian fleet.

These circulars are published by the Commission and contain brief non-technical accounts of the investigations of the Commission and other matters relating to the halibut and the regulation of its fishery. The circulars are numbered consecutively and appear at irregular intervals.

PILCHARD AND HERRING INVESTIGATION.

The Provincial Department of Fisheries in 1936 again gave financial assistance to the investigation of pilchard and herring which was begun in 1929 as a joint undertaking of the Biological Board of Canada and the Provincial Fisheries Department and which was continued from 1932 by the Biological Board alone. Progress has been made in both investigations, and for each species methods of tagging and recovery have been instituted which have already yielded valuable data and which give indications of providing practical results in the near future. The pilchard-work has been undertaken by Dr. J. L. Hart; Dr. A. L. Tester has been responsible for the general work on herring; and the work in herring-tagging has been done by the two investigators working together.

PILCHARD.

The 1936 pilchard-fishing season was notable in several ways. The catch made off the coast of Vancouver Island was very materially smaller than usual, the deficiency being sufficient to lead to operating losses for some of the operators. On the other hand, a considerable body of fish penetrated beyond the west end of Vancouver Island, with the result that a small but successful reduction operation was carried on at Namu. Many small fish were mixed with the commercial schools; these constituted a major nuisance to the fishermen as they gilled in the nets, making them difficult to lift. The biological causes of these phenomena were investigated by sampling the commercial catch for length and sex during the season.

For the first time since the sampling of the pilchard-catch for length was begun in 1929, the length-frequency distribution shows two definite groups of fish, the appropriate curve having well-marked modes with centres at approximately 193 mm. and 245 mm. for males and 195 mm. and 250 mm. for females, and minima at 213 mm. for males and 218 mm. for females. Fish of the size included in the smaller group in length are an entirely new element in the British Columbia pilchard-fishery, and consequently no forecasts in regard to their future in the pilchard stock can be made. Evidently it is a different year-class or group of year-classes, but it cannot be stated whether its phenomenal appearance is due to the presence in the pilchard stock of this group in unusual abundance, whether its high representation is only relative being due to reduction in the numbers of larger older pilchards, or whether in association with the general northward movement of the pilchard population small southern fish such as occur in California waters entered the area fished by Canadian seiners. Inspection of the mode for larger fish indicates its position as being somewhat lower than during the previous year. This change may be due to differences of technique associated with a change of

investigator, dying-out of the older and larger fish in the population, or the influx of a new group of fish in addition to that represented by the distinct group of small fish.

The average vertebra numbers of fish in the two groups have been determined separately. They have been found to be 50.75 (5) for the group of small fish and 50.60 for the larger fish. This shows that marked year-class variation exists between pilchards in vertebra number.

Indices of availability of pilchards have been prepared from records supplied by the fishing companies and are shown compared with the indices for previous years in the following tabulation:—

	1934.	1935.	1936.
Average season's catch per boat (tons)	2,120	2,170	1,520
Average catch per boat per day (tons)	25.3	27.0	18.6

There is no reasonable doubt but that the decline in availability indicated by these figures is significant. It is believed that the decline is not principally the result of unfavourable weather conditions, and it is accordingly the result of either a sharply reduced abundance of fish or of a change in their summer feeding-grounds, which in turn is probably related to oceanographic conditions.

A preliminary report on the tagging programme for pilchards is included in the Appendix. The report describes the method of using internal tags of magnetic material in the abdominal cavities of the fish and their recovery by the use of electromagnets. The California State Fisheries Laboratory, which is engaged in a similar programme of tagging and recovery, has given full co-operation, and it is interesting to note that already five British Columbia tags have been returned from the California sardine-fishery.

Herring.

The programme of examining representative portions of the herring-catch from different fishing-grounds around Vancouver Island has been continued with the object of determining the changes taking place each year in the length, age, and abundance of the fish, and of investigating the extent to which herring migrate or, conversely, form local populations.

The standard length of the Saltspring Island herring averaged 196.2 mm.—the largest value obtained over a period of seven years. The average length for Barkley Sound was somewhat less—192.5 mm. This value is similar to those obtained in previous years for the same locality. The percentage age compositions in the two regions are as follows:—

Locality.	In Year of Age.							
	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.
Saltspring Island	1.3	39.9	31.5	20.5	1.3	4.2	1.0	0.3
Barkley Sound	2.6	66.0	16.7	13.1	1.3	0.1	0.1	.....

The exceptionally large percentage of fish (27.3) over age IV. accounts for the large average length of the Saltspring Island fish. The percentage of V.'s is the largest encountered in seven years. This year-class (1931) has been considerably above average strength since it entered the fishery as III.'s in 1933–34. Another rich year-class, that of 1929, is relatively well represented as VII.'s in 1935–36. The results suggest that the number of older fish in the catches is tending to increase as a result of the decreased fishing activity during the past three or four years. The exceptionally large percentage of III.'s in the Barkley Sound samples indicates that a year-class (that of 1933) considerably above average strength entered the fishery in force during the past season.

Racial studies on the populations have included a consideration of vertebral count, sex ratio, and rate of growth. As has usually been the case in past years, the total vertebral counts of the same year-classes at Saltspring Island and in Barkley Sound were not significantly different. However, the abdominal count was significantly lower in the former locality (23.096 as compared with 23.262). The percentage of the sexes was also considerably

different in the two localities, males forming 59.9 per cent. at Saltspring Island and 47.3 per cent. in Barkley Sound. On the average the rate of growth of the east-coast fish was slower than that of the west-coast fish. All of the above results confirm those of previous years and prove that the herring of the two localities form essentially distinct populations. Sufficient data are not available as yet for a detailed study of the racial characters of each population.

Daily catch records have been collected and analysed in an effort to estimate the changes which take place in the availability of fish within seasons and between seasons. On the south-east coast of Vancouver Island the fishery was concentrated in Swanson and Satellite Channels. During the 1935–36 season availability was at its height during the fourth week of fishing (October 21st to 26th). The daily catch records indicate that there has been an increase in the three successive seasons 1933–34 to 1935–36, which is possibly related to the trend in age composition noted above. On the west coast of Vancouver Island in 1935–36 herring were found to be more available in Nootka and Kyuquot Sounds than in Barkley Sound, where they were found to be less available than in the two previous years.

Reports on herring spawning made by Dominion Fisheries Inspectors have been analysed, with the result that considerable information has been derived about the places and time of spawning and more especially about the mortality on the spawning-grounds and the intensity of spawning.

A description of the methods and apparatus used and the results obtained in the herring-tagging work is printed in the Appendix. The apparatus described detects the tagged herring by the disturbance caused in a magnetic field by an iron internal tag, and by-passing the tagged individual into a box along with those near it in the chute. Use of this equipment has already demonstrated the instability of schools as units on the fishing-grounds and the existence of a movement of herring from the Strait of Juan de Fuca to the Strait of Georgia in the neighbourhood of Porlier Pass. However, the principal result of the first year's work has been to demonstrate that the methods are applicable to the study of herring movements in Southern British Columbia.

APPENDICES.

CONTRIBUTIONS TO THE LIFE-HISTORY OF THE SOCKEYE SALMON. (No. 22.)

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

INTRODUCTION.

During the year 1936 the runs of sockeye salmon to the four main river systems of British Columbia were very satisfactory. In spite of the limited amount of fishing at Rivers Inlet, the total pack for the four areas was approximately 80,000 cases larger than that of 1935. At the same time the escapements on all four river systems were reported as particularly good.

The run to the Fraser was exceptionally large, resulting in a pack of 244,359 cases, the largest in that cycle since 1912. The small catch in the Strait of Juan de Fuca and in Washington Sound and the large catch in the Johnstone Strait area presented a rather puzzling situation. In the future it would be most desirable to have made available for this report more accurate data on the Johnstone Strait catches.

Owing to a strike of the fishermen in the Rivers Inlet area, fishing was greatly curtailed and a pack of only 46,351 cases was made. As a consequence the escapement was exceptionally good. There was no evidence of overcrowding on the spawning-beds and, unless freshets did a great deal of damage, there should be good returns in 1940 and 1941. As a matter of fact, a reduction in catch of 30,000 cases represents approximately 400,000,000 additional eggs on the spawning-beds, and may mean a very good investment.

The pack on the Skeena River of 81,973 cases indicated a fair run with an apparently satisfactory escapement.

The Nass River had an unexpectedly good return with a pack of 28,562 cases and a very good escapement, in spite of the fact that in 1931 the pack was only 16,929 cases and the spawning-beds were reported as poorly seeded. The pronounced fluctuations in the runs to this river present an interesting problem.

In respect to the fish comprising the runs to the Fraser, Skeena, and Nass Rivers two points are of interest. In the first place, they were of comparatively large size, particularly in weight. In the second place, the percentage of males was exceptionally low.

DESIGNATION OF AGE-GROUPS.

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

- 3_1, 4_1—the "sea-types" or fish which migrate in their first year and mature at the ages of three and four years respectively.
- 3_2—"the grilse," usually males, which migrate in their second year and mature at the age of three.
- 4_2, 5_2—fish which migrate in their second year and mature at the ages of four and five respectively.
- 5_3, 6_3—fish which migrate in their third year and mature at the ages of five and six respectively.
- 6_4, 7_4—fish which migrate in their fourth year and mature at the ages of six and seven respectively.

THE FRASER RIVER SOCKEYE RUN OF 1936.

(1.) General Characteristics.

The total pack of Fraser River sockeye in the season of 1936 amounted to 244,359 cases, of which 184,854 cases were packed in the Province of British Columbia and 59,505 in the State of Washington (Table I.). Included in the latter figure are 16,611 cases of fish caught in British Columbia but packed in the State of Washington. The percentages of the two packs are 75 and 25 respectively.

The run was remarkable in several respects. In the first place, it was unexpectedly large. Not only was the pack the largest in its cycle since 1912, but the escapements to certain areas such as Chilco, Seton-Anderson, Birkenhead, Harrison Lake, Pitt Lake, and Cultus Lake were very good. The reports indicate that comparatively few fish reached the Upper Fraser River at Stuart and Quesnel Lakes and only a small number at Shuswap Lake. In the second place, a very considerable number of sockeye came in through Johnstone Strait. It is well known that some sockeye take this route to the Fraser River each year and the larger catch in 1936 may have been merely a reflection of the greatly increased run of this year.

There has always been difficulty in determining what percentage of the catch in the northern area should be credited to the Fraser River. In this year a special effort has been made to arrive at a reliable figure and 23,153 cases are assigned to the Fraser and are included in its total pack of 244,359 cases. No part of 6,346 cases packed at the Quathiaski cannery are so credited. In the third place, the catch in British Columbia waters was very much in excess of the catch in Washington waters. Whether this was related to the absence of traps in American territory or to a peculiar movement of the fish through the southern waters cannot be discovered.

The run of 1937 will be derived largely from the brood-year of 1933. In that year the pack was 179,069 cases and the escapement was reported as disappointing, except in the Chilco area, where at least 100,000 fish were estimated to have spawned. There are no known factors which would indicate an increased run in 1937.

(2.) Age-groups.

The material for this year's study consists of data and scales from 826 sockeye salmon taken at random from the catch in the traps at Sooke from April 30th to September 17th in twenty-six samplings. The 4_2 age-group is represented by 685 individuals or 83 per cent., the 5_2's by 97 or 11.7 per cent., and the 5_3's by 34 or 4 per cent. The remaining groups are present in small numbers as follows: 6_3's, 4 fish; 3_2's, 6 fish; together constituting about 1 per cent. The 3_1 and 4_1 age-groups, usually represented by a few individuals, are absent this year probably because of the relatively small total sampling. The absence of these two classes and the high percentage of four-year-old fish are the two features of note.

Samplings from 143 sockeye caught in the Johnstone Strait area were obtained at the cannery at Quathiaski. The distribution of the age-groups was as follows: 4_2's, 134 fish or 94 per cent.; 5_2's, 7 or 5 per cent.; 5_3's, 2 or 1 per cent.

(3.) Lengths and Weights.

While the average lengths and weights of the various classes do not show any outstanding features, it may be noted that the fish of the dominant 4_2 age-group are of large size, particularly in respect to weight (Tables V. and VI.).

The average lengths and weights of the Johnstone Strait fish are considerably greater than those of the Sooke fish, as shown in Table VIII. The difference is probably not significant because the northern sampling is relatively small and taken within a rather narrow time period.

(4.) Distribution of the Sexes.

The total number of males in the samplings is 356 and of females 470, being percentages of 43 and 57 respectively. This is the lowest percentage of males on record. In both the 4_2 and 5_2 age-groups the discrepancy is very pronounced. In Table VII. are shown the percentages of the sexes for the past twenty-two years.

Among the Johnstone Strait fish the males formed 45 per cent. and the females 55.

Table I.—Fraser River Packs, 1895–1936, arranged in accordance with the Four-year Cycle.

B.C.	1895—	395,984	1896—	356,984	1897—	860,459	1898—	256,101
Wash.		65,143		72,979		312,048		252,000
Total		461,127		429,963		1,172,507		508,101
B.C.	1899—	480,485	1900—	229,800	1901—	928,669	1902—	293,477
Wash.		499,646		228,704		1,105,096		339,556
Total		980,131		458,504		2,033,765		633,033
B.C.	1903—	204,809	1904—	72,688	1905—	837,489	1906—	183,007
Wash.		167,211		123,419		837,122		182,241
Total		372,020		196,107		1,674,611		365,248
B.C.	1907—	59,815	1908—	74,574	1909—	585,435	1910—	150,432
Wash.		96,974		170,951		1,097,904		248,014
Total		156,789		245,525		1,683,339		398,446
B.C.	1911—	58,487	1912—	123,879	1913—	719,796	1914—	198,183
Wash.		127,761		184,680		1,673,099		335,230
Total		186,248		308,559		2,392,895		533,413
B.C.	1915—	91,130	1916—	32,146	1917—	148,164	1918—	19,697
Wash.		64,584		84,637		411,538		50,723
Total		155,714		116,783		559,702		70,420
B.C.	1919—	38,854	1920—	48,399	1921—	39,631	1922—	51,832
Wash.		64,346		62,654		102,967		48,566
Total		103,200		111,053		142,598		100,398
B.C.	1923—	31,655	1924—	39,743	1925—	35,385	1926—	85,689
Wash.		47,402		69,369		112,023		44,673
Total		79,057		109,112		147,408		130,362
B.C.	1927—	61,393	1928—	29,299	1929—	61,569	1930—	103,692
Wash.		97,594		61,044		111,898		352,194
Total		158,987		90,343		173,467		455,886
B.C.	1931—	40,947	1932—	65,769	1933—	52,465	1934—	139,238
Wash.		87,211		81,188		126,604		352,579
Total		128,158		146,957		179,069		491,817
B.C.	1935—	62,822	1936—	184,854				
Wash.		54,677		59,505*				
Total		117,499		244,359				

* This figure includes 16,611 cases of fish caught in British Columbia waters but packed in the State of Washington.

Table II.—Fraser River Sockeyes, Vancouver Island Traps, Percentages of the Year-classes from 1920 to 1936.

Year.	4_2	5_2	5_3	6_3	3_1	4_1	3_2
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
1923	67.1	10.8	3.9	1.2	6.7	9.9	0.4
1924	68.2	18.7	9.2	0.5	0.5	2.0	0.8
1925	67.9	24.9	3.4	0.2	2.2	.....	0.6
1926	66.1	20.3	5.2	1.6	2.0	2.5	2.1
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
1929	77.3	11.9	7.8	0.4	0.1	0.1	2.5
1930	75.7	19.6	2.8	0.5	0.2	0.7	0.5
1931	79.0	13.1	1.3	.....	2.0	2.0	2.6
1932	80.7	13.5	2.8	.....	0.8	0.8	1.4
1933	83.6	9.2	1.9	.....	1.4	0.5	3.4
1934	84.2	10.7	2.3	.....	0.1	1.2	1.5
1935	71.3	22.9	2.3	0.3	0.4	1.3	1.5
1936	83.0	11.7	4.1	0.5	.....	.....	0.7

Table III.—Fraser River Sockeyes, 1936, Vancouver Island Traps, 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		3_2		
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	
17	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	1
17½	.....	3	.....	.....	.....	.....	.....	.....	1	.....	4
18	7	.....	1	.....	1	.....	.....	.....	1	.....	10
18½	3	6	.....	.....	1	.....	.....	.....	.....	.....	10
19	3	13	.....	.....	.....	.....	.....	.....	2	.....	18
19½	10	5	.....	.....	.....	1	.....	.....	1	.....	17
20	8	12	.....	4	1	1	.....	.....	1	.....	27
20½	2	10	.....	1	.....	1	.....	.....	.....	.....	14
21	5	7	1	.....	.....	.....	.....	.....	.....	.....	13
21½	1	7	1	2	.....	1	.....	.....	.....	.....	12
22	6	8	1	.....	.....	1	.....	.....	.....	.....	16
22½	8	26	.....	2	2	1	.....	.....	.....	.....	39
23	10	51	3	3	2	1	.....	.....	.....	.....	70
23½	28	75	.....	.....	.....	5	.....	.....	.....	.....	108
24	32	64	1	4	1	2	.....	.....	.....	.....	104
24½	45	59	.....	9	1	3	.....	2	.....	.....	119
25	47	35	7	8	4	.....	.....	.....	.....	.....	101
25½	35	10	6	10	1	1	.....	.....	.....	.....	63
26	28	4	7	2	.....	.....	.....	.....	.....	.....	41
26½	7	1	5	5	1	1	.....	.....	.....	.....	20
27	2	.....	3	1	.....	.....	.....	1	.....	.....	7
27½	1	.....	1	.....	.....	.....	.....	.....	.....	.....	2
28	.....	.....	2	.....	.....	.....	1	.....	.....	.....	3
28½	.....	.....	4	.....	.....	.....	.....	.....	.....	.....	4
29	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	2
29½	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
30	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	1
Totals	288	397	46	51	15	19	1	3	6	.....	826
Average lengths	23.9	23.2	25.8	24.3	23.2	23.2	.....	25.3	18.8	.....	.....

Table IV.—Fraser River Sockeyes, 1936, 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_2		
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	
2	.....	3	1	.....	.....	.....	.....	.....	.....	.....	4
2½	7	5	.....	.....	1	.....	.....	.....	3	.....	16
3	17	24	.....	.....	2	.....	.....	.....	1	.....	44
3½	11	13	1	4	.....	2	.....	.....	2	.....	33
4	5	18	.....	3	.....	4	.....	.....	.....	.....	30
4½	11	18	2	.....	1	1	.....	.....	.....	.....	33
5	14	49	3	4	2	2	.....	.....	.....	.....	74
5½	28	51	1	3	3	1	.....	.....	.....	.....	87
6	37	81	3	5	1	5	.....	1	.....	.....	133
6½	26	58	5	4	2	3	.....	.....	.....	.....	98
7	52	45	3	11	2	1	.....	1	.....	.....	115
7½	24	19	6	10	.....	.....	.....	.....	.....	.....	59
8	32	8	3	2	.....	.....	.....	.....	.....	.....	45
8½	14	.....	4	2	.....	.....	.....	1	.....	.....	21
9	8	3	3	1	.....	.....	.....	.....	.....	.....	15
9½	1	2	1	2	1	.....	.....	.....	.....	.....	7
10	.....	.....	5	.....	.....	.....	.....	.....	.....	.....	5
10½	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	1
11	1	.....	1	.....	.....	.....	.....	.....	.....	.....	2
11½	.....	.....	3	.....	.....	.....	.....	.....	.....	.....	3
12	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	1
Totals	288	397	46	51	15	19	1	3	6	.....	826
Average weights	6.3	5.7	7.7	6.5	5.5	5.2	.....	7.2	2.9	.....	.....

Table V.—Fraser River Sockeyes, Vancouver Island Traps, Average Lengths in Inches of Principal Classes from 1920 to 1936.

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.
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
1930	24.4	23.6	26.2	24.6	24.4	23.5	26.7	26.0	22.5	20.7	24.7	23.2
1931	23.4	22.8	25.6	24.6	24.3	24.1	.....	.....	21.5	21.6	25.3	22.5
1932	23.6	22.8	25.3	24.2	24.6	23.2	.....	.....	21.9	21.5	23.0	23.4
1933	23.1	22.7	24.9	24.0	24.0	22.9	27.0	.....	22.5	22.3	24.3	23.8
1934	23.9	23.2	24.2	24.1	23.0	23.0	.....	.....	.....	.....	23.5	22.1
1935	23.8	22.8	26.4	24.9	23.6	22.5	25.5	24.0	22.2	22.2	23.0	23.5
Average lengths	23.7	23.0	25.5	24.4	23.8	23.0	26.0	24.8	22.4	21.7	24.4	23.8
1936	23.9	23.2	25.8	24.3	23.2	23.2	.....	25.3	.....	.....	.....	.....

Table VI.—Fraser River Sockeyes, Vancouver Island Traps, Average Weights in Pounds of Principal Classes from 1922 to 1936.

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.
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
1930	6.9	6.1	7.7	6.7	6.6	6.0	7.7	6.0	5.5	4.2	6.3	5.8
1931	5.8	5.2	7.3	6.5	6.1	6.3	-----	-----	4.5	4.6	7.3	6.0
1932	6.1	5.4	7.3	6.7	6.6	5.4	-----	-----	4.9	4.4	5.7	5.9
1933	5.4	5.0	7.0	6.3	6.0	5.2	8.8	-----	5.1	4.9	6.5	6.1
1934	6.3	5.6	6.5	6.4	5.2	5.1	-----	-----	-----	-----	6.6	5.1
1935	6.0	5.2	8.6	7.1	6.2	5.0	6.0	6.0	5.2	5.5	5.0	5.6
Average weights	6.1	5.4	7.3	6.5	6.0	5.4	7.6	6.3	5.6	4.9	7.0	6.2
1936	6.3	5.7	7.7	6.5	5.5	5.2	-----	7.2	-----	-----	-----	-----

Table VII.—Fraser River Sockeyes, Percentages of Males and Females of the 4_2, 5_2, and 5_3 Age-groups, 1915 to 1936.

Year.	4_2		5_2		5_3		Per Cent. Total Males.	Per Cent. Total Females.
	M.	F.	M.	F.	M.	F.		
1915	55	45	57	43	53	47	54	46
1916	49	51	50	50	38	62	51	49
1917	50	50	50	50	49	51	50	50
1918	51	49	56	44	57	43	52	48
1919	53	47	53	47	48	52	52	48
1920	50	50	47	53	47	53	49	51
1921	48	52	42	58	43	57	47	53
1922	49	51	52	48	46	54	53	47
1923	51	49	55	45	46	54	50	50
1924	51	49	50	50	47	53	51	49
1925	46	54	53	47	43	57	49	51
1926	52	48	48	52	50	50	51	49
1927	48	52	58	42	41	59	48	52
1928	53	47	64	36	66	34	56	44
1929	46	54	55	45	50	50	49	51
1930	42	58	55	45	44	56	45	55
1931	47	53	56	44	42	58	48	52
1932	44	56	58	42	30	70	46	54
1933	49	51	50	50	47	53	51	49
1934	54	46	56	44	46	54	55	45
1935	48	52	52	48	35	65	48	52
1936	42	58	47	53	44	56	43	57
Average	49	51	53	47	46	54	50	50

Table VIII.—Comparison of Lengths and Weights of Sockeyes taken in 1936 at Sooke and in the Quathiaski Area.

	Sooke.			Quathiaski.		
	Number.	Ave. in Inches.	Ave. in Pounds.	Number.	Ave. in Inches.	Ave. in Pounds.
4_2	M. 288	23.9	6.3	M. 62	25.0	7.3
	F. 397	23.2	5.7	F. 72	24.1	6.5
5_2	M. 46	25.8	7.7	M. 2	27.3	8.5
	F. 51	24.3	6.5	F. 5	25.9	7.7
5_3	M. 15	23.2	5.5	M. 1	26.0	7.5
	F. 19	23.2	5.2	F. 1	25.0	7.0

2. THE RIVERS INLET SOCKEYE RUN OF 1936.

(1.) General Characteristics.

The sampling of the run of sockeye to Rivers Inlet was entirely inadequate in 1936 because of a strike among the fishermen. Data and scales were obtained from only 996 fish in eight samplings from July 24th to August 4th, inclusive. Only 46,351 cases were packed. Correspondingly the escapement was large, but during the autumn a freshet occurred over the whole area and the officers of the Dominion Department of Fisheries are of the opinion that possibly considerable damage was done to the spawning-beds.

It does not seem of value at this time to attempt to compare cycle-years as to packs or percentages of age-groups, but it is interesting to recall that the cycle-years 1910–15–20–25–30–35 have consistently produced large packs, over 100,000 cases. Other years have produced medium-sized packs, 60,000 to 100,000 cases, with an occasional small pack (as low as 45,000 cases).

The years 1932 and 1933 will be the brood-years for the run of 1937. The packs in these years were 69,732 and 83,507 cases respectively. In the former year the escapement was apparently not very satisfactory and the spawning-beds probably damaged by freshets. In the latter year the spawning-beds were reported to have been heavily seeded. On the basis of the above there would seem to be grounds for expecting a medium-sized run in 1937.

(2.) Age-groups.

As stated previously, the sampling was curtailed. Size and sex data were obtained from 996 individuals taken in eight random samplings from July 24th to August 4th. The data from this limited material are presented in the usual way, but comparisons should be made with some reservations. The 4_2 age-group was slightly more abundant than the 5_2, being represented by 524 individuals or 53 per cent.; the 5_2 group by 462 or 46 per cent.; the 5_3 by 10 or 1 per cent. The 6_3 age-group was unrepresented this year. As may be seen in Table IX., the percentages of the two dominant age-groups, 4_2 and 5_2, have varied a great deal over the period of record, and the present proportions are apparently not of unusual significance.

(3.) Lengths and Weights.

The length and weight statistics are presented in Tables X. and XI. and the comparative average sizes over a period of years in Tables XII. and XIII. The lengths of the fish in the sample are exceptionally small; in fact, the smallest on record. Both the males and females of the 4_2 age-group were an inch and a half less than the averages of the past twenty-three years. In the 5_2 age-group the differences are not quite so great, but even so the females strike a new low record.

The average weight data present some unusual features, in that the 4_2 females show the lowest average weight on record and the 5_2 males the highest.

The males of both the 4_2 and 5_2 classes were apparently short but relatively plump.

(4.) Distribution of the Sexes.

During the short period of sampling there was a marked preponderance of females (Table XIV.). In past years, when the sampling was carried out throughout the fishing season, the males of the 4_2 age-group have always outnumbered the females, but the limited data of this year show a percentage of 43 for the males as compared with a usual average of 65.

Even in the 5_2 age-group, where the males have always been in the minority, they form only 20 per cent. as contrasted with a usual average of 36.

As shown in the data presented for 1935, the males are more abundant in the early part of the season and there is no doubt that the peculiarities in the data of 1936 are the result of the late and limited sampling.

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

Year.	Percentage of Individuals.			
	4_2	5_2	5_3	6_3
1907 (87,874 cases)	---	---	---	---
1908 (64,652 cases)	---	---	---	---
1909 (89,027 cases)	---	---	---	---
1910 (126,921 cases)	---	---	---	---
1911 (88,763 cases)	---	---	---	---
1912 (112,884 cases)	21	79	---	---
1913 (61,745 cases)	80	20	---	---
1914 (89,890 cases)	35	65	---	---
1915 (130,350 cases)	13	87	---	---
1916 (44,936 cases)	26	74	---	---
1917 (61,195 cases)	39	61	---	---
1918 (53,401 cases)	57	43	---	---
1919 (56,258 cases)	46	54	---	---
1920 (121,254 cases)	5	95	---	---
1921 (46,300 cases)	49	51	---	---
1922 (60,700 cases)	81	18	1	---
1923 (107,174 cases)	74	24	2	---
1924 (94,891 cases)	43	54	2	1
1925 (159,554 cases)	23	77	---	---
1926 (65,581 cases)	59	38	2	1
1927 (64,461 cases)	81	16	3	---
1928 (60,044 cases)	55	40	4	1
1929 (70,260 cases)	77	18	3	2
1930 (119,170 cases)	49	48	2	1
1931 (76,428 cases)	53	44	2	1
1932 (69,732 cases)	67	27	5	1
1933 (83,507 cases)	44	55	1	---
1934 (76,923 cases)	77	20	2	1
1935 (135,038 cases)	57	41	1	1
1936 (45,351 cases)	53	46	1	---

Table X.—Rivers Inlet Sockeyes, 1936, 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.	
17	1	-----	-----	-----	-----	-----	-----	-----	1
17½	-----	-----	-----	-----	-----	-----	-----	-----	-----
18	-----	-----	-----	-----	-----	-----	-----	-----	-----
18½	2	-----	-----	-----	-----	-----	-----	-----	2
19	12	6	-----	-----	-----	-----	-----	-----	18
19½	19	18	-----	-----	-----	-----	-----	-----	37
20	38	55	-----	5	-----	-----	-----	-----	98
20½	28	49	1	4	1	2	-----	-----	85
21	36	122	1	12	-----	4	-----	-----	175
21½	27	25	1	12	1	-----	-----	-----	66
22	29	10	1	27	1	1	-----	-----	69
22½	12	9	5	23	-----	-----	-----	-----	49
23	12	2	9	80	-----	-----	-----	-----	103
23½	3	2	6	60	-----	-----	-----	-----	71
24	5	-----	14	62	-----	-----	-----	-----	81
24½	-----	-----	8	32	-----	-----	-----	-----	40
25	1	-----	14	37	-----	-----	-----	-----	52
25½	-----	-----	7	11	-----	-----	-----	-----	18
26	-----	1	11	5	-----	-----	-----	-----	17
26½	-----	-----	5	1	-----	-----	-----	-----	6
27	-----	-----	4	-----	-----	-----	-----	-----	4
27½	-----	-----	4	-----	-----	-----	-----	-----	4
Totals	225	299	91	371	3	7	-----	-----	996
Ave. lengths	21.0	20.9	24.6	23.4	21.3	21.0	-----	-----	-----

Table XI.—Rivers Inlet Sockeyes, 1936, 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.	
2½	1	-----	-----	-----	-----	-----	-----	-----	1
3	4	6	-----	1	-----	-----	-----	-----	11
3½	12	22	-----	1	-----	-----	-----	-----	35
4	36	40	-----	4	-----	1	-----	-----	81
4½	57	94	-----	8	-----	4	-----	-----	163
5	39	69	3	26	1	1	-----	-----	139
5½	31	42	1	35	1	-----	-----	-----	110
6	24	20	6	54	1	1	-----	-----	106
6½	14	3	13	56	-----	-----	-----	-----	86
7	3	2	9	69	-----	-----	-----	-----	83
7½	3	1	17	50	-----	-----	-----	-----	71
8	1	-----	12	33	-----	-----	-----	-----	46
8½	-----	-----	3	16	-----	-----	-----	-----	19
9	-----	-----	6	11	-----	-----	-----	-----	17
9½	-----	-----	5	6	-----	-----	-----	-----	11
10	-----	-----	5	1	-----	-----	-----	-----	6
10½	-----	-----	7	-----	-----	-----	-----	-----	7
11	-----	-----	3	-----	-----	-----	-----	-----	3
11½	-----	-----	1	-----	-----	-----	-----	-----	1
Totals	225	299	91	371	3	7	-----	-----	996
Ave. weights	4.9	4.1	7.9	6.7	5.5	4.7	-----	-----	-----

Table XII.—Rivers Inlet Sockeyes, Average Length in Inches of the 4_2 and 5_2 Groups, 1912 to 1936.

Year.	Four-year Males.	Four-year Females.	Five-year Males.	Five-year Females.
1912	23.2	22.8	25.8	24.6
1913	22.9	23.0	25.9	25.2
1914	23.0	22.8	25.9	25.2
1915	22.9	22.8	26.0	25.1
1916	22.9	22.8	25.8	25.0
1917	22.5	22.3	25.0	24.4
1918	22.3	22.5	24.9	24.5
1919	22.4	22.3	24.8	24.4
1920	.....	.....	26.0	25.0
1921	22.9	22.6	25.2	24.2
1922	22.5	22.4	24.6	24.2
1923	22.4	22.3	24.6	24.1
1924	22.3	22.3	24.9	24.3
1925	22.2	22.2	25.5	24.8
1926	22.8	22.9	25.1	24.6
1927	22.1	22.4	24.6	24.2
1928	22.3	22.8	26.1	25.2
1929	22.6	22.2	25.2	25.3
1930	22.7	22.6	26.0	25.2
1931	21.9	22.0	25.2	24.8
1932	22.4	22.4	25.2	24.6
1933	22.1	22.0	25.5	24.7
1934	22.4	22.2	25.6	25.0
1935	22.4	22.4	25.8	25.1
Average lengths	22.5	22.4	25.4	24.7
1936	21.0	20.9	24.6	23.4

Table XIII.—Rivers Inlet Sockeyes, Average Weight in Pounds of the 4_2 and 5_2 Groups, 1914 to 1936.

Year.	Four-year Males.	Four-year Females.	Five-year Males.	Five-year Females.
1914	5.4	5.2	7.3	6.8
1915	5.3	5.1	7.3	6.6
1916	5.5	5.0	7.6	6.7
1917	5.0	4.9	6.6	6.2
1918	4.9	5.1	6.7	6.7
1919	4.9	4.8	6.3	5.9
1921	5.2	4.9	6.9	6.0
1922	6.0	5.9	7.4	7.0
1923	5.0	4.8	6.5	5.9
1924	4.9	4.8	6.6	6.1
1925	4.6	4.4	6.9	6.2
1926	5.2	5.2	6.9	6.3
1927	5.3	5.8	7.3	7.6
1928	4.8	5.0	7.5	6.7
1929	5.0	4.8	6.6	6.7
1930	4.9	4.8	7.5	6.9
1931	4.5	4.6	6.7	6.4
1932	4.7	4.7	6.5	6.5
1933	4.8	4.6	7.3	6.6
1934	4.9	4.6	7.3	6.7
1935	4.5	4.3	6.9	6.1
Average weights	5.0	4.9	7.0	6.5
1936	4.9	4.1	7.9	6.7

Table XIV.—Rivers Inlet Sockeyes, Percentages of Males and Females of the 4_2 and 5_2 Age-groups, 1915 to 1936.

Year.	4_2		5_2		Per Cent. Total Males.	Per Cent. Total Females.
	M.	F.	M.	F.		
1915	----	----	----	----	45	55
1916	65	35	43	57	49	51
1917	63	37	39	61	48	52
1918	79	21	49	51	66	34
1919	77	23	41	59	58	42
1920	74	26	48	52	49	51
1921	63	37	40	60	51	49
1922	66	34	38	62	61	39
1923	71	29	31	69	62	38
1924	74	26	31	69	50	50
1925	66	34	34	66	41	59
1926	63	37	32	68	51	49
1927	68	32	36	64	62	38
1928	63	37	30	70	50	50
1929	57	43	36	64	53	47
1930	56	44	37	63	47	53
1931	59	41	33	67	47	53
1932	54	46	28	72	47	53
1933	56	44	32	68	42	58
1934	55	45	27	73	49	51
1935	63	37	39	61	53	47
1936	43	57	20	80	32	68
Average	63	37	35	65	51	49

3. THE SKEENA RIVER SOCKEYE RUN OF 1936.

(1.) General Characteristics.

The pack on the Skeena River amounted to 81,973 cases, which was a decided improvement over those of recent years (Table XV.).

The reports from the spawning-beds indicate good escapements both to the Lakelse and the Babine areas, with excellent conditions for spawning and incubation. It may be noted that the fishing boundary was lowered on the river in order to secure the escapement of a larger percentage of the run, and this action apparently had the desired result.

The run of 1937 will be the product of the spawnings of 1932 and 1933. In the former year the pack was 59,916 cases, with a fair escapement in the Babine area and a good one at Lakelse, but with the possibility of freshets doing considerable damage. In the latter year the pack was 30,506 and the escapement was reported as fair. The above data would seem to indicate a relatively small return and that the catch should be on a conservative basis.

(2.) Age-groups.

Scales and length, weight and sex data were obtained from 2,070 fish from June 29th to August 21st in nineteen random samplings. The 4_2 age-group is represented by 1,393 fish or 67 per cent.; the 5_2's by 414 or 20 per cent.; the 5_3's by 215 or 11 per cent.; and the 6_3's by 48 or 2 per cent. The run is thus composed predominately of four-year-old fish, but the percentage of occurrence of this or the other three age-groups is not exceptional (Table XV.).

In addition to the above and not recorded in the calculations, there are four individuals of the 3_2 age-group averaging 17 inches and 2½ lb. The dates are July 31st, August 14th, 17th, and 19th.

(3.) Lengths and Weights.

The length and weight data are presented in Tables XVI., XVII., XVIII., and XIX. In all cases, in both lengths and weights, the averages are slightly above the gross averages of the past years of record, and while not exceptional they indicate fish of relatively large size.

(4.) Proportions of the Sexes.

The total number of males in the samplings is 792 and of females 1,278, percentages of 38 and 62 respectively. The females greatly outnumber the males in the 4_2, 5_2, and 5_3 age-groups, but are slightly in the minority in the 6_3's. Not since the year 1920 has there been such a small proportion of males (Table XX.).

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

Year.	Percentage of Individuals.			
	4_2	5_2	5_3	6_3
1907 (108,413 cases)	----	----	----	----
1908 (139,846 cases)	----	----	----	----
1909 (87,901 cases)	----	----	----	----
1910 (187,246 cases)	----	----	----	----
1911 (131,066 cases)	----	----	----	----
1912 (92,498 cases)	57	43	----	----
1913 (52,927 cases)	50	50	----	----
1914 (130,166 cases)	25	75	----	----
1915 (116,553 cases)	36	64	----	----
1916 (60,923 cases)	34	38	13	18
1917 (65,760 cases)	57	29	9	5
1918 (123,322 cases)	51	34	9	6
1919 (184,945 cases)	27	60	9	4
1920 (90,869 cases)	15	71	6	8
1921 (41,018 cases)	69	22	6	3
1922 (96,277 cases)	70	16	12	2
1923 (131,731 cases)	56	29	8	7
1924 (144,747 cases)	23	69	7	1
1925 (77,784 cases)	51	45	3	1
1926 (82,360 cases)	62	26	9	3
1927 (83,996 cases)	62	28	9	1
1928 (34,559 cases)	51	39	7	3
1929 (78,017 cases)	62	30	6	2
1930 (132,372 cases)	39	52	8	1
1931 (93,023 cases)	40	30	28	2
1932 (59,916 cases)	44	37	7	12
1933 (30,506 cases)	57	36	5	2
1934 (54,558 cases)	58	34	7	1
1935 (52,879 cases)	49	31	18	2
1936 (81,973 cases)	67	20	11	2

Table XVI.—Skeena River Sockeyes, 1936, 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	1	-----	-----	-----	-----	-----	-----	-----	1
20	-----	1	-----	-----	-----	-----	-----	-----	1
20½	6	4	-----	-----	-----	1	-----	-----	11
21	11	13	-----	-----	-----	1	-----	-----	25
21½	16	30	-----	-----	-----	3	-----	-----	49
22	27	74	-----	2	3	9	-----	1	116
22½	33	128	-----	3	1	17	1	-----	183
23	51	211	4	3	8	19	-----	-----	296
23½	78	175	2	18	15	33	-----	-----	321
24	117	137	4	31	13	17	-----	5	324
24½	83	67	17	35	13	19	2	5	241
25	65	17	19	46	13	4	1	5	170
25½	30	3	16	34	7	2	5	2	99
26	10	2	29	51	7	4	5	-----	108
26½	3	-----	14	22	1	3	3	1	47
27	-----	-----	15	13	2	-----	4	1	35
27½	-----	-----	16	2	-----	-----	3	-----	21
28	-----	-----	9	1	-----	-----	2	1	13
28½	-----	-----	5	2	-----	-----	-----	-----	7
29	-----	-----	1	-----	-----	-----	-----	-----	1
29½	-----	-----	-----	-----	-----	-----	-----	-----	-----
30	-----	-----	-----	-----	-----	-----	1	-----	1
Totals	531	862	151	263	83	132	27	21	2,070
Ave. lengths	23.8	23.2	26.0	25.2	24.4	23.5	26.3	25.0	-----

Table XVII.—Skeena River Sockeyes, 1936, 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	2	1	-----	-----	-----	1	-----	-----	4
3½	13	10	-----	-----	-----	-----	-----	-----	23
4	25	51	-----	1	1	6	-----	-----	84
4½	48	173	2	4	5	19	1	1	253
5	72	268	5	19	7	26	-----	-----	397
5½	124	201	10	39	21	30	-----	4	429
6	112	111	14	37	12	28	3	10	327
6½	73	34	24	50	15	8	2	3	209
7	50	11	19	44	14	8	7	-----	153
7½	8	1	20	34	4	5	5	1	78
8	4	1	19	26	4	1	2	2	59
8½	-----	-----	15	6	-----	-----	5	-----	26
9	-----	-----	10	1	-----	-----	2	-----	13
9½	-----	-----	7	2	-----	-----	-----	-----	9
10	-----	-----	5	-----	-----	-----	-----	-----	5
10½	-----	-----	1	-----	-----	-----	-----	-----	1
Totals	531	862	151	263	83	132	27	21	2,070
Ave. weights	5.6	5.2	7.3	6.6	6.1	5.5	7.4	6.2	-----

Table XVIII.—Skeena River Sockeyes, Average Lengths in Inches of Principal Age-groups, 1912 to 1936.

Year.	4_2		5_2		5_3		6_3	
	M.	F.	M.	F.	M.	F.	M.	F.
1912	24.6	23.5	26.4	25.2	-----	-----	-----	-----
1913	23.5	22.9	25.5	24.7	-----	-----	-----	-----
1914	24.2	23.4	26.2	25.1	-----	-----	-----	-----
1915	24.2	23.5	25.9	25.0	24.5	23.4	25.6	24.4
1916	23.9	23.6	26.2	25.0	24.1	23.8	26.2	24.8
1917	23.6	23.2	25.5	24.7	23.9	23.8	25.4	25.0
1918	24.1	23.3	25.9	25.0	23.9	23.4	25.2	24.7
1919	24.3	23.4	25.7	24.8	24.3	23.4	25.8	24.7
1920	23.8	23.2	26.2	25.3	24.1	23.4	26.2	25.1
1921	23.8	23.1	25.2	24.2	24.2	23.4	24.9	24.2
1922	23.6	23.2	25.3	24.4	23.8	23.3	24.6	24.1
1923	23.7	23.1	25.5	24.5	23.9	23.2	25.6	24.4
1924	24.1	23.3	26.2	25.2	24.7	23.6	25.8	24.8
1925	23.6	22.8	25.6	24.7	24.1	23.3	25.8	24.8
1926	23.8	23.4	25.6	24.8	24.6	23.8	26.0	25.0
1927	23.9	23.3	25.7	24.8	24.1	23.5	25.2	24.9
1928	23.3	22.8	25.3	24.7	23.5	22.8	25.6	24.7
1929	22.9	22.7	25.5	24.7	23.8	22.8	25.5	24.3
1930	23.1	22.7	24.7	23.9	23.5	22.4	24.6	23.2
1931	23.5	23.1	25.7	24.8	23.8	23.1	25.8	24.7
1932	23.4	22.7	25.2	24.4	24.1	22.8	25.4	24.4
1933	23.2	22.8	26.1	25.2	24.3	23.4	26.4	25.3
1934	23.8	23.2	26.3	25.2	25.2	24.1	26.0	24.9
1935	23.1	22.9	26.3	25.2	23.6	22.8	26.2	25.1
Average lengths	23.7	23.1	25.7	24.8	24.1	23.3	25.6	24.6
1936	23.8	23.2	26.0	25.2	24.4	23.5	26.3	25.0

Table XIX.—Skeena River Sockeyes, Average Weights in Pounds of Principal Age-groups, 1914 to 1936.

Year.	4_2		5_2		5_3		6_3	
	M.	F.	M.	F.	M.	F.	M.	F.
1914	5.9	5.3	7.2	6.3	-----	-----	-----	-----
1915	5.7	5.2	6.8	6.2	5.9	5.2	6.6	6.0
1916	5.4	5.1	7.1	6.3	5.8	5.4	7.1	5.9
1917	5.3	5.0	6.4	6.0	5.5	5.2	6.3	5.8
1918	5.8	5.3	6.9	6.4	5.7	5.3	6.6	6.1
1919	6.1	5.5	7.0	6.2	6.1	5.4	6.9	6.3
1920	5.6	5.1	7.2	6.4	6.3	5.1	7.3	6.3
1921	5.7	5.1	6.4	5.7	5.8	5.1	6.0	5.6
1922	5.4	5.1	6.5	5.7	5.5	5.1	6.2	5.7
1923	5.3	4.9	6.3	5.7	5.3	4.8	6.3	5.4
1924	5.6	5.0	7.0	6.3	5.9	5.1	6.6	5.8
1925	5.1	4.7	6.5	5.8	5.5	4.9	6.9	5.4
1926	5.3	5.1	6.5	5.8	5.9	5.2	6.9	6.2
1927	5.4	5.1	6.5	5.9	5.4	5.0	6.0	5.8
1928	5.0	4.6	6.4	5.8	5.0	4.6	6.5	5.8
1929	4.9	4.7	6.8	6.2	5.6	4.9	6.8	5.7
1930	5.4	5.1	6.7	6.0	5.6	5.0	6.8	5.8
1931	5.4	5.1	6.8	6.3	5.5	5.0	6.9	6.0
1932	5.4	4.9	6.9	6.1	6.0	5.0	6.8	5.9
1933	4.9	4.7	7.1	6.3	5.7	5.0	7.1	6.3
1934	5.7	5.2	7.7	6.6	6.7	5.8	7.7	6.2
1935	5.1	4.9	7.4	6.5	5.5	4.7	7.2	6.4
Average weights	5.4	5.0	6.8	6.1	5.7	5.1	6.8	5.9
1936	5.6	5.2	7.3	6.6	6.1	5.5	7.4	6.2

Table XX.—Skeena River Sockeyes, Percentages of Males and Females of the 4_2 and 5_2 Age-groups, 1915 to 1936.

Year.	4_2		5_2		Per Cent. Total Males.	Per Cent. Total Females.
	M.	F.	M.	F.		
1915	56	44	45	55	49	51
1916	70	30	43	57	55	45
1917	66	34	48	52	60	40
1918	63	37	46	54	57	43
1919	53	47	46	54	49	51
1920	41	59	37	63	38	62
1921	44	56	44	56	45	55
1922	52	48	41	59	50	50
1923	60	40	37	63	52	48
1924	50	50	43	57	45	55
1925	57	43	42	58	50	50
1926	40	60	43	57	42	58
1927	45	55	41	59	44	56
1928	48	52	45	55	46	54
1929	50	50	46	54	50	50
1930	47	53	56	44	53	47
1931	43	57	39	61	44	56
1932	47	53	63	37	54	46
1933	48	52	40	60	45	55
1934	42	58	33	67	39	61
1935	41	59	32	68	40	60
1936	38	62	36	64	39	61
Average	50	50	43	57	48	52

4. THE NASS RIVER SOCKEYE RUN OF 1936.

(1.) General Characteristics.

The run to the Nass River was exceptionally good. Not only was a pack of 28,562 cases put up, but the escapement was reported to have been very good. It may be recorded here that the fishing boundary in the river was lowered by 6 miles in order to provide for increased escapements (Table XXI.).

The brood-year for 1937 is 1932. In that year the pack amounted to 14,154 cases and the escapement to Meziadin Lake was reported to have been satisfactory. A small return in 1937 would seem to be indicated, but in view of the vagaries of the runs to the Nass River it is inadvisable to attempt a prediction.

(2.) Age-groups.

The analysis of the run is based on data for 1,447 fish collected in thirteen random samples between July 1st and August 14th. As usual, the 5_3's constitute the major group with 972 fish or 67 per cent. The 4_2's are represented by 230 individuals or 16 per cent.; the 5_2's by 96 or 7 per cent.; and the 6_3's by 149 or 10 per cent. The distribution of these age-groups does not present any unusual features, except that the 6_3's are somewhat better represented than they have been during the past nine years (Table XXI.), As in recent years, representatives of the sea-type classes do not appear.

In addition, there are three fish not included in the calculations, as follows:—

6_2, female, 27 inches, 7½ lb.
6_4, female, 26 inches, 6½ lb.
7_3, male, 30 inches, 10 lb.

(3.) Lengths and Weights.

For the most part, the fish of 1936 maintain the large average size of recent years. All the average length and weight measurements are above the averages of the past twenty-four and twenty-two years (Tables XXII., XXIII., XXIV., and XXV.).

The Fishery Inspector in his report states: "For some reason, the fish appeared to be deeper and of more girth but not as long this year." These observations tend to be confirmed by the data of Tables XXIV. and XXV. It will be noted that while the fish of 1936 are not significantly longer than those of 1935, they are definitely heavier. Such increase in weight might well be shown by increase in depth and girth.

It may be of interest to again point out: (1) That the average size of the Nass River sockeyes in all the age-groups is considerably greater than those of the Skeena River, Rivers Inlet, and the Fraser River in the corresponding age-groups; (2) that the 5_3's reach as large a size as the 5_2's, whereas the 5_3's of the Skeena and Fraser Rivers are approximately the size of the 4_2's; in other words, the 5_3's of the Nass do not lose a year's growth by reason of spending two years in fresh water as seems to be the case of the 5_3's in the Skeena and Fraser. The following average length data illustrate these points:—

	4_2		5_2		5_3	
	M.	F.	M.	F.	M.	F.
Nass River	24.5	23.7	26.2	25.2	26.2	25.3
Skeena River	23.7	23.1	25.7	24.8	24.1	23.3
Rivers Inlet	22.5	22.4	25.4	24.7	.....	.....
Fraser River	23.7	23.0	25.5	24.4	23.8	23.0

(4.) Proportions of the Sexes.

Except in the 6_3 age-group, the males are much outnumbered by the females. Reference to Table XXVI. shows that the percentages in the various classes are much like those of 1935, except in the case of the 6_3's, where the proportions of the sexes were equal. As stated in previous reports, it is believed that the shortage of males is in part associated with early maturity, with the result that the smaller males pass through the nets.

(5.) The Meziadin and Bowser Sockeye Colonies.

Although some data were collected from the Upper Nass River, it does not seem of particular value to continue the presentation of their analyses. A summary of the information up to and including the year 1935 was given in the report of last year.

Table XXI.—Nass River Sockeyes, Percentages of Principal Age-groups from 1912 to 1936, and Packs.

Year.	Percentage of Individuals that spent			
	One Year in Lake.		Two Years in Lake.	
	Four Years old.	Five Years old.	Five Years old.	Six Years old.
1912 (36,037 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
1930 (26,405 cases)	28	15	54	3
1931 (16,929 cases)	10	17	67	6
1932 (14,154 cases)	28	4	61	7
1933 (9,757 cases)	35	7	55	3
1934 (36,242 cases)	13	9	74	4
1935 (12,712 cases)	11	10	73	6
1936 (28,562 cases)	16	7	67	10

Table XXII.—Nass River Sockeyes, 1936, 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.	
20½	1	.....	.....	.....	.....	.....	.....	.....	1
21½	1	.....	.....	.....	.....	.....	.....	.....	1
22	1	2	1	.....	.....	.....	.....	.....	4
22½	2	6	.....	.....	.....	.....	.....	.....	8
23	3	11	.....	1	2	5	.....	.....	22
23½	3	22	.....	1	2	7	.....	.....	35
24	9	44	.....	4	2	31	.....	.....	90
24½	15	15	.....	3	10	38	.....	2	83
25	26	20	2	10	30	116	1	4	209
25½	18	8	2	10	34	77	.....	1	150
26	7	5	7	15	63	144	1	12	254
26½	10	.....	3	7	59	69	5	6	159
27	1	.....	9	6	105	58	5	11	195
27½	.....	.....	2	2	52	6	5	11	78
28	.....	.....	4	3	40	4	19	16	86
28½	.....	.....	.....	.....	10	.....	12	5	27
29	.....	.....	2	.....	8	.....	16	4	30
29½	.....	.....	1	.....	.....	.....	5	1	7
30	.....	.....	1	.....	.....	.....	7	.....	8
Totals	97	133	34	62	417	555	76	73	1,447
Average lengths	24.9	24.1	26.8	25.8	26.6	25.6	28.3	27.1	.....

Table XXIII.—Nass River Sockeyes, 1936, 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.	
3½	1	-----	1	-----	-----	-----	-----	-----	2
4	1	-----	-----	-----	-----	-----	-----	-----	1
4½	2	4	-----	1	1	1	-----	-----	9
5	3	27	-----	2	3	12	-----	-----	47
5½	7	40	-----	1	3	42	-----	4	97
6	17	36	3	6	16	108	-----	4	190
6½	29	20	2	10	46	129	2	8	246
7	21	3	5	18	77	123	2	11	260
7½	9	2	4	8	80	103	5	20	231
8	5	-----	6	10	92	29	11	11	164
8½	2	-----	7	5	68	8	19	9	118
9	-----	-----	2	1	21	-----	16	2	42
9½	-----	1	2	-----	7	-----	13	3	26
10	-----	-----	-----	-----	3	-----	4	1	8
10½	-----	-----	2	-----	-----	-----	4	-----	6
Totals	97	133	34	62	417	555	76	73	1,447
Average weights	6.5	5.7	7.8	7.1	7.6	6.7	8.7	7.5	-----

Table XXIV.—Nass River Sockeyes, Average Lengths in Inches of Principal Classes from 1912 to 1936.

Year.	4_2		5_2		5_3		6_3	
	M.	F.	M.	F.	M.	F.	M.	F.
1912	24.6	23.3	26.5	25.1	26.2	25.4	27.0	25.6
1913	24.1	23.5	25.6	24.8	26.0	25.2	26.0	26.6
1914	24.6	22.7	26.1	25.1	26.3	25.5	26.9	25.6
1915	24.0	23.5	25.9	25.2	26.5	25.9	26.6	25.3
1916	24.5	23.3	26.4	25.0	26.5	25.6	27.9	25.7
1917	23.4	23.2	25.5	24.7	25.3	24.7	26.5	25.5
1918	25.0	24.3	25.7	24.7	25.9	25.0	27.2	25.2
1919	24.9	24.1	26.2	25.2	26.5	25.8	27.9	26.7
1920	24.0	23.4	26.3	25.0	26.7	25.9	27.4	25.9
1921	24.3	23.5	25.5	24.3	26.2	25.6	27.9	26.2
1922	24.2	23.4	25.6	24.6	25.7	25.0	28.0	25.9
1923	24.3	23.7	25.9	25.3	26.2	25.5	27.2	26.5
1924	24.7	23.8	26.2	24.9	26.3	25.4	28.0	25.4
1925	24.4	23.8	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	23.2
1929	24.1	23.5	26.1	25.2	25.9	24.9	27.2	26.2
1930	24.5	23.7	26.5	25.4	26.4	25.3	27.9	26.8
1931	24.5	23.8	26.5	25.7	26.1	25.3	28.2	27.1
1932	24.9	23.9	26.4	25.2	26.6	25.6	28.3	27.1
1933	24.6	23.7	27.1	25.8	25.9	25.2	28.4	27.9
1934	24.9	24.1	26.9	25.9	26.3	25.4	28.6	27.1
1935	24.9	24.0	27.3	25.9	26.5	25.2	28.9	27.6
Average lengths	24.5	23.7	26.2	25.2	26.2	25.3	27.6	26.2
1936	24.9	24.1	26.8	25.8	26.6	25.6	28.3	27.1

Table XXV.—Nass River Sockeyes, Average Weights in Pounds of Principal Classes from 1914 to 1936.

Year.	4_2		5_2		5_3		6_3	
	M.	F.	M.	F.	M.	F.	M.	F.
1914	6.2	5.0	7.4	6.5	7.2	6.5	7.9	6.8
1915	5.6	5.2	6.9	6.4	7.0	6.6	7.2	6.5
1916	6.0	5.3	7.2	6.3	7.2	6.2	8.1	6.4
1917	5.3	5.3	6.8	6.2	6.3	5.8	7.3	6.4
1918	6.3	5.8	7.2	6.3	7.2	6.4	8.3	6.7
1919	6.0	5.5	6.6	5.9	6.7	6.1	7.8	6.7
1920	5.6	5.2	7.4	6.3	7.4	6.7	7.9	7.0
1921	6.0	5.4	6.9	6.1	6.9	6.3	7.7	6.6
1922	5.9	5.4	6.8	6.2	6.8	6.3	8.1	6.6
1923	5.8	5.2	6.7	6.1	6.6	6.0	7.2	6.8
1924	5.9	5.4	7.2	6.1	6.8	6.1	8.0	6.5
1925	5.9	5.4	6.8	6.1	6.7	6.0	7.4	6.3
1926	6.0	5.4	6.9	6.2	6.7	6.0	7.8	7.1
1927	6.2	5.8	7.1	6.3	6.9	6.2	7.8	7.0
1928	5.6	5.0	7.0	6.2	6.2	5.5	8.1	6.6
1929	5.7	5.2	7.1	6.6	6.7	5.9	7.6	6.8
1930	5.9	5.2	7.3	6.5	7.1	6.1	8.2	7.2
1931	6.0	5.5	7.4	6.8	6.8	6.2	8.3	7.4
1932	6.3	5.6	7.5	6.6	7.3	6.3	8.7	7.5
1933	6.2	5.4	8.1	7.0	7.0	6.2	8.4	7.9
1934	6.7	5.9	8.4	7.3	7.6	6.7	9.4	8.1
1935	6.1	5.2	7.8	6.5	7.0	6.1	8.4	7.4
Average weights	6.0	5.4	7.2	6.4	6.9	6.2	8.0	6.9
1936	6.5	5.7	7.8	7.1	7.6	6.7	8.7	7.5

Table XXVI.—Nass River Sockeyes, Percentages of Males and Females of the 4_2, 5_2, 5_3, and 6_3 Age-groups, 1915 to 1936.

Year.	4_2		5_2		5_3		6_3		Per Cent. Total Males.	Per Cent. Total Females.
	M.	F.	M.	F.	M.	F.	M.	F.		
1915	55	45	49	51	52	48	53	47	52	48
1916	61	39	61	39	50	50	68	32	55	45
1917	55	45	47	53	46	54	58	42	47	53
1918	52	48	40	60	50	50	70	30	51	49
1919	53	47	48	52	46	54	54	46	48	52
1920	46	54	39	61	40	60	66	34	42	58
1921	40	60	45	55	47	53	54	46	46	54
1922	36	64	32	68	46	54	64	36	44	56
1923	43	57	43	57	47	53	60	40	46	54
1924	55	45	44	56	47	53	67	33	48	52
1925	58	42	52	48	45	55	68	32	49	51
1926	43	57	44	56	44	56	57	43	46	54
1927	39	61	54	46	45	55	61	39	46	54
1928	50	50	48	52	42	58	62	38	46	54
1929	48	52	51	49	44	56	58	42	46	54
1930	49	51	43	57	40	60	63	37	43	57
1931	49	51	53	47	43	57	70	30	47	53
1932	49	51	46	54	45	55	72	28	48	52
1933	49	51	56	44	47	53	76	24	49	51
1934	48	52	51	49	50	50	58	42	50	50
1935	39	61	40	60	39	61	71	29	42	58
1936	42	58	35	65	43	57	50	50	43	57
Average	48	52	46	54	45	55	63	37	47	53

THE CANADIAN HALIBUT FLEET.*

BY A. J. WHITMORE, COMMISSIONER FOR CANADA.

Improvement in the condition of the halibut banks on the Pacific Coast and particularly off British Columbia as the result of regulation is unmistakable. Success is attending the efforts of the International Fisheries Commission in rebuilding the supply of spawning fish and stopping the decline in abundance which went on for many years before 1930. The drop in annual catch on the grounds south of Cape Spencer from 65,000,000 to 22,000,000 has been brought to a stop with every prospect of an increase as soon as young fish appear as the result of more spawning. A decline in catch per day, or per unit of gear, which would have made every trip a loss at present prices, has been reversed.

Fear for the future of the halibut-fishery off British Columbia can be dismissed, unless we permit what has been and is being done by international co-operation to be destroyed.

Such a remarkable change has been accomplished in no other marine fishery. And it is still more remarkable that it has been accomplished without a reduction in the catch, which might well have been a radical one in view of the condition of the banks.

The Canadian Commissioners feel themselves fortunate in being able to report that the banks frequented by British Columbia fishermen show this improvement in somewhat greater amount than the banks elsewhere in Area 2, the grounds south of Cape Spencer; greater, in fact, to the extent of 17 per cent. since 1930. Canada has had its full share of the benefits of conservation, and no more than its share of restriction.

The Commissioners have had no responsibility for the system of voluntary curtailment and its effects upon price and distribution of the landings. They have no control over the prices obtained and cannot be expected to maintain the earnings of the fleet in the face of decreased prices obtained; for instance, the decrease from 11.3 cents for southern mediums in Prince Rupert in 1930 to 6.6 cents in 1936. Only the general economic situation can do that. They can, however, show clearly by the statistics of the annual catches since 1931, when their regulations first became effective, that they have done their full share to preserve the halibut industry for Canada.

Canadian official records show that since regulation began the value of the halibut landings by Canadian vessels in Pacific ports has risen remarkably. This increase is such, having regard to the trend of other businesses caught in the depression, that the fleet and trade should feel greatly encouraged. This increase has been contributed to by a general recovery in prices, by the increase in price of halibut-livers, by the increased proportion of first-class fish as a result of regulation, by better prices for the lessened proportion of second-class fish, and by an increase in the total amount landed by the Canadian fleet.

Value of Landings by the Canadian Fleet (1936 estimated).

Year.	Value of Halibut.	Value of Halibut-livers.	Total.
1932	$257,855	$10,800	$268,655
1933	369,797	21,800	391,597
1934	528,874	34,000	562,874
1935	635,227	72,200	707,427
1936	666,057	79,600	745,657

This change in quantity of second-class fish is shown clearly by the fact that, due to overfishing, the proportion of chickens in the Area 2 catch had risen steadily to 42 per cent. in 1932, whereas it had fallen to 28 in 1935. The price for second-class fish was 50 per cent. of that for first-class in Prince Rupert until 1933. In 1935 it was 88 per cent. and 80 per cent. in 1936.

The Canadian fleet has done well, both from the local grounds south of Cape Spencer in Area 2 and from Area 3. It has increased its share of the catch in the local Area 2 from 30 per cent. in the two years 1931 and 1932 at the beginning of regulation to 40 per cent. in the

* NOTE.—Reprinted from bulletin published by International Fisheries Commission.

last three years—1934, 1935, and 1936. Its share is greater than in 1929, when a full nine-month season was necessary, and a million and a half greater than in 1931 just before regulation began. It is two and a half million greater than in 1932, at the depth of the economic depression. The following table shows this:—

Canadian Catch in Area 2.

Year.	Lb.	Percentage of Total United States and Canadian.	Year.	Lb.	Percentage of Total United States and Canadian.
1929	8,386,000	34	1933	7,649,000	34
1930	7,009,000	33	1934	8,967,000	40
1931	7,018,000	32	1935	8,954,000	41
1932	5,960,000	27	1936	8,585,000	39

If, as some fishermen are prone to say, the large Area 3 boats have been using an undue amount of Area 2 fish, it has certainly not been at the expense of the Canadian fleet.

The share of the Canadian fleet in the catch from Area 3, or the western area, has doubled. Where before regulation it took 600,000 to 700,000 lb., in the last two years it has taken an average of 1,500,000, making its total from the coast very much larger. These figures are most significant when it is remembered that to rebuild the banks has required the total international catch from Areas 2 and 3 to be temporarily limited to a fixed amount since 1931.

Canadian Catch in Area 3 and Total for the Coast (1936 estimated).

Year.	Area 3, Lb.	Combined Areas 2 and 3, Lb.	Year.	Area 3, Lb.	Combined Areas 2 and 3, Lb.
1929	656,000	9,042,000	1933	637,000	8,286,000
1930	617,000	7,626,000	1934	751,000	9,718,000
1931	765,000	7,783,000	1935	1,251,000	10,205,000
1932	452,000	6,412,000	1936	1,725,000	10,310,000

The fact of these increased landings is the important point, but this increase has not come from the remaining Area 2 fleet to south and north. At one time dory-fishing by large vessels was extensive in Area 2, totalling 1,799,000 lb. in 1932. At that time the Commission took action to reduce this fishing and in 1935 completely prohibited it. The vessels which carried on this fishery then left Area 2, catching but 246,000 lb. by "long-line" fishing there in 1936, a saving of over 1,500,000 lb. for the other vessels in that area. The catch of other large vessels usually fishing in Area 3 shows a reduction in the amount credited to Area 2 in the accounts of the Commission from 735,000 lb. in 1932 to 353,000 lb. in 1936, thus adding another 400,000 lb. to that available for the smaller vessels of both the United States and Canada in that area.

Catches of Large Vessels in Area 2.

Year.	By Vessels formerly using Dories.	By other Large Vessels.	Total.
1932	1,799,000	735,000	2,534,000
1933	877,000	660,000	1,537,000
1934	296,000	436,000	732,000
1935	559,000*	575,000	1,134,000
1936	246,000*	353,000	599,000

* By long-line fishing which is legal in Area 2.

The Area 2 fleets, including of course the Canadian vessels, have profited in another way. There has been a steady increase in the number of trips made to Area 3 by boats which belong

to Area 2. This, it is important to note, is a net gain for the Area 2 fleets, because it was not made from the quota given Area 2.

Landings from Area 3 by Vessels usually fishing Area 2 (1936 estimated).

Year.	Canadian.	United States.	Year.	Canadian.	United States.
1932	.....	224,000	1935	670,000	1,607,000
1933	130,000	1,232,000	1936	917,000	2,715,000
1934	252,000	1,277,000			

It is clear that there is a decided shift toward Area 3. In 1932 the larger vessels were taking 2,534,000 lb. from Area 2; in 1936, 599,000. In 1932 the smaller vessels were taking 224,000 lb. from Area 3; in 1936 this increased to 3,632,000 lb.

This shift is to the advantage of the Area 2 fleet in two ways, because it leaves a greater poundage in Area 2 for this fleet and because it tends to reduce the number of vessels sharing. On the other hand, new Canadian vessels have joined the halibut fleet, and it is of interest to see whether these additions have been great enough to affect the earnings of the individual vessel. For the three years before regulation, 1929–31, the average number of men engaging in the fishery was 488; in 1932–33, the first two years of regulation, the number was 342; and in 1934–36 it had risen to 511, with 585 the last year. From the standpoint of national interest it may be desirable to spread employment in that way. If some complaint should arise as a result, it is not a matter in which the Halibut Commission could or should intervene.

But this tendency toward spread of employment has not been sufficient to decrease the landings per vessel of the regular halibut fleet. These landings are now as great as in 1927 and 1928. Before regulation the pounds caught annually by each of the vessels in this fleet had fallen regularly from year to year as a result of overfishing. This had caused a decline in abundance which the Commission has shown to have been from a yield of 300 lb. per set of a skate of gear in 1906 to 35 lb. per set in 1930. The decline of catch per vessel is very close to that of abundance. For example, in 1927 and 1928 the average season's landings of vessels fishing the whole season was 144,600 lb., and the catch per skate was 47.4 lb. In 1930 the same vessels took 112,700 lb. each, and the catch per skate was 35.4 lb., in both cases a fall to 75 per cent. of the amounts in 1927 and 1928. The years 1929, 1930, and 1931 were nearly on a par, averaging 117,100 lb. per season per boat.

As soon as regulation became effective in 1932, the abundance and the catch per set of a skate of gear rose. The result was a much higher total catch for the season of these Canadian vessels, averaging 161,300 lb. in 1932 and 1933, but dropping to 143,700 in the last three years, 1934 to 1936. This drop was due to the adoption of curtailment in order that a better price might be obtained. The season's catch in the last three years was therefore very nearly the same as in 1927 and 1928, and much better than during the year 1930, in which the banks were in the poorest condition. This depletion and low yield were the result of the most intensive fishery the banks had ever known, reaching a climax in 1929, and were not due to bad economic conditions. The recovery in abundance and in greater catch per vessel has been due to the rebuilding of the banks by regulation.

Regulation, giving halibut a longer life and the chance to spawn, has benefited the fleet in another way which should not be overlooked. The greater amount of growth has produced larger fish and a higher percentage of first-class fish. In fact, " chickens " have become fewer and are wanted, so that the price paid for them is approaching that paid for mediums.

There are good prospects for activities supplementing the earnings during the halibut season. In 1936, of 131 Canadian vessels, but five tied up at the end of the halibut season in Area 2, and sixty-eight had left considerably before the end, engaging in salmon, pilchard, and other fisheries. When Area 2 closed the remaining vessels engaged in salmon and black-cod fishing, and nineteen went to Area 3 for halibut. The black-cod market is increasing steadily. This is tending to divert vessels from the halibut-fishery, and should be encouraged as leaving more halibut for the remainder of the fleet. Fisheries of this sort after the end of the season are additional to the income from halibut, which is not reduced.

The larger vessels (schooners) in Area 3 have not had an increase in the average season's catch per boat corresponding to that of the Area 2 fleet. They have, however, sold their catch at higher prices because they have prolonged their season by their own efforts. If this opportunity to sell at higher prices after the closure of Area 2 were lost to them, an inspection of their records shows that they would need an increase in poundage from Area 3 of more than 35 per cent. to bring their catch to equal that of 1927 and 1928, as Area 2 vessels have done. This is not a matter of opinion but of facts easily obtained from records of landings in the markets.

TAGGING BRITISH COLUMBIA PILCHARDS (*SARDINOPS CÆRULEA* (GIRARD)): METHODS AND PRELIMINARY RESULTS.

By John Lawson Hart, Ph.D., Pacific Biological Station, Nanaimo, B.C.

That the pilchard is rather freely migratory on the British Columbia fishing-grounds has been indicated by the fishery from its very beginning. However, no definite information has been available on the total extend of its movements. Accordingly, the men engaged in the industry have had considerable diversity of opinion in regard to the identity of the British Columbia pilchard and the California sardine. Some maintained that the pilchards were adult sardines which made a northward feeding migration during the late summer and early fall, only to return to California during the winter. Others considered that the movement of pilchards to the fishing-grounds was from the ocean offshore. Much of the evidence appeared to corroborate the former idea, but all of it was indirect and as a result neither hypothesis could be regarded as proved. It was apparent that the question could be submitted to a critical test by means of a practical tagging programme. However, for some time it appeared that such an approach to the problem was impossible for two reasons. In the first place, it seemed that the pilchard was too small and too delicate a fish to carry a tag such as was commonly used in halibut and salmon. In the second place, it was obvious that in the case of a fish such as the pilchard, which was being passed by the ton in mechanical conveyors through reduction plants, the chances for recovery were very small indeed if the detection of the tag depended upon its being seen.

In 1933 Rounsefell and Dahlgren described the methods developed by them in investigating the migration of Alaska herring. It appeared that their methods might be modified to be applied to pilchards. This has been done and the present report describes the methods which have been used and the results obtained to date in this work.

TAGS.

As the method of recovering the tags depends upon their being attracted by a magnet, they are made from the most easily obtained magnetic material available—iron. These tags are stamped with serial numbers, preceded by the letter P, and are nickel-plated. In size they are 19 mm. (¾ in.) long, 4 mm. (5/32 in.) wide, and 0.86 mm. (1/34 in.) thick. The weight is approximately 0.44 g. (1/68 oz.).

TAGGING METHODS.

The pilchard-fishery for the most part is carried out offshore, where large or choppy seas are the rule rather than the exception. For this reason, and because pilchards have been found to die rather rapidly when confined, the following method of tagging was fixed upon. The man responsible for the tagging-work lived on the tender of a commercial seine-boat. When a set was made, he took up his position in the seine-skiff. From there the pilchards were taken with a dip-net from the seine while it was being fleeted in. The fish were tagged by cutting a small slit in the side of the fish about midway between the pectoral and pelvic fins with a specially made knife having its cutting-edge at the end. The tag was then inserted into the body-cavity of the fish which was immediately released outside the net. As a rule, 100 to 300 pilchards could be tagged in this way before the fish appeared to suffer any injury from being confined in the net.

RECOVERY METHOD.

The tags are recovered by the use of electromagnets placed in the meal-lines of pilchard-reduction plants. These magnets are put in the bottom of the inclined chute down which the meal slides into the grinder in such a way that all of the meal produced by the plant cascades over a small iron step attached to the upper pole of the magnet. Any iron or steel which has passed through the plant with the fish is attracted and held to the magnet as long as the power is left on, or until the metal is removed by hand. Tests have shown that the tags also stay on the magnet, from which they are recovered by the plant crews, to be turned in later with all available information in regard to the point of origin of the fish from which the tag was believed to come.

A similar programme of tagging and recovery has been undertaken by the California State Fisheries Laboratory. The officials of that organization and the Biological Board keep each other posted in regard to progress made in both the tagging and recovery phases of their programmes.

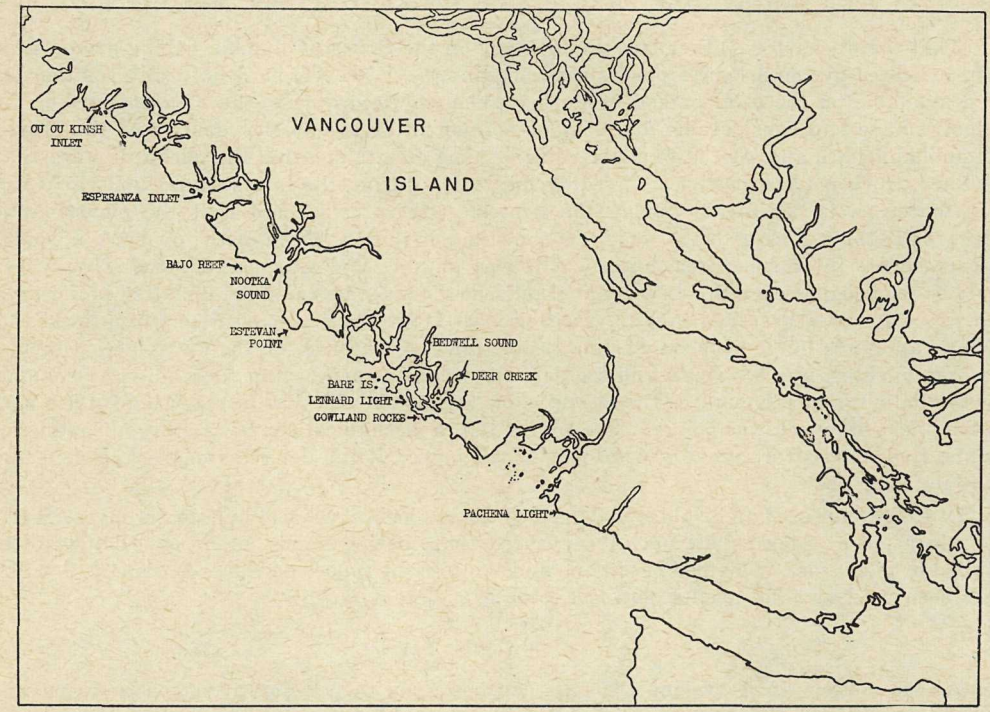

Fig. 1. Map of Southern Vancouver Island showing the reference points for the locations of places where pilchards were tagged and for the British Columbia recoveries.

TAGS APPLIED.

In all, more than 3,500 tags have been applied to pilchards in British Columbia waters. About 1,000 were used during 1935 to test the feasibility of the methods, and the remainder in 1936. Table I. shows the place and date at which the tags were applied. The tagging done on August 22nd and 23rd, 1936, was not carried out as described in the text: as an experiment in technique a floating pound was used similar to that used in the herring-tagging (*see* Hart and Tester, 1937). In cases where "(in part)" occurs in the table, the detail is available on file at the Pacific Biological Station.

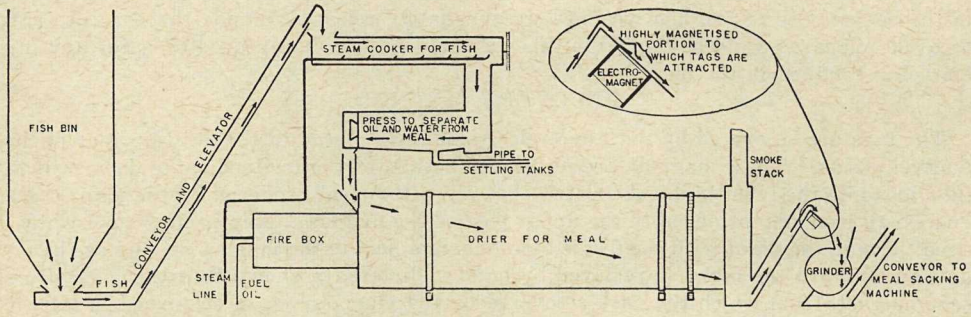

Fig. 2. Diagrammatic representation of a pilchard- or herring-reduction plant showing the direction of the flow of fish and meal and the location of the magnet used for recovering pilchard-tags.

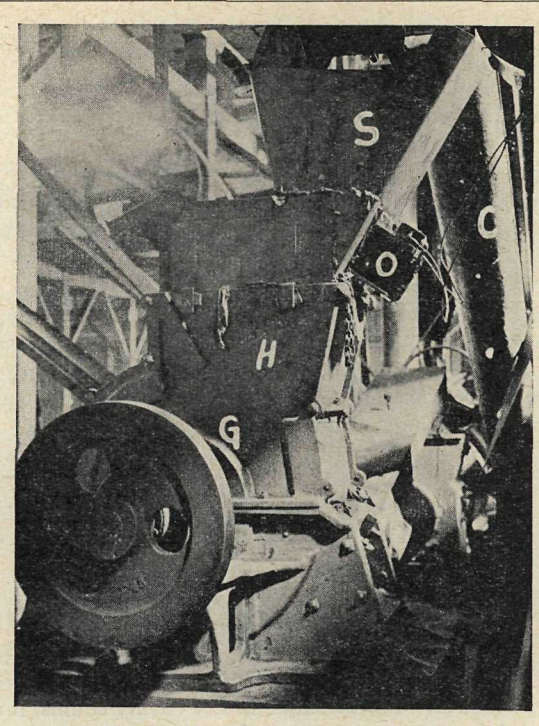

Fig. 3. Photograph of the electromagnet for the recovery of pilchard-tags as installed in the meal-line of the Nootka Packing Co. plant at Nootka. C is the bottom of the screw-conveyor from the drier; S is the chute leading from the conveyor into H, the hopper for G, the meal-grinder; O is the electromagnet.

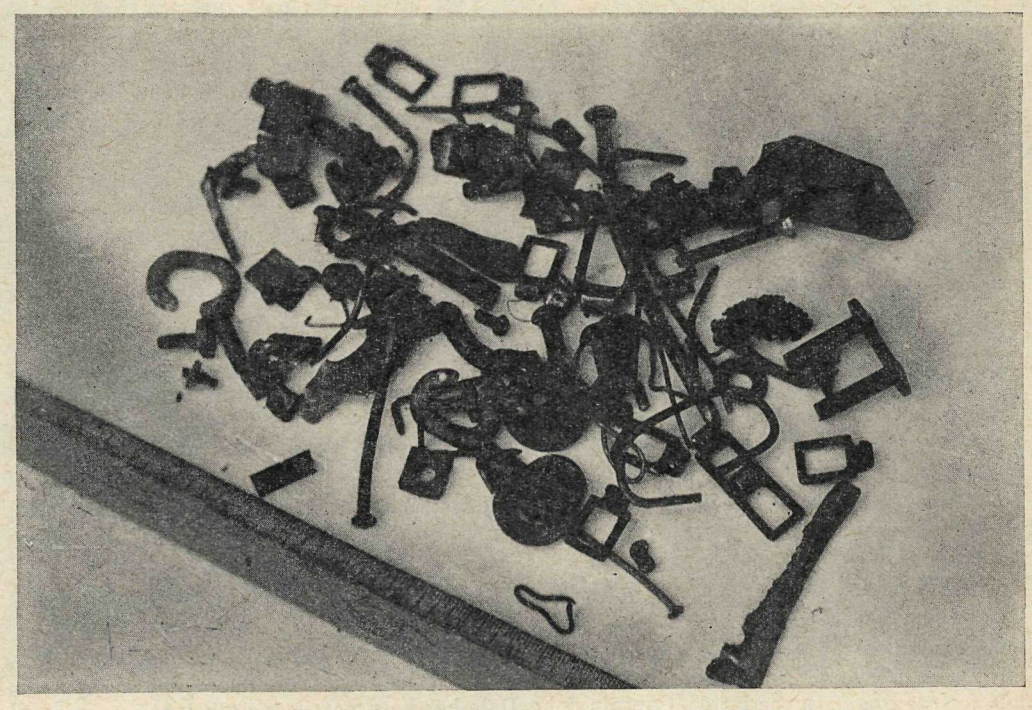

Fig. 4. Miscellaneous iron and steel collected on the magnet. In bulk this represents approximately one week's accumulation on a magnet.

RECOVERIES AND DISCUSSION.

Of the 3,513 tags applied, twenty have been recovered from reduction plants in British Columbia and five from California. The pertinent details in regard to these recoveries are shown in Table II.

The discovery of five British Columbia tags in the sardine-fishery of California, taken in combination with the indirect evidence cited by Clark (1935) and reviewed by Hart (1937), indicates strongly that a general southward movement of pilchards takes place during the fall months.

From the tagging done on August 22nd, 1936, in which a floating pound was used, seven returns (two from California) have been obtained from the 500 tags applied. This is a considerably higher proportion than that obtained by the other method of tagging, but the difference may be in part due to the fact that those fish were tagged first during the 1936 season and were exposed to capture for a longer period of time. In any case, the results are not yet extensive enough to permit a final comparison between the two methods. This is especially the case in view of the high degree of variability in the proportion of recoveries from different taggings made by the same method. For example, of the 353 fish tagged on August 29th, 1936, seven recoveries were made, six within two days and the remaining one more than five months later, while, on the other hand, from the 300 tags applied on August 26th, only one was returned.

Only two tags were recovered from the 978 used during 1935. The low value is undoubtedly due to the fact that the recovery equipment was not installed until part way through the 1936 season.

One weakness of the method of recovery is illustrated by the returns for tags P1235 and P2165 from runs of salmon-offal. As the salmon were chiefly chums, it seems improbable that the tags could have originated from pilchards eaten by them. Accordingly, the tags must have been retained in the drier or some other part of the reduction machinery for some time. This gives a definite indication of what had been realized on theoretical grounds, that it is impossible to determine with certainty the exact source of the fish from which tags are recovered. Experimental trials at the plants and the immediate returns at two plants of tags applied on August 29th demonstrated, however, that many tags pass directly through the reduction plants without being held up at all.

The recoveries of tags P235 and P2230 indicate the movement of pilchards from offshore into the inlets. To date, no movement in the reverse direction has been indicated, although two recoveries have been made in the inlets of the Clayoquot Sound area of tags applied in Bedwell Sound.

The results to date have demonstrated that the use of internal tags and their recovery by electromagnets placed in the meal-line is suitable for studying the movements of pilchards. A southward fall migration has already been established as well as small movements into the west-coast inlets. It is expected that further work will provide more complete information on both the general and local movements.

ACKNOWLEDGMENTS.

The work described in this report has been carried out under a joint arrangement between the Biological Board of Canada and the Provincial Fisheries Department of British Columbia. Acknowledgment is made of the financial assistance given by both organizations and to the directors concerned, Dr. W. A. Clemens and Mr. George J. Alexander, for their sympathetic interest in the work.

Thanks are due to the officers of the California State Fisheries Laboratory for their interest in attending to the recovery of tags in California and returning them to British Columbia for identification.

Mr. Lennard Quickenden carried out the exacting work of tagging and to him special thanks are due.

It is a pleasure to acknowledge the co-operation of members of the fishing industry. They have been most obliging in installing magnets, in collecting tags from them, and in supplying fish for tagging. In the latter, Captain John Dale has been particularly helpful.

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TABLE I.—LIST OF TAGS APPLIED.

Date.	No. of Tags inserted.	Serial No. of Tags P.	Place Tagged Fish released.	Remarks.
Aug. 25, 1935	150	101–250	22 mi. S.S.W. of Nootka Light.	
Aug. 25, 1935	77	251–300 351–400 (in part)	20 mi. S.W. of Nootka Light.	
Aug. 26, 1935	100	301–350 401–450	2½ mi. S.E. of Estevan Point.	
Aug. 27, 1935	50	501–550	3 mi. S. of Estevan Point.	
Aug. 27, 1935	200	451–500 551–700	10 mi. S. by W. of Nootka Light.	
Aug. 28, 1935	150	701–750 801–900	14 mi. S.S.E. of Nootka Light.	
Aug. 28, 1935	141	251–400 (in part) 751–800 901–950 951–1000 (in part)	16 mi. S.E. of Nootka Light	Escaped with a 40-ton school when seine burst.
Aug. 29, 1935	80	951–1000 (in part)	5 mi. S.E. of Nootka Light.	
		1001–1050 1051–1080 (in part)		1004 and 1010 not used.
Aug. 30, 1935	30	1051–1080 (in part)	15 mi. S.E. of Nootka Light.	
Aug. 22, 1936	500	1101–1300 1701–1800 2001–2100 2201–2300	10 mi. S. by E. of Nootka Light	Fish tagged from floating pound.
Aug. 23, 1936	62	1401–1500 (in part)	Inside entrance of Nootka Sound	Fish tagged from floating pound.
Aug. 23, 1936	163	1301–1400 (in part) 1501–1532 1534–1600	4 mi. off Nootka Light	Fish tagged in floating pound inside and hauled off shore to be released.
Aug. 26, 1936	300	1601–1700 1901–2000 2101–2200	20 mi. S. of Rafael Point	Very large fish.
Aug. 26, 1936	100	1801–1900	20 mi. S. by E. of Rafael Point	Mixed sizes.
Aug. 26, 1936	99	2401–2481 2483–2500	20 mi. S. of Clayoquot Sound	Mixed sizes.
Aug. 27, 1936	58	2501–2600 (in part)	8 mi. S.W. of Bajo Reef.	
Aug. 28, 1936	100	2301–2400	15 mi. S. of Bajo Reef.	
Aug. 28, 1936	200	2601–2700 2701–2800	25 mi. S.W. of Nootka Light.	
Aug. 28, 1936	200	2801–2900 3501–3600	15 mi. S.W. of Bajo Reef.	
Aug. 29, 1936	353	2901–2952 2954–3000 3001–3200 3201–3300 (in part)	15 mi. S.W. of Nootka Light.	

TABLE I.—LIST OF TAGS APPLIED—*Continued.*

Date.	No. of Tags inserted.	Serial No. of Tags P.	Place Tagged Fish released.	Remarks.
Aug. 30, 1936	100	3401–3500	15 mi. S.W. of Estevan Point.	
Aug. 30, 1936	200	3301–3400 3701–3800	5 mi. off Estevan Point.	
Sept. 2, 1936	100	3601–3700	Bedwell Sound.	

TABLE II.—DETAILS IN REGARD TO PLACE AND TIME OF TAGGING AND RECOVERY FOR TAGS WHICH WERE RETURNED.

Tag No. P.	Date applied.	Place applied.	Date recovered.	Probable Place of Recovery.	Plant making Recovery.
180	Aug. 25, 1935	22 mi. S.W. Nootka Light	Aug. 22, 1936	9 mi. S. of Gowland Rocks	Kildonan.
235	Aug. 25, 1935	22 mi. S.W. Nootka Light	July 7, 1936	Ououkinsh Inlet	Espinoza.
1150	Aug. 22, 1936	10 mi. S.E. Nootka Light	Aug. 28, 1936	Off Lennard Island	Hecate.
1209	Aug. 22, 1936	10 mi. S. by E. Nootka Light	March 5, 1937	Off San Pedro	Sea Pride.
1235	Aug. 22, 1936	10 mi. S. by E. Nootka Light	Oct. 11, 1936	Recovered in run of salmon-offal	Kildonan.
1288	Aug. 22, 1936	10 mi. S.E. Nootka Light	Aug. 25, 1936	Off Bare Island	Hecate.
1792	Aug. 22, 1936	10 mi. S.E. Nootka Light	Aug. 31, 1936	20 mi. off Pachena or 15 mi. off Lennard Island	Ecoole.
2165	Aug. 26, 1936	20 mi. S. Rafael Point	Oct. 9, 1936	Recovered in run of salmon-offal	Kildonan.
2230	Aug. 22, 1936	10 mi. S.E. Nootka Light	Sept. 2, 1936	Quatsino Sound or Ououkinsh Inlet	Nootka.
2285	Aug. 22, 1936	10 mi. S. by E. Nootka Light	Jan. 29, 1937	Off San Francisco	Floater "Manatauny."
2521	Aug. 27, 1936	8 mi. S.W. Bajo Reef	Aug. 31, 1936	20 mi. off Pachena or 15 mi. off Lennard Island	Ecoole.
2656	Aug. 28, 1936	25 mi. S.W. Nootka Sound	Aug. 29, 1936	Off Esperanza Inlet	Hecate.
2784	Aug. 28, 1936	25 mi. S.W. Nootka Sound	Aug. 31, 1936	Between Esperanza Inlet and Estevan Point, 25 mi. off	Nootka.
2818	Aug. 28, 1936	15 mi. S.W. Bajo Reef	Jan. 8, 1937	Off San Francisco	Wilbur-Ellis.
2839	Aug. 28, 1936	15 mi. S.W. Bajo Reef	Aug. 29, 1936	Off Esperanza Inlet	Hecate.
2974	Aug. 29, 1936	15 mi. S.W. Nootka Light	Aug. 29, 1936	Off Esperanza Inlet	Hecate.
2985	Aug. 29, 1936	15 mi. S.W. Nootka Light	Aug. 29, 1936	Between Esperanza Inlet and Estevan Point, 25 mi. off	Nootka.
3040	Aug. 29, 1936	15 mi. S.W. Nootka Light	Aug. 29, 1936	Off Esperanza Inlet	Hecate.
3127	Aug. 29, 1936	15 mi. S.W. Nootka Light	March 25, 1937	Off San Pedro	Van Camp, N. K.
3139	Aug. 29, 1936	15 mi. S.W. Nootka Light	Aug. 30, 1936	Between Esperanza Inlet and Estevan Point, 25 mi. off	Nootka.
3146	Aug. 29, 1936	15 mi. S.W. Nootka Light	Aug. 29, 1936	Between Esperanza Inlet and Estevan Point, 25 mi. off	Nootka.
3198	Aug. 29, 1936	15 mi. S.W. Nootka Light	Aug. 29, 1936	Off Esperanza Inlet	Hecate.
3329	Aug. 30, 1936	5 mi. S.W. Estevan Point	March 20, 1937	Off San Pedro	Van Camp, N. K.
3652	Sept. 2, 1936	Bedwell Sound	Dec. 14, 1936	Deer Creek, Tofino Inlet	Ecoole.
3677	Sept. 2, 1936	Bedwell Sound	Sept. 4, 1936	Bedwell Sound	Nootka.

THE TAGGING OF HERRING (*CLUPEA PALLASII*) IN BRITISH COLUMBIA: METHODS, APPARATUS, INSERTIONS, AND RECOVERIES DURING 1936–37.

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Until quite recently, knowledge of the extent of mixing of the runs of herring to different localities has depended on an indirect method of study—the analysis and comparision of "racial" characters such as vertebra number, head-length, rate of growth, etc. If constant and statistically significant differences in these characters are found between fish of two runs, they are taken as proof that intermingling is limited. Using this method, it has been shown (Tester, 1936, 1937) that many of the runs of herring in British Columbia tend to comprise local populations. But the shortcomings of the method have also been pointed out. Although two runs may be essentially discrete from each other, these differences may not be present, or, if they are, they may be too small to be detected without examining enormous numbers of fish. Even when significant differences in racial characters between two runs are found, a slight degree of intermingling is still possible and its exact extent cannot be ascertained. The method gives no positive information on the movements of herring, although it may be assumed that migration between localities in which local populations are found is limited during the time of year for which samples are available, and that, if seasonal movements take place, local runs return each year to the same general areas.

For many years, the direct method of studying migration by tagging or marking and subsequent recovery of the tagged or marked fish has been applied successfully in other species such as the salmon and halibut. But only recently, through the efforts and enterprise of Dr. G. A. Rounsefell and Mr. E. H. Dahlgren, United States Bureau of Fisheries, has a satisfactory procedure been developed for the herring. Their methods involve the use of a small metal tag which is inserted in the body-cavity of herring and the recovery of this by means of an electromagnet in the meal-line of a reduction plant (Rounsefell and Dahlgren, 1933) or by an "electronic" or "induction" detector (Dahlgren, 1936) in the conveyor system of either a saltery or a reduction plant. The idea of the detector was first conceived by Mr. Dahlgren and was designed and built by engineers of the University of Washington.

In 1936 a tagging and recovery programme was started in British Columbia, using a procedure similar to that of Dahlgren. This report describes the methods of tagging, the recovery apparatus, and gives the results to date. The investigation has been confined to the south-east and west coasts of Vancouver Island, where the major herring-fisheries are located. It is believed that, within a relatively short time, exact information on the extent of intermingling and migration of the runs of herring to these areas will be obtained, and that, in addition, the results will enable an estimate of "fishing mortality" to be made. The important bearing of this information on the efficient management of the fishery has already been pointed out (Tester, 1936).

ACKNOWLEDGMENTS.

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The authors are indebted to the United States Bureau of Fisheries and the University of Washington for permission to copy their design of the detector, and to the Washington Instrument Company, Seattle, for many services rendered in connection with its construction and installation. Thanks are due to the Moresby Island Fisheries Co., Ltd., North Galiano Island, for permission to alter their conveyor system to accommodate the detector unit.

Sincere thanks are also offered to the Canadian Fishing Co., Ltd., Vancouver, for supplying the seine-boat "Cape Mudge" for tagging operations on the west coast of Vancouver Island during March, 1937, and to the crew, Capt. T. Dunnvick, and Mr. T. Mitchell, for their assistance in these operations.

Mr. L. Quickenden, of this Station, has assisted in the actual tagging and for this and other help we wish to express our appreciation.

TAGS.

The " belly " tags used in this investigation are made of magnetic, nickel-plated iron with rounded ends and smooth edges. They are 19 mm. (¾ in.) long, 4 mm. (5/32 in.) wide, 1.6 mm. (1/16 in.) thick, and weigh 0.95 g. (1/30 oz.). In material, shape, length, and width they are

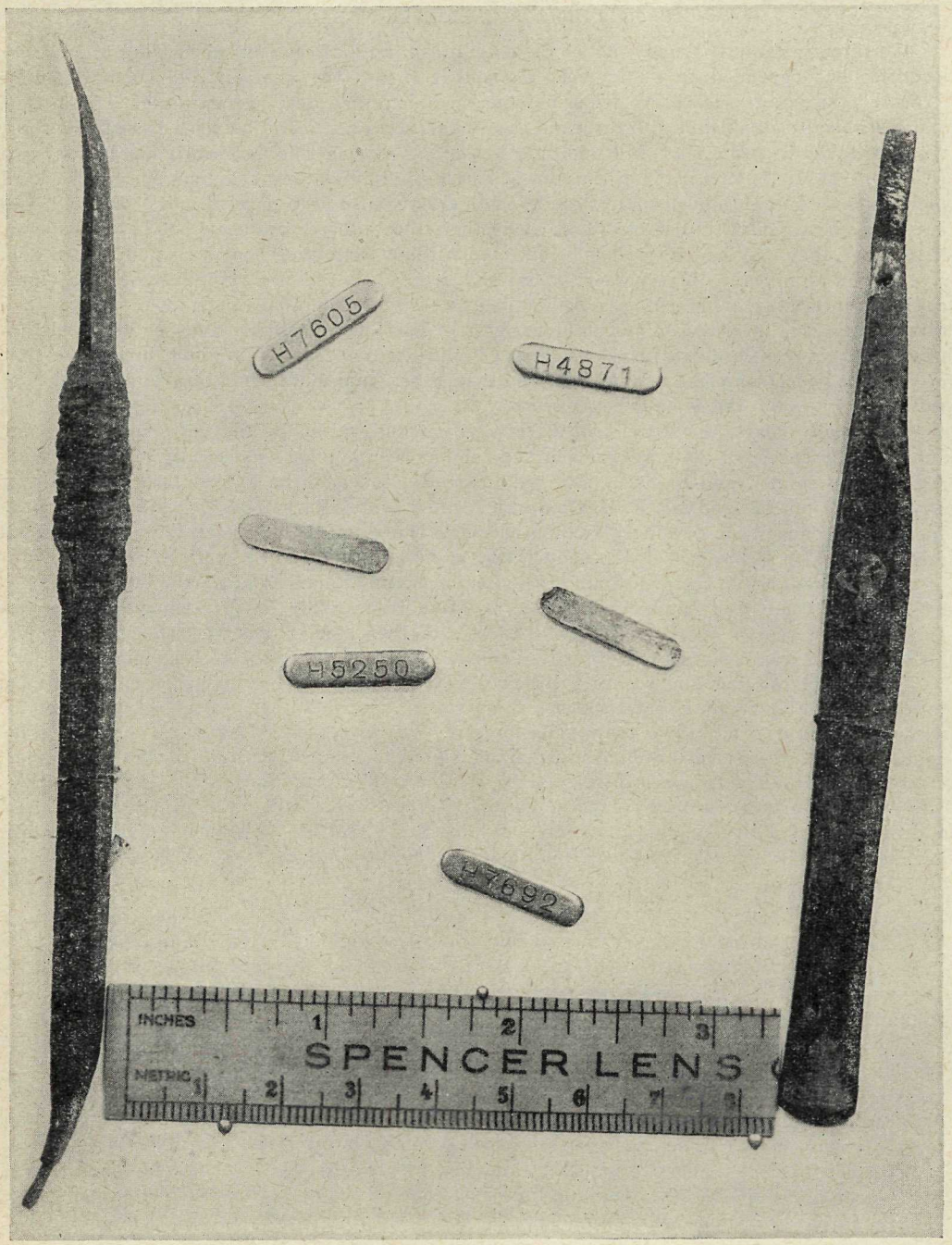

Fig. 1. Herring-tags and tagging " irons " or knives. The implement is sharpened at the end and is used to make a small cut in the side of the fish through which the tag is pushed into the body-cavity.

Fig. 2. Tagging herring. Fish are removed from a pocket of the bait-seine by means of a dip-net and are then tagged.

Fig. 3. Tagging herring. The fish is held firmly in one hand, a small incision is made with the tagging-knife, and the tag is pushed through the opening into the body-cavity. The fish is then returned to the water.

similar to those used by Dahlgren and found by him to be most efficient (Dahlgren, 1936; Fig. 2, type 4), but, to enable them to be recovered more readily by the induction detector, they are of greater thickness (1.6 as compared with 1 mm.) and weight. Each tag bears an individual serial number preceded by the letter " H " (Fig. 1).

TAGGING.

The metal tags are designed to be carried inside the body-cavity of the fish. In the process of tagging, a fish is selected from a dip-net (Fig. 2) and held firmly with one hand; after scraping away a few scales, a small incision is made in its side about midway between the opercle and vent by means of a sharp knife or " tagging-iron," with the cutting-edge at the end (Fig. 1); the tag is pushed through this small opening into the body-cavity (Fig. 3) and the fish is quickly returned to the water. The whole operation usually takes less than ten seconds. Care is taken to keep the hands moist, to avoid harming the fish more than necessarily, and to use only those fish which are in good condition.

Using this procedure, herring were tagged during the fall of 1936 and during the spring of 1937. In the fall taggings the fish were obtained for the most part from the commercial purse-seines. As soon as possible after the seine was pursed the fish were dipped into a small floating pound, and this was towed away from the scene in order not to interfere with fishing operations. The tags were then inserted, and the fish were either released immediately or were returned to a second section of the pound and released later. In one instance (October 15th, 1936) the fish were obtained from and released at a salmon-trap; in another instance (November 8th, 1936) the fish were tagged and released direct from the purse-seine. In the spring taggings the fish were captured on or close to spawning-grounds by means of a bait-seine with a purse-line. After a set was made the net was pursed, partially dried up, and the fish were dipped from the pocket, tagged, and released at the net.

Dates, serial numbers, numbers of tags inserted, localities, and other information relative to tagging are given in Table I.

TABLE I.—DATA ON HERRING-TAGGING DURING 1936–37.

Date.	No. of Tags inserted.	Serial No. of Tags H.	Place Tagged Fish released.	Remarks.
Oct. 6, 1936	172	1–100 101–200 (in part)	Swanson Channel, ½ mi. W. of Beaver Point.	
Oct. 7, 1936	897	201–1100	Swanson Channel, Beaver Point	201–700 released at dock; 701–1100 released in channel; 257, 439, 647, missing.
Oct. 8, 1936	1,323	1101–2400 101–200 (in part)	Swanson Channel, area between Beaver Point, Shingle Bay, and Wallace Point	1286, 1457, 1771, 2252, 2388, missing.
Oct. 15, 1936	1,500	6001–7500	Strait of Juan de Fuca, Sooke traps	Taken from salmon-traps.
Oct. 17, 1936	390	2401–2700 2901–3000 (in part)	Swanson Channel, Beaver Point dock.	
Oct. 19, 1936	700	2701–2900 3001–3500	Swanson Channel, between Beaver Point and Moresby Pass	Drifting S. while fish released in order of serial numbers.
	409	3501–3900 2901–3000 (in part)	Swanson Channel, off Coal Island.	
Oct. 20, 1936	899	3901–4800	Swanson Channel, off Wallace Point	4711 missing; 3901–4300 a.m., 4300–4800 p.m.
Nov. 8, 1936	300	4801–5000 5901–6000	Trincomali Channel, Porlier Pass	Fish tagged direct from seine.
Nov. 12, 1936	500	5001–5500	Trincomali Channel, just S.E. of Porlier Pass.	
	700	5501–5900 7501–7800	Trincomali Channel, Porlier Pass.	

TABLE I.—DATA ON HERRING-TAGGING DURING 1936–37—*Continued.*

Date.	No. of Tags inserted.	Serial No. of Tags H.	Place Tagged Fish released.	Remarks.
Nov. 18, 1936	500 (appr.)	7801–8300 8901–9000	Trincomali Channel, Porlier Pass	Approximately half of 8001–8200 lost overboard.
Nov. 19, 1936	300	8301–8400 8701–8900	Trincomali Channel, Porlier Pass.	
March 4, 1937	700	10001–10700	Strait of Georgia, Horswell Point.	
March 11, 1937	898	10701–11100 11301–11400 11901–12000 12301–12600	Barkley Sound, Uchucklesit Harbour	10860, 12490, missing.
March 12, 1937	1,199	11101–11200 12201–12300 14101–14200 14501–14600 14901–15700	Barkley Sound, Macoah Passage, near Toquart	15455 missing; fish spawning when captured.
March 14, 1937	899	11201–11300 12001–12200 12601–12800 12901–13000 13301–13500 14401–14500	Nootka Sound, head of Kendrick Arm	14479 given away.
March 17, 1937	1,000	11601–11700 12801–12900 13201–13300 13601–13700 14201–14400 14601–14900 15901–16000	Kyuquot Sound, Blind Entrance	Fish spawning when captured.
March 17, 1937	898	11401–11600 11701–11800 13701–13900 15801–15900 16001–16300	Entrance Ououkinsh Inlet, Scow Bay, Bunsby Islands	16095, 16235, missing.
March 19, 1937	798	11801–11900 13001–13200 13501–13600 13901–14100 15701–15800 16301–16400	Nootka Sound, head of Ewin Creek	15724 given away; 15794 missing.
April 25, 1937	1,198	16401–16600 16701–16900 17001–17100 17301–17700 17801–17900 18001–18100 19701–19800	Saanich Inlet, head of Tod Inlet	16825, 17413, missing; fish spawning.

The following schedule gives in summarized form the number of tagged herring released in each locality during the fall and spring tagging operations, all of which took place on the south-east and west coasts of Vancouver Island:—

SOUTH-EAST COAST.				WEST COAST.	
Fall, 1936.		Spring, 1937.		Spring, 1937.	
Sooke	1,500	Horswell Point	700	Barkley Sound	2,098
Swanson Channel	4,790	Tod Inlet	1,198	Nootka Sound	1,697
Trincomali Channel	2,300			Kyuquot Sound	1,000
				Ououkinsh Inlet	898
	8,590		1,898		5,692

The localities in which the tags were inserted are shown on the accompanying map (Fig. 4).

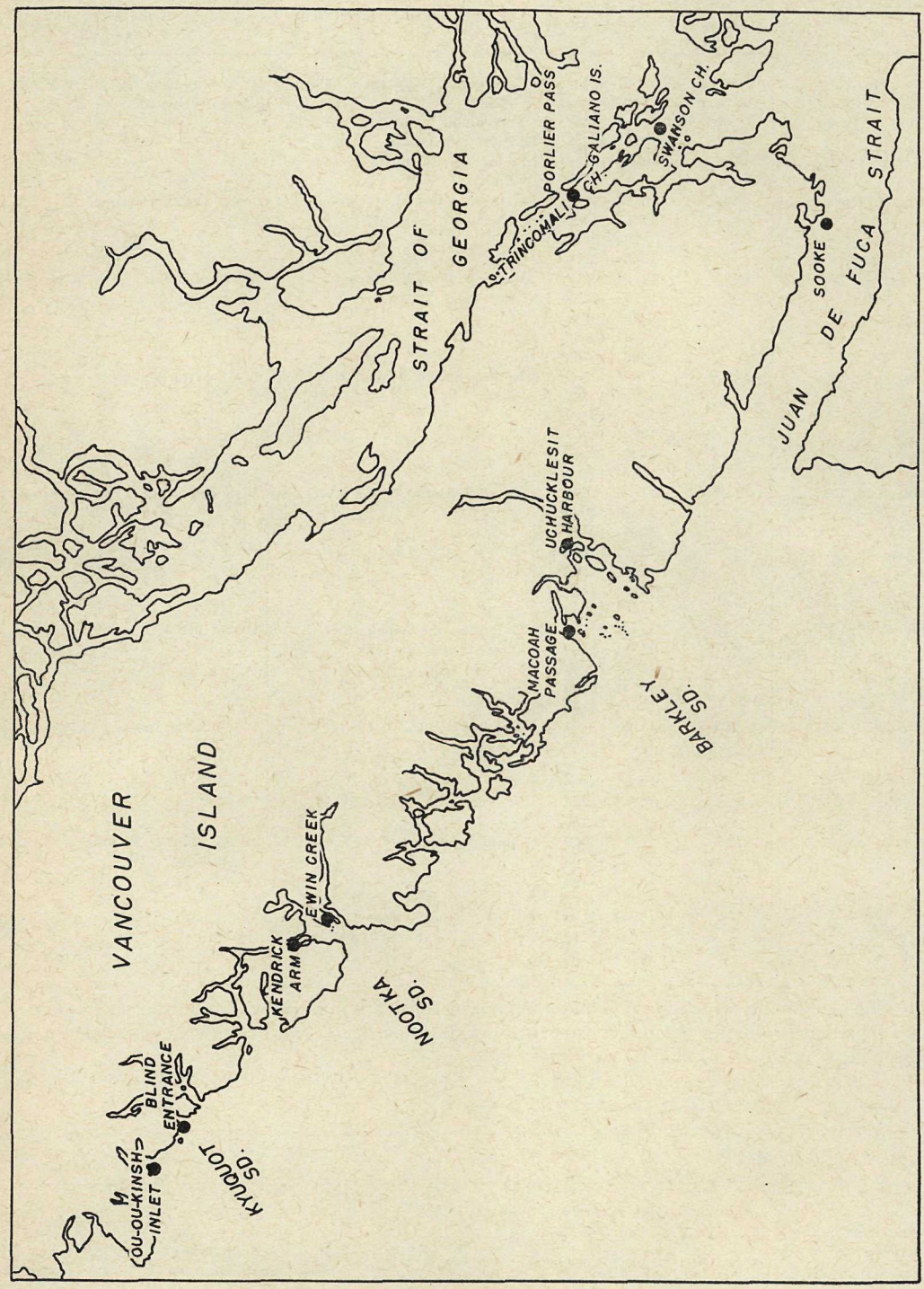

Fig. 4. Map of the localities in which tagging took place (shown as black dots).

INDUCTION DETECTOR.

Even if the herring-tags were applied to the outside of the fish, it would be practically impossible to pick a tagged fish from the several million untagged individuals which pass through a saltery or reduction plant in one season unless some mechanical aid were available. This was furnished by the induction detector which was installed in a saltery at North Galiano Island, on the south-east coast of Vancouver Island, during the fall of 1936.

The equipment consists essentially of a pair of rectangular compound coils of wire in water-proof cases, two control cabinets of electrical equipment (Fig. 5), a trap-door operated by a compressed-air piston, a four-way pneumatic valve operated electrically by a solonoid, an air-compressor, and a motor-generator unit. An inclined chute is built between the head of the elevator and the horizontal conveyor leading to the salting-tanks. Towards the top of this one of the compound coils is inserted in such a way that the fish will pass through it on their way down the chute. About 50 cm. (20 in.) down the chute from the coil is installed a trap-door made of heavy fibre-board (" Masonite "), pivoted at the centre transverse to the chute and connected from below towards its lower end to a piston (Fig. 6). When the piston

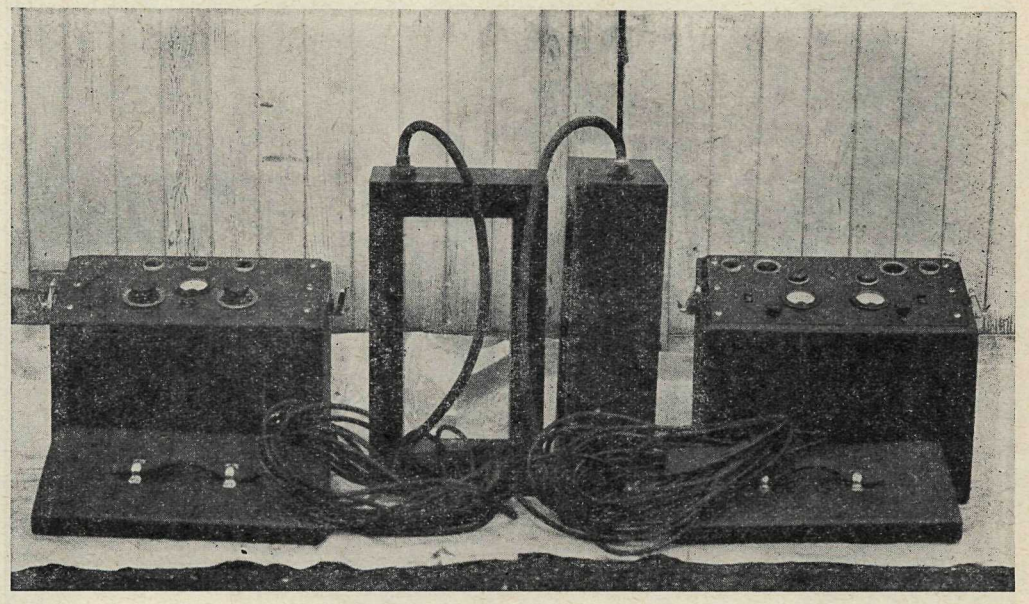

Fig. 5. Part of the recovery apparatus—the cabinets of electrical equipment and the compound coils.

is extended, the lower edge of the trap-door swings up and the upper edge swings down about the pivot, forming a barrier at right angles to the flow of fish and deflecting the flow downwards into a by-pass chute leading to a bin off to one side. The piston is operated by compressed air and its action is controlled by means of the pneumatic-solonoid valve, a mercury switch attached to the under-surface of the trap-door, and relay systems in the cabinets of electrical equipment. In constructing the chute and installing the coil and trap-door, copper or brass is used throughout in order that the magnetic field about the coil will be influenced as little as possible. The second compound coil is suspended from a beam a short distance from the chute. The control cabinets are kept in a small heated room built near the conveyor. A diagram of the apparatus is given in Fig. 7 and part of the actual installation is shown in Fig. 8.

Each compound coil has two windings and these are arranged in Wheatstone-bridge formation. Alternating current, supplied by the motor-generator unit, is stabilized, passes through the coils, and the two phases are held in delicate balance by variable resistances and condensers in the control cabinets. When the machine is in operation, the coils are " balanced " and the trap-door is held closed by the piston, air being forced into the cylinder from above.

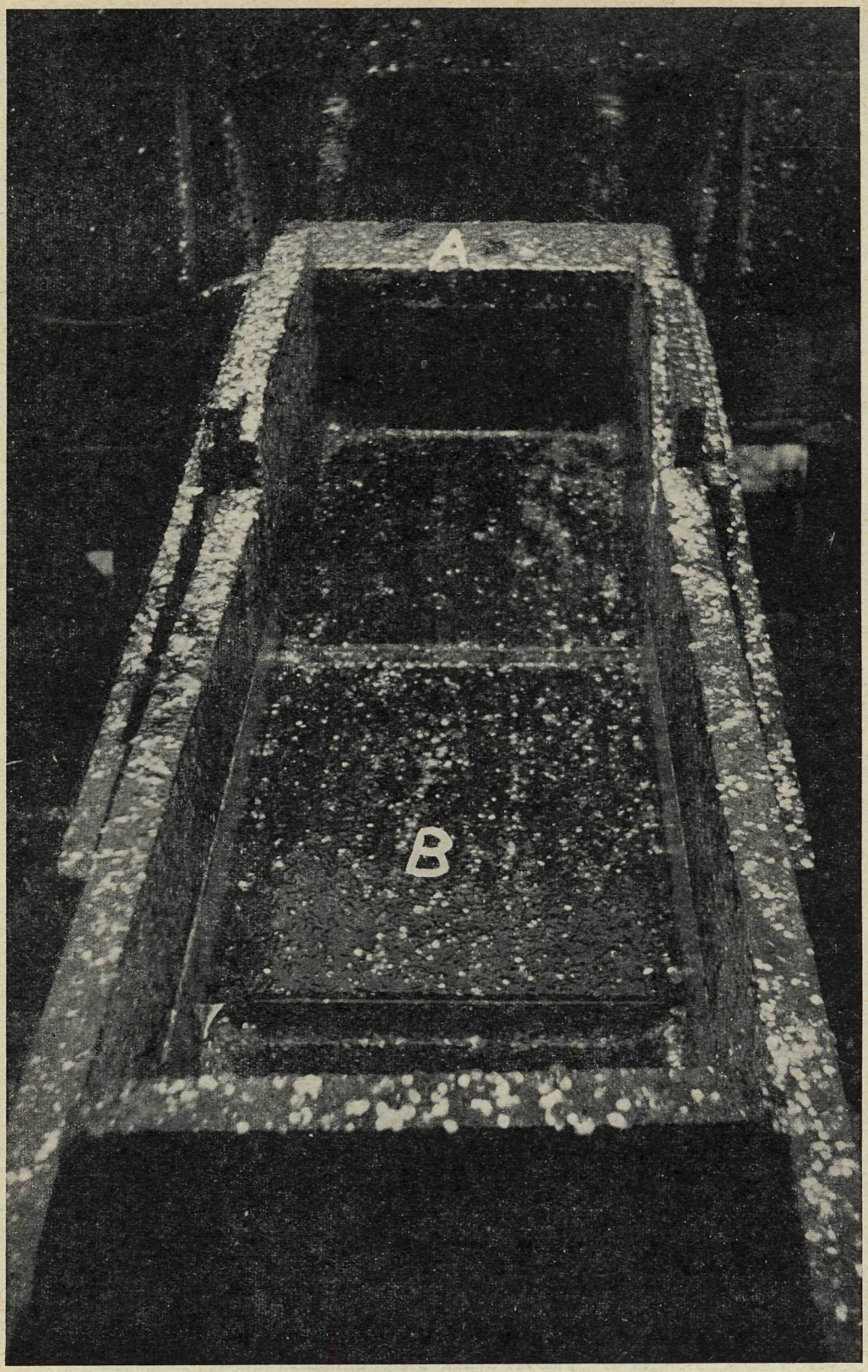

Fig. 6. The chute between the elevator and the horizontal conveyor showing the coil (A) and the trap-door (closed) (B).

Fish pass up the elevator, drop to the chute, pass through the coil, over the trap-door, and drop to the horizontal conveyor. When a tagged fish passes through the coil, the metal tag changes the magnetic field about the coil and throws it momentarily "out of balance" in respect to the other coil. The disturbance is amplified, detected, reamplified, and momentarily closes a sensitive relay which in turn closes a latching-relay and allows direct current to pass through the solonoid of the pneumatic valve and through the mercury switch on the under-surface of the trap-door. When the solonoid is energized a plunger in the valve is raised; this allows air to pass into the bottom of the cylinder and at the same time allows it to escape from the

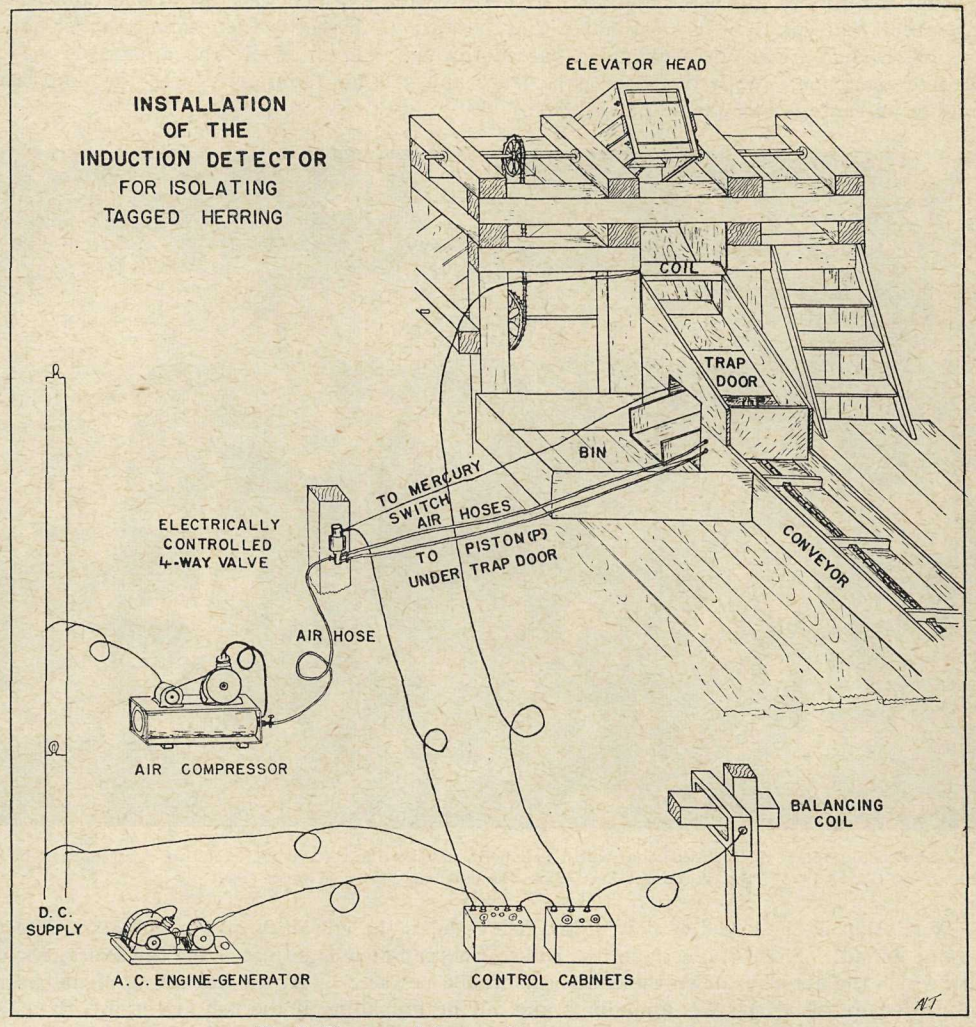

Fig. 7. Diagram of the complete recovery apparatus.

top, causing the piston to be forced up and the trap-door to open. When the door opens to a certain aperture, the current passing through the mercury switch is cut off and this opens the latching-relay, cutting off the current from the solonoid in the pneumatic valve, causing the plunger to drop, air to be forced into the top of the cylinder and exhausted from the bottom, thus forcing the piston down and the trap-door shut again. The machine is now ready for the reception of another impulse through the coil. The whole operation, from the "unbalancing" to the restoration of balance and the closing of the trap-door, takes less than two seconds. The tagged fish which creates the disturbance, along with about one hundred other fish, drops through the opening, down the by-pass chute, and into the retaining-bin before

the trap-door closes and the normal flow over the trap is restored. When unloading is not under way the fish in the bin are passed down the chute a few at a time, or, if only a few are present, they are passed through the coil one at a time by hand, until the tagged fish is finally isolated. The fish is then cut open and the tag is removed.

The efficiency of the induction detector in recovering tagged fish has not been definitely ascertained as yet. During this first season of operation, a number of mechanical difficulties were encountered and the machine had to be shut off several times during the process of unloading to make adjustments and repairs. In addition, the detector had to be rebalanced at about ten-minute intervals, and during this procedure, which took up to one minute, the trap circuit was cut off. It is estimated that, because of these two factors, only about 85 per cent. of the fish which were unloaded passed through the coil while the apparatus was in effective operation. With increased experience and greater familiarity with the apparatus, a higher percentage run should be obtained.

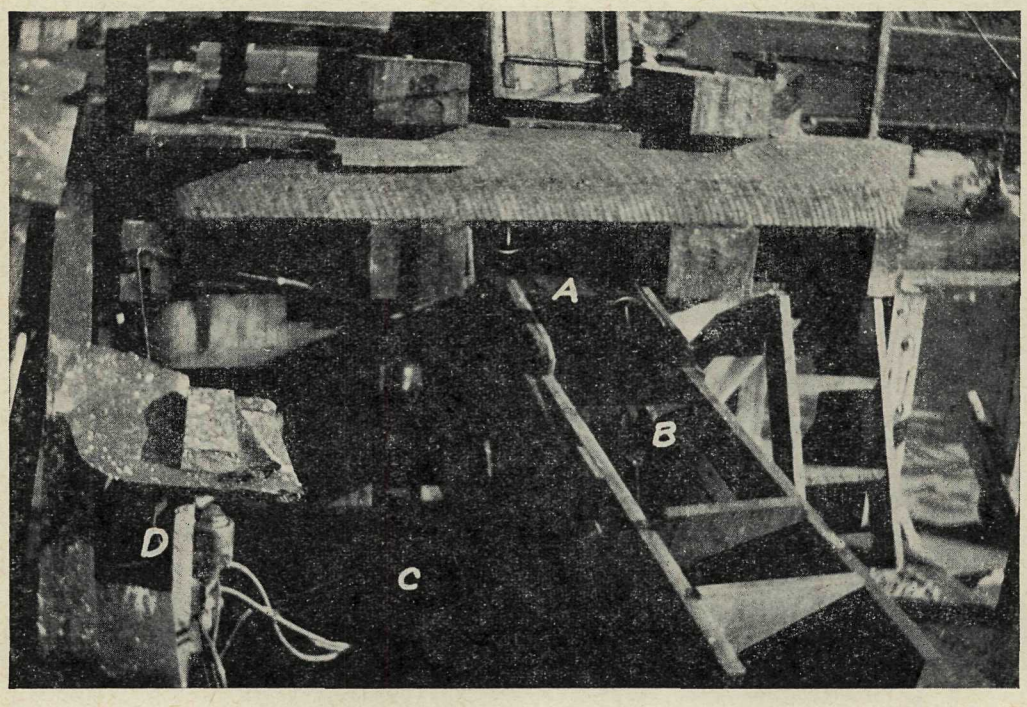

Fig. 8. Photograph of the installation at North Galiano Island showing the coil (A), the trap-door (open) (B), the retaining bin (C), and the pneumatic-solonoid valve (D).

Variation in the speed of flow of the fish reduces the efficiency of the induction detector to some extent. The distance from the coil to the trap-door is adjusted for the average speed with which the fish pass down the chute (about 100 per sec.). At the beginning of unloading, before the chute becomes wet and slimy, and during unloading if the fish are sticky, the speed is retarded and a tagged fish may reach the trap after the door has closed. This difficulty may be overcome to some extent by passing a stream of water down the chute to make the fish slide more easily. However, even under normal conditions, the speed of the flow is more rapid at the centre than towards the sides of the chute and a tagged fish may not be trapped if it happens to pass close to one side or the other. This difficulty is reduced by adjusting the mercury switch to increase the gape of the trap-door and its time of swing, although the task of isolating the tagged fish is rendered more difficult because more fish are trapped. If, as sometimes happens, the elevator is loaded to capacity, a few fish on falling to the chute rebound and land on the trap-door. If one of these happens to contain a tag, the trap-door will operate after the fish has passed over. The difficulties caused by variation in the rate of flow are again present when the fish which have been by-passed are rerun through the apparatus,

and in at least two known cases tagged fish have been lost because the trap-door opened and closed too soon or too late.

In all cases of possible loss of tagged individuals discussed in the preceding paragraph the tags have been assumed to create the electrical disturbance necessary for the operation of the trap-door. Some tags may also be lost because of failure to do this. If the tag inside the fish passes through the coil so that its long axis is exactly parallel to that of the coil—i.e., transverse to the chute—no impulse will be generated. Apart from this one position, the reaction will be obtained regardless of the speed of transit, provided that the coils are held in delicate balance.

During the coming season it is planned to plant a known number of tags in each of several scow-loads of fish in order to determine experimentally the average efficiency of the recovery apparatus.

RECOVERY OF TAGS.

Although the fishing season on the south-east coast of Vancouver Island extended from October 1st to November 27th, 1936, the installation of the induction detector at a saltery on North Galiano Island was not completed until November 1st, and, due to subsequent mechanical difficulties, the machine was operating effectively for only the last three weeks of fishing (November 8th to 27th, 1936). The estimated daily catch of the plant, the estimated tonnage tested for tags, the locality in which the fish were caught, and the serial numbers of the tags which were recovered are given in Table II. The number of recoveries per day from each tagging is shown in Table III.

TABLE II.—DATA ON HERRING-TAG RECOVERIES DURING 1936–37.

Date of Capture, 1936.	Estimated Tonnage caught.*	Estimated Tonnage tested.*	Locality of Fishing.	Recoveries, Serial No. H.
Nov. 8	240	176	Trincomali Channel, off Porlier Pass	----------
Nov. 9	110	99	Trincomali Channel, off Porlier Pass	4895
Nov. 10	240	204	Trincomali Channel, off Porlier Pass	4871, 4994, 5917, 5982
Nov. 11	30	15	Trincomali Channel, off Porlier Pass	----------
Nov. 12	30	29	Trincomali Channel, off Tree Island	4950
Nov. 12	120	86	Pylades Channel	----------
Nov. 13	140	136	Pylades Channel	----------
Nov. 15	70	63	Trincomali Channel, off Porlier Pass	5264, 5308
Nov. 16	210	203	Trincomali Channel, off Porlier Pass	4892, 5101, 6015, 7665
Nov. 17	195	182	Trincomali Channel, off Porlier Pass	4865, 5241, 5353, 5697, 7605, 7773
Nov. 18	60	58	Trincomali Channel, off Porlier Pass	4878, 5049, 5733
Nov. 20	60	51	Swanson Channel	----------
Nov. 21	100	40	Trincomali Channel, off Porlier Pass	8107
Nov. 22	100	90	Trincomali Channel, off Porlier Pass	4972, 5250, 6354, 7606, 7647, 7904, 8775
Nov. 23	15	6	Trincomali Channel, off Porlier Pass	----------
Nov. 24	30	27	Trincomali Channel, off Porlier Pass	4855, 5623, 7955
Nov. 25	25	15	Trincomali Channel, off Porlier Pass	----------
Nov. 26	40	39	Trincomali Channel, off Porlier Pass	5894, 8285
Nov. 27	140	133	Trincomali Channel, off Porlier Pass	4977, 7571, 7635, 7692, 8211, 8233, 8288, 8720, 8986
Totals	1,955	1,652		

* Approximate.

TABLE III.—THE NUMBER OF RECOVERIES FROM EACH TAGGING DURING 1936–37.

Date, 1936.	Sooke, Oct. 15 (1,500).	Swanson Channel, Oct. 6–20 (4,790).	TRINCOMALI CHANNEL, NEAR PORLIER PASS.			
			Nov. 8 (300).	Nov. 12 (1,200).	Nov. 18 (500).	Nov. 19 (300).
Nov. 8	------	------	------	------	------	------
Nov. 9	------	------	1	------	------	------
Nov. 10	------	------	4	------	------	------
Nov. 11	------	------	------	------	------	------
Nov. 12	------	------	1	------	------	------
Nov. 13	------	------	------	------	------	------
Nov. 14	------	------	------	------	------	------
Nov. 15	------	------	------	2	------	------
Nov. 16	1	------	1	2	------	------
Nov. 17	------	------	1	5	------	------
Nov. 18	------	------	1	2	------	------
Nov. 19	------	------	------	------	------	------
Nov. 20	------	------	------	------	------	------
Nov. 21	------	------	------	------	1	------
Nov. 22	1	------	1	3	1	1
Nov. 23	------	------	------	------	------	------
Nov. 24	------	------	1	1	1	------
Nov. 25	------	------	------	------	------	------
Nov. 26	------	------	------	1	1	------
Nov. 27	------	------	1	3	4	1
Totals	2	------	12	19	8	2

During the three-week period, all of the fish passing into the saltery were taken in Trincomali and Pylades Channels near Porlier Pass, with the exception of 60 tons from Swanson Channel. From approximately 1,652 tons which were tested forty-three tagged herring were recovered. Of these, forty-one were released from November 8th to 19th in Trincomali Channel and were recovered from November 9th to 27th in the same area. The remaining two were released at Sooke, in the Strait of Juan de Fuca, on October 15th and were recovered from Trincomali Channel on November 16th and 22nd. Of the large number of fish tagged at Swanson Channel from October 6th to 20th, not one was recovered from catches made in Trincomali Channel nor from the one catch made in Swanson Channel. From Table III. it may be seen that the largest number of tags was recovered from the largest tagging (November 12th), but that, as might be expected, the greatest percentage recovery (4 per cent.) was made from the earliest tagging (November 8th) in the Trincomali area. It may also be seen that often tags from two, three, or all four separate taggings were present in the same catch.

DISCUSSION.

The initial attempt at tagging herring with metal " belly " tags and recovering the tagged fish by means of the induction detector has demonstrated the feasibility of applying the methods to British Columbia herring. In addition, the results have already yielded some information of value. The two recoveries from the Sooke tagging show a migration of some fish from the Strait of Juan de Fuca to Trincomali Channel near Porlier Pass, a distance of approximately 65 nautical miles. The lack of recovery of Swanson Channel tags indicates that the herring fished in Trincomali Channel were not those which were being fished in Swanson Channel, 20 nautical miles to the south, while tagging was going on. The fact that tags from several different taggings at Trincomali Channel were recovered from the same catches indicates that considerable intermingling of the fish took place on the grounds.

It is hoped that the tagging and recovery programme, in addition to yielding information on the extent of intermingling and migration, will give some indication of the " fishing mortality." An example will show how this may be accomplished. Of the 300 tags inserted on November 8th at Trincomali Channel, twelve were recovered during the period November 9th to 27th from 1,425 tons of fish taken on the same ground (1,652 less 176 and 51 tons taken on November 8th and 20th). Now, the total catch by all plants during the same period in

this area was approximately 5,441 tons. In this tonnage there were probably forty-six tagged fish (12 by 5441/1425), representing a probable recovery of 15 per cent. if the total catch had passed through the machine. From this calculation it would appear that the fishermen must have caught about 15 per cent. of the fish which were present on the grounds during the interval. However, this value is definitely a *minimum,* for in its calculation allowance is not made for tagged fish which might have passed through the apparatus undetected, for fish which died as a result of tagging, or for the movements of fish on and off the fishing-grounds. It is likely, therefore, that between November 9th and 27th the fishermen took considerably more than 15 per cent. of all the fish on this particular ground.

In calculations such as the above it is very important to have a reliable estimate of the number of fish which die as a result of handling and tagging, or the "tagging mortality." Initial experiments to determine this have already been performed and a preliminary account of the results has been published (Hart and Tester, 1937). This investigation will be continued during the next fishing season if opportunity permits.

Plans have been made for the installation of a second induction detector in the conveyor system of a reduction plant in Barkley Sound, on the west coast of Vancouver Island. Electromagnets have already been installed in the meal-lines of reduction plants in several localities on the west coast of Vancouver Island in connection with the pilchard investigation (Hart, 1937), and these will also be used for the recovery of herring tags during the season 1937–38. The two detectors, together with the electromagnets, should make possible the recovery of tags inserted on the east coast in the fall of 1936, on the east and west coasts in the spring of 1937, and those to be inserted on the east and west coasts in the fall of 1937. The results of the coming season should be of great interest and value in providing information on the movements of herring and the fishing mortality.

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REPORT ON SALMON-SPAWNING GROUNDS, 1936.

By J. A. Motherwell.

Generally speaking, the year of 1936 has been an unusually favourable one from the standpoint of conditions found on the spawning-beds of the salmon. Of course, there have been exceptions where conditions have not been all that might be expected, but in the areas frequented by the valuable sockeye species, for instance, the catch in the year under review has been the largest since 1930, but notwithstanding this fact the quantities found on the spawning-grounds were found to be highly satisfactory.

Efforts of the Department with a view to assuring of the escapement of a reasonable percentage of the several runs by means of closed times and the moving of boundaries farther down the main rivers and farther out from the mouths of smaller streams are undoubtedly producing the results desired, and there need be little fear of the salmon-supply of the Province being seriously depleted as long as it is possible to maintain the machinery at present in force for the purpose of enforcement of regulations.

A more detailed description of conditions is given as follows:—

QUEEN CHARLOTTE ISLANDS.

There is no commercial fishing of sockeye in these waters, but the supply which reaches the two or three small streams and which is used largely by local residents for their own food purposes is being maintained.

Cohoes do not use the streams in this area to any large extent, but the escapement was normal.

The pink variety is the one which utilizes spawning areas in the Queen Charlottes to the greatest extent, and in the year under review the escapement was found to be excellent, generally speaking, apart from an odd stream. The Yakoun River, which is the one which produces the largest number of pinks, was found upon examination by the inspecting officer to be crowded with pinks. The number found was considerably in excess of what might be expected from the pack. The quantity caught, of course, is largely dependent on tidal and weather conditions.

The chum-supply on the spawning-grounds was found to be heavier than usual. There is no doubt that the precautions taken during recent years by the Department are restoring the runs of this variety to their original state.

NASS RIVER.

The numbers of sockeye reaching the spawning-grounds of the Meziadin Lake District are reported as being larger than that of the past fifteen or twenty years. There was also a heavy escapement to that portion of the Nass watershed lying above Meziadin Lake. This year's escapement would appear to be additional evidence showing that the lowering of the boundary in the Nass River by 6 miles was a most efficient method of conservation. The spring-supply was heavier than for several years past and can be considered as quite satisfactory.

The number of cohoes found was considerably greater than that of four years ago and the escapement is reported as being heavy.

The pinks also reached the spawning-grounds in large quantities and the escapement is reported to be considerably greater than that of the brood-year of 1934, both in the Nass River proper and the streams tributary to Portland and adjoining inlets.

The chum-supply also on the spawning-grounds was found to be large, both in the spawning-grounds of the Nass River and the streams draining into the salt water. The escapement was greater than in recent years.

SKEENA RIVER.

At Lakelse Lake there was a heavy escapement which was estimated to be considerably greater than that of the brood-year of 1932. The fact that the hatchery was not operating during the season would, of course, permit to pass to the spawning-grounds a number of fish that would otherwise have been taken in the fish-cultural operations. Even so, the escapement was very good.

In the Kitsumgallum area the supply was also good and better than that of the cycle-year.

In the Babine Lake and River areas the sockeye escapement was reported as being fairly heavy and very similar to the spawning of 1931 and 1932. The inspecting officer reports in part as follows:—

"I would consider that this has been a very favourable year with plenty of fish that spawned freely under very favourable conditions, with lots of water covering the areas and going into the fall well covered. I am of the opinion that this has been the best year, in respect to natural conditions, that I have seen on the area; areas covered with plenty of water during and after the spawning, and practically no frosts; while there were freshets, no extremes; on the whole, large fish, and the sexes fairly even."

Quite a satisfactory supply of springs and cohoes were also found on the spawning-grounds and a particularly large number of the former variety in the Ocstahl River. The quantities of the latter variety were found to be much better than for several years. The season was an "off" year for the pinks to the upper portions of the Skeena, but heavy escapement took place all over the lower reaches of the Skeena watershed and the escapement of this variety in general was superior to that of the preceding cycle-year.

The supply of chums was better than usual and it is reported as a heavy run for the area, although large quantities do not use the Skeena River spawning-grounds.

The upper fishing boundary of the Skeena River in the year under review was lowered to a line between Lambert Point and Mowitch Point in order to secure the escapement of a larger percentage of the runs of the several varieties. This action appears to have obtained the results desired, judging from the reports from the spawning areas.

LOWE INLET.

The sockeye streams and lakes in this area are quite near the coast and the streams are affected more than the larger ones by the rainfalls, or lack of them. During this season conditions were good, from the standpoint of water, and the escapement of sockeye was reported as heavy, with the exception of the streams on the west coast of Banks Island. Precautions will be taken in the cycle-year, however, to see that a reasonable percentage of the return of fish pass unmolested to the spawning-grounds.

The supply of pinks was found to be quite satisfactory and there was a heavy escapement, reported to be much greater than 1934, the brood-year, and similar to the big escapement of 1930. It will be remembered that in this area special precautions have been taken in recent years to assure protection for the pink salmon in view of the intensive fishing which has prevailed for some time.

The chum-supply is also reported as heavy and similar to that of four years ago.

BUTEDALE AREA.

This is not a prolific sockeye area, but the escapement was similar to that of the brood-year.

The escapement of cohoes was better than usual and was no doubt due to the closing of fishing unusually early.

In the case of pinks, all the streams in the Douglas Channel area were heavily seeded. The supply in the southern portion of the area, however, was not so great, but due to the fishing operations being concentrated largely in the northern portion the percentage of escapement was greater and the conditions are reasonably satisfactory. The escapement generally all over the area is reported as a decided increase over that of the brood-year.

In the case of the chums, the fishing intensity was considerably less as a result of lack of demand by the canners. A large percentage of the runs escaped to the spawning-grounds and the supply found was large, although possibly not equal to the unusually large escapement in the year 1932.

BELLA BELLA AREA.

The sockeye-supply on the spawning-grounds is reported as being heavier and greater than that of the brood-year. Fortunately, the streams were high during the run and the salmon were able to pass directly to the spawning-grounds instead of waiting around the mouths of the streams, as always happens in dry seasons.

The cohoe-supply in this area as well was reasonably good, as fishing was closed earlier than usual and the streams were high when this variety of salmon arrived.

In the case of the pinks, the fishing effort was greatly curtailed as supplies were more plentiful in other areas. This permitted a large percentage of the run to pass safely to the spawning-grounds. The main pink-streams were well seeded and the small streams fairly so.

The bulk of the chum run arrived after the closing date of September 25th and passed unmolested to the spawning-grounds. The main spawning areas were well seeded.

BELLA COOLA AREA.

The escapement of sockeye as compared to the brood-year of 1932 was heavy. Undoubtedly the strike of the gill-net fishermen had a good deal to do with the satisfactory escapement.

The spring supplies were found to be fair, but there has never been a large run of this variety to this area.

The cohoe escapement is reported as quite heavy, although the pink-supply was only fair and not equal to the brood-year of 1934.

Large quantities of chums were found on the spawning-grounds. Unfortunately, since the spawning of the salmon, there have been unusually severe freshets in the Bella Coola area, resulting in the destruction of large quantities of eggs. Precautions will be taken to see that in the cycle-year provision is made for the escapement of a reasonable percentage of the runs.

RIVERS INLET AREA.

The supply of sockeye in this important gill-net area has been maintained well during recent years. This season, due to a strike amongst the gill-net fishermen, the bulk of the sockeye were enabled to pass unmolested to the spawning-grounds and the resultant spawning, as might be expected, was heavy. A disquieting factor, however, has been a freshet, the severity of which has not been known for many years. Undoubtedly quite a percentage of the eggs deposited in the gravel have been destroyed, and this may nullify to some extent the excellent results which might be expected four and five years hence.

In this area also the escapement of cohoes was better than usual due to the early closing of fishing, although the supply found on the spawning-grounds was not as great as might be desired.

The pinks and chums do not frequent the Rivers Inlet area in any large quantities, but the numbers found on the spawning-grounds would justify the conclusion that the runs are being maintained.

SMITH INLET AREA.

The same conditions in this area, from the standpoint of striking fishermen, obtained as in the case of the Rivers Inlet area, and a greater percentage of the sockeye was permitted to pass safely to the spawning-grounds, where large quantities were observed spawning under favourable conditions.

There was a larger number of springs observed than usual, although the quantity of this variety frequenting Smith Inlet area does not justify at the present time intensive fishing.

The cohoe-supply has never been a very important one, but the run appears to be maintaining itself.

The pink-supply, although never heavy, was not quite as good as usual.

The chums do not appear in large quantities in the inlet, apart from the Takush River. The escapement for this season was quite a heavy one at that point and is undoubtedly the result of the closure of fishing which has been in effect for four years.

FRASER RIVER WATERSHED.

The escapement of sockeye to the Fraser River spawning areas was much larger than expected. It is difficult to explain the situation, as the indications on the spawning-grounds in the brood-year of 1932 did not justify the expectation of so large a seeding. The quality of a very large percentage of this run was unusually high and compared very favourably with that of the previous big fourth-year run, now a thing of the past. This being the case, it was suggested that possibly these salmon were heading for the upper reaches of the watershed, which was the area to which the big fourth-year run ascended for spawning purposes. The usual examinations of the spawning-grounds, however, showed very clearly that there was

no merit in this suggestion, as the quantities found in the Quesnel, Horsefly, Bowron Lake, Stuart Lake, and Francois Lake District showed no appreciable increase over recent seasons. There was, however, a considerably larger supply than expected found in the spawning areas of the Pemberton and Pitt Lake Districts and an unexpectedly large return to the Seton-Anderson Lake system, whilst in the Chilko Lake area, where four years ago some 70,000 sockeye had been estimated, there was this year found at least an equal supply, and probably more.

Water conditions at Hell's Gate were unusually favourable all through the summer and salmon found the ascent past this point easier than usual.

Each year there has been a run of sockeye by way of Johnstone Strait, which is between Vancouver Island and the mainland, in addition to the bulk of the run by way of Juan de Fuca Strait and Puget Sound waters. Undoubtedly in the year under review the number using the first-mentioned route was somewhat greater than usual and must have been responsible for a considerable portion of the unexpected supply reaching the Fraser spawning-grounds. On the other hand, it is probable that the restriction placed on fishing-gear in the Puget Sound waters has had the effect of permitting a larger percentage of the run passing through Puget Sound waters to reach the Fraser River.

Spring salmon were found in numbers greater than during recent years on the spawning-grounds of the Fraser, and this also applies to the quantity of chums in all the spawning-grounds in District No. 1 frequented by this variety.

Cohoes.—The supply, generally speaking, was not found to be satisfactory, but indications were that due to the unusually low water in the streams frequented by this variety they had not passed up to the usual spawning-grounds. Salmon-fishing was therefore closed in the Fraser District until the rains provided sufficient water to fill the streams. There are cohoe on the spawning-grounds of the Fraser River watershed as late as February and March in each year.

The year 1936 was the " off " year for the pink run and none was found.

In more detail, conditions found during 1936 were as follows:—

Prince George Area.—In the Stuart Lake District there were extremely few sockeye found. The supply reaching the Fraser-Francois Lake watershed was less than expected and about six weeks later in arriving than in recent years. These were observed during the last week in September.

Quesnel Area.—In the Bowron Lake area indications were that more sockeye were observed than in recent years, although not more than 1,000 were seen. In the Quesnel Lake area also the supply was a disappointment, but conditions found in the brood-year were not encouraging. It is estimated that 70,000 spawning sockeye were observed on the beds in Chilko Lake. This was the main run, but a later run passed up the Chilko River in October. It was estimated at possibly 4,000 fish. The first were in good physical condition, but the second were very weak.

The supply of springs in the Quesnel area, generally speaking, showed considerable improvement over that of recent years.

Kamloops Area.—Although sockeye ascend the North Thompson River, this branch is not considered one of the very important spawning areas. The supply this year was reasonably satisfactory; in fact, at Raft River, those living in the district contend that there were more sockeye observed this year than for the past twelve seasons. The Clearwater River was inspected more thoroughly this year than before in order to ascertain whether it is used by sockeye. None of this variety was observed, however.

The South Thompson system, as in the past, contained larger quantities of sockeye than the North Branch. Favourable conditions make it possible to estimate pretty accurately the quantity of salmon seen. At Adams River the number of spawning sockeye seen was estimated at 4,000, as compared with 2,000 in the cycle-year of 1932. These made their first appearance on October 18th, in a fairly advanced stage towards spawning.

At Little River it is estimated some 2,000 sockeye were observed. In this district also the supply of springs found on the spawning-grounds was quite satisfactory, compared with recent years, and cohoe could be seen in reasonable quantities all over. The run of this variety extends over several months in the fall, and at the time of inspection it was not possible to obtain a complete picture.

Hope Area.—Sockeye were first observed in the vicinity of Yale on July 10th and from that date on the run steadily increased, with the local officer reporting a heavy escapement through Hell's Gate and past the rapids in the Fraser River at the confluence with Bridge River.

Apparently there was no difficulty in passing through Hell's Gate as the water conditions during the whole run were unusually favourable. The local officer, who has been observing the conditions at Hell's Gate for the past twenty years, is satisfied that the sockeye run ascending to points above Hell's Gate was heavier than for any previous year since 1913.

An unusual feature in this sub-area was the unexpected large quantity of sockeye reaching the Seton-Anderson Lake system. For many years past there have been observed no more than 200 or 300 individual spawners, but during the season just past the number found was estimated at approximately 12,000 fish. This is the greatest number found in the past twenty years. They commenced to arrive in the middle of August and continued until about the third week in October. Spawning took place in Gates Creek, Portage Creek, and Seton Creek. Some small schools were observed on the lake-shore at the mouths of some very small streams.

The spring-salmon spawning in this sub-area was also heavier than usual.

Pemberton-Birkenhead Area.—Although a good seeding was expected, the supply of sockeye found this year was considerably larger than usual, and it was estimated by those observing to be the largest in the past twenty years. The fish individually were large also.

The Harrison Lake portion of the area, which includes Morris Creek, Silver Creek, and Harrison River, showed quite a good supply of sockeye in comparison with the run of recent years.

Cohoes in satisfactory quantities were also observed, although the supply of spring salmon was only fair.

The supply of chums in Harrison Lake and River was found to be unusually heavy.

Cultus Lake.—The return of sockeye to the Cultus Lake was larger than expected and considered quite satisfactory. The normal supply passed up the Chilliwack River to the lake of that name.

The chum run to this area was quite good and the cohoes were found to be abundant.

Chilliwack-Pitt Lake Area.—In the Pitt River the run of sockeye was reported to be larger than expected and the individual fish were big. There is no doubt but that the Pitt system will receive a heavy seeding.

Coastal Streams.—In the Serpentine and Nicomekl Rivers, draining into Boundary Bay, cohoes were found to be more plentiful than usual.

In the Howe Sound area a very large supply of chum salmon arrived; in fact, it is reported as the heaviest for twelve years.

These conditions also apply in a lesser degree to the Indian River at the head of Burrard Inlet.

ALERT BAY AREA.

The quantity of sockeye found on the spawning-grounds of the Nimpkish River system was much greater than for many years owing to comparatively light fishing as a result of a strike amongst the salmon purse-seine fishermen. The inspecting officer reports the spawning-grounds as being crowded with sockeye, with large numbers still showing in the various lakes. In Fullmore River, Port Neville, the supply was greater than in any year since 1928. Spawning at McKenzie, Nahwitti, Shushartie, and Keough Rivers was normal, but in the Kakweiken River there was some falling-off compared with the brood-year.

The beds frequented by the spring variety can be considered as being fairly well supplied.

The cohoe-supply was satisfactory in all the streams usually frequented by them.

In the case of pinks the run was estimated at about 20 per cent. greater than that of the brood-year, generally speaking, although the seeding was not so heavy at Wakeman and Kingcome Rivers.

In the case of chums the seeding generally was heavier than for many years, the inspecting officer estimating an increase of 25 per cent. over the heavy run of the brood-year of 1932. The supply to the Nimpkish area is reported as being the largest in twenty years.

QUATHIASKI AREA.

Sockeye in this area spawn at Hayden Bay Lake and in the stream entering the head of Phillips Arm. In the former area the supply was much heavier than the brood-year of 1932,

but in Phillips Arm the quantities were not so great as in the brood-year. Due to lack of intensive fishing, however, the seeding was satisfactory.

Good runs of springs occurred at Campbell River and Phillips Arm, and the spawning-grounds generally throughout the area were better seeded than during the previous season with this variety.

The cohoe-supply was not what could be desired, except at Bute Inlet, where there was a good spawning. In the remainder of the area the conditions were not so satisfactory.

As a result of the heavy freshets of the winter of 1934–35 and the consequent scouring of the spawning-beds, the return this season of pinks was considerably smaller than usual, but the escapement was large and under the circumstances there was a reasonably good seeding.

The chum run was reported to be heavier than for four yars. Fishing was not intensive and the spawning areas have been better seeded than for many years.

PENDER HARBOUR AREA.

Saginaw Creek is the only sockeye-stream of any value and there was a normal supply found of this variety on the spawning-beds, as well as at several other minor streams.

The run of cohoe was fairly light, but a good proportion escaped to the spawning-beds.

The pink run was lighter than that of the brood-year, due to the scouring of the spawning-beds in the winter of 1934–35. The return was estimated at only about 75 per cent. of the run two years previously, but owing to there being practically no fishing of this variety the escapement was quite satisfactory.

All streams throughout the area were plentifully seeded with chums.

COMOX AREA.

The Puntledge River received a larger supply of springs than for some years. Spawning was satisfactory in the usual area below the impounding-dam, but considerable numbers spawned in the lower portion of the river. This was due to low-water conditions.

The cohoe-supply was normal in all the streams of the area, although late in ascending, due to low water.

The Oyster, Puntledge, and Tsolum Rivers, which are the main pink-streams in the area, received only from 5 to 10 per cent of the usual supply of pinks. The only exception was in the case of Tsable River. This condition is the result of the heavy floods of 1934.

The chum spawning at all streams was heavier than for many years.

NANAIMO AREA.

The seeding of springs was greater than for several years.

Cohoes were not as numerous as the supply four years previously, but due to low-water conditions they were late in arriving and at the time of inspection were still passing up the streams in good numbers. Extra precautions were taken, particularly opposite the Qualicum Rivers, by means of the 2-mile boundary, to assure of a proper escapement.

The pink seeding, whilst light, was better than for several years.

The chum run to Nanaimo River was much better than that of the brood-year, and this condition was fairly general, although low-water conditions interfered somewhat with the ascent of the fish.

LADYSMITH AREA.

Springs spawned in greater numbers in Chemainus River than for several seasons. This is the main stream in the area.

A good average supply of cohoes was found in the Chemainus River and satisfactory quantities appeared in Bonsall and other smaller streams.

There is only a light run of pinks to the Chemainus River at any time, but the supply found on the spawning-grounds showed an improvement over that of recent years.

The chum seeding in the Chemainus River was much heavier than that of the past four years. The smaller streams also received reasonable supplies, although some of the early run, due to low-water conditions, were not able to pass up the small streams.

COWICHAN AREA.

The early run of springs occurs during the months of May and June, but, as has been the case in recent years, the run was found to be light, although this year the fish succeeded in

passing up the Cowichan River before the water receded. The main run during August and September was of good average size. These were delayed later than usual, but on the arrival of the delayed rains the salmon were able to pass up to the spawning-grounds. The supply on the beds, however, is not considered entirely satisfactory.

A medium early run of cohoes had difficulty in passing up the river, but eventually succeeded. A good late run, however, was passing safely to the spawning-grounds at the time of inspection.

The chums appeared in larger quantities than for several years and the seeding has been satisfactory.

VICTORIA AREA.

This is chiefly a cohoe and chum area and the supply of both these varieties was normal.

ALBERNI AREA.

The sockeye-supply on the spawning-grounds shows an improvement over all years in the knowledge of the local officers. Notwithstanding the record commercial catch, the escapement to Sproat and Great Central Lake areas was the heaviest in experience, and that to the Anderson Lake system was better than that of the brood-year. This is undoubtedly the direct result of conservation and fish-culture by the Department and shows what can be done.

Spring salmon are reported to have appeared on the spawning-grounds in much greater numbers than for several years, the Somass River and tributaries and the Sarita River receiving particularly large supplies.

The cohoe-streams received supplies comparable with those of the brood-year and the spawning was reasonably satisfactory.

The chum seeding was heavier than for several years, particularly that in the Nitinat District.

CLAYOQUOT AREA.

The seeding of sockeye exceeded that of the brood-year and can be considered as satisfactory.

The springs were not so plentiful as during the past two years, but there was a reasonably good seeding.

The cohoes were quite plentiful and the spawning-beds were well seeded with this variety.

This area is not frequented by any considerable number of pinks, but the normal supply was observed.

The supply of chums was the heaviest seen for a number of years.

NOOTKA AREA.

The sockeye and spring varieties were found in normal quantities in the streams. As a matter of fact, this applies also to the cohoes and pinks. All the streams were heavily seeded with chums and the numbers appearing were even greater than in the brood-year, which in turn was heavier than that of the several preceding seasons.

KYUQUOT AREA.

Sockeyes and springs were found in normal numbers in this area, but the cohoe seeding was a fair average only, compared with that of recent seasons.

The run of pinks to this system is always light, but there was observed probably double the number during the year under review as compared with that of normal seasons.

QUATSINO AREA.

Sockeye do not run in large numbers to this district and the Mahatta River is the one containing the only supply of any particular value. The numbers appearing this year showed an increase over the runs of recent years.

The supply of springs to Marble Creek was lighter than for several seasons. The cohoes, on the other hand, were a good average over the whole area, with an increase in the Rupert Arm and Marble Creek portions.

Pinks were found to be considerably more numerous in some streams than others, and in comparison with the brood-year the run was very fair.

The chum-supply was very heavy and there was a good spawning of this variety.

THIRD ANNUAL REPORT, BRITISH COLUMBIA SALT-FISH BOARD.

The following are the members of the Board, appointed in accordance with the provisions of the Scheme, for the year 1936–37:—

Appointees of the Meal, Oil, and Salt-fish Section, B.C. Division, Canadian Manufacturers' Association.—Mr. Geo. E. Crawford, foot Gore Avenue, Vancouver, B.C.; Mr. A. J. Blackwell, 119 Pender Street West, Vancouver, B.C.

Alternates.—Mr. R. Nelson, 325 Howe Street, Vancouver, B.C.; Mr. J. J. Dorsey, 207 Hastings Street West, Vancouver, B.C.; Mr. G. L. Davies, 1575 Sixteenth Avenue West, Vancouver, B.C.

Appointees of Messrs. Canadian Salt Herring Exporters, Ltd.—Mr. K. Kimura, 217 Dunlevy Avenue, Vancouver, B.C.; Mr. T. Matsuyama, 467 Powell Street, Vancouver, B.C.

Alternates.—Mr. K. Shiraishi, 219 Dunlevy Avenue, Vancouver, B.C.; Mr. R. Suzumoto, 208 Hastings Street East, Vancouver, B.C.; Mr. S. Yoshida, P.O. Box 8, Steveston, B.C.

Mr. Hugh Dalton was reappointed Chairman of the Board by the Deputy Minister of Fisheries, Ottawa, and Mr. G. R. Clark continued as Secretary.

On September 2nd, 1936, the first meeting of the newly appointed Board was held for the purpose of recording officially the appointees of the two producers' organizations. At this meeting the Chairman of the Board was not in attendance, and accordingly the meeting reviewed in general terms the marketing prospects for dry-salt salmon. It was reported that information received from Japan indicated that the production of dry-salt salmon in that country this season was approximately 400,000 boxes, this being an increase of about 33⅓ per cent. over normal and an increase of approximately 70 per cent. over 1935, which had been a poor year.

In view of this information the Board considered that it was going to be exceptionally difficult to market the British Columbia production on a profitable basis this year, and that the producers would be well advised to move slowly in the direction of packing any great quantity.

At this same meeting it was reported to the Board that the Provincial Department of Fisheries had incorporated certain clauses in their applications for salmon-saltery licences with a view to assisting the Board in its efforts to maintain orderly marketing. These clauses were:—

"(1.) I also hereby agree that, if such licence is issued, I will conduct the operation and dispose of the product of such in accordance with the regulations laid down by the British Columbia Salt-fish Board.

"(2.) I also agree that this licence, if issued, will not be used as a means of obtaining from the British Columbia Salt-fish Board an extra marketable quantity, but that the plant covered by this licence will be operated to produce the quantity allowed by the British Columbia Salt-fish Board."

In view of the Chairman's absence and the fact that September 14th had been set by the Provincial Fisheries Department as the final date for the issuance of salmon-saltery licences, it was decided to defer action, in so far as determining the total marketable quantity of salt salmon was concerned, until a later date.

On September 23rd the Board, after full consideration of the information received from the Canadian Government Trade Commissioner at Tokyo and other sources as to market conditions in Japan, determined that the total marketable quantity of dry-salt salmon for the 1936 season should be 31,950 boxes of all varieties; i.e., chums, springs, etc. The Board, having been advised by the Provincial Department of Fisheries that thirty producers had been licensed (thirty-one in 1935), proceeded at this date to determine the individual marketable quantities covering the thirty Provincial licensees.

The difficulties experienced by the Board in arriving at equitable marketable quantities for each producer will be fully realized, when it is pointed out that prior to the Board exercising marketing control over dry-salt salmon there were only about fifteen producers licensed each season. The fact that market conditions were unfavourable did not, of course, tend to assuage the problem. Following lengthy consideration, it was determined to obtain the past performance of each producer over a period of years from the official records of the Federal Department

of Fisheries. These particulars were obtained and the average of a two- or three-year performance taken as the basis of arriving at individual marketable quantities. New licence-holders—i.e., those holding Provincial salmon dry-saltery licences for the first time in 1936 (of whom there were six)—were placed in a separate category.

Following the announcement of the Board's determination of individual marketable quantities, several producers expressed themselves as being dissatisfied. It was, however, pointed out by the Board that the basis of arriving at marketable quantities was, in so far as the Board could ascertain, the most equitable one for all concerned. Resulting from the voluntary co-operation of one or two packers, certain adjustments were made, as a consequence of which the producers in the main were satisfied that the Board had, to the best of its ability, determined in a fair manner the individual marketable quantities.

An attempt was made to have instituted a form of Government inspection as to the merchantable quality of dry-salt salmon; that is to say, inspection prior to shipment. The Federal Department of Fisheries was approached on this question and the Board was advised that the Department would co-operate in every way possible. It developed, however, that the season had progressed too far to put the necessary regulations into effect for the 1936 season, and consequently this proposal was left in abeyance. It is considered highly desirable for the protection of producers and shippers that a form of Government inspection be enforced. Experience has shown that certain buyers in Japan are inclined to make claims as to the quality of the fish on arrival in the Orient. In certain instances it is felt that these claims are not justified, the sole purpose being to force down the price of the product. With the furnishing of a Government certificate stating that the goods had been inspected and had been found to be in good, sound, merchantable condition prior to shipment, it would, in the Board's opinion, tend to eliminate false claims. It is anticipated that prior to next season an inspection system will be established.

Under the authority of subsection (1) of section 6 of the Scheme, the Local Board on September 30th designated the following companies as its marketing agencies:—

Dry-salt Salmon.—Messrs. Salt Salmon Exporters of B.C., Limited, 217 Dunlevy Avenue, Vancouver, B.C.; Messrs. Producers' Salt Fish Sales, Limited, 355 Burrard Street, Vancouver, B.C.

Dry-salt Herring.—Messrs. Canadian Salt Herring Exporters, Limited, 217 Dunlevy Avenue, Vancouver, B.C.; Messrs. Producers' Salt Fish Sales, Limited, 355 Burrard Street, Vancouver, B.C.

The Board also determined that the terms of sale covering dry-salt salmon should be on consignment, with a minimum guaranteed advance to the producer covered by irrevocable letters of credit without recourse. Also, that the terms of sale should be on the basis of not less than 440 lb. net weight (fish and salt) per box.

After conferring with their respective producers the marketing agencies reported to the Board that the following minimum guaranteed advances had been agreed upon:—

Dry-salt Chum Salmon.—Fraser River, $12.50 U.S. funds, c.i.f. Yokohama, per box of not less than 440 lb. net shipping weight (fish and salt); Island, $10 U.S. funds, c.i.f. Yokohama, per box of not less than 440 lb. net shipping weight (fish and salt); Queen Charlotte, $9.50 U.S. funds, c.i.f. Yokohama, per box of not less than 440 lb. net shipping weight (fish and salt).

All other Varieties.—$8 U.S. funds, c.i.f. Yokohama, per box of not less than 440 lb. net shipping weight (fish and salt).

During the 1935 season the minimum guaranteed advances received by the producer were: Fraser River, $15 per box; Island, $13; and Queen Charlotte, $12.50. The marketing agencies reported, however, that in view of market conditions in Japan it was impossible to persuade the buyers to advance more than the prices listed above for the 1936 pack. Indications from Japan are, however, that fair selling conditions were experienced and it is believed that most producers received a return of from 50 cents to $1 per box over the minimum guaranteed advance.

Dry-salted chum salmon is the most important species as far as the Japanese market is concerned, with the other varieties, such as springs, pinks, sockeye, and cohoe, being in limited demand. After a rather slow beginning at the commencement of the season, due entirely to the reluctance of the buyers to meet the minimum guaranteed advances, the marketing agencies were successful in effecting contracts for the entire production. The heaviest move-

ment of the product took place during the month of November, it being necessary to have the goods arrive in Japan not later than December 15th in order to ensure a favourable market.

The run of chum salmon in British Columbia waters last fall was exceptionally good, both as to quality and quantity. Had the domestic pack in Japan not been so large, it would have permitted the marketing of a much larger quantity of British Columbia salmon. It is, however, the considered opinion of those having full knowledge of the Japanese market that a total of 35,000 boxes is the maximum which can be absorbed of our product. It must be remembered that while Japan is a large consumer of fish, our product is consumed almost entirely during the festival season; i.e., Christmas and New Year's. Consequently, with the large Japanese production of salt salmon, it meant that if British Columbia producers were to obtain a reasonable price it would be necessary to market a lesser quantity, otherwise prices would have fallen far below an economic level.

DRY-SALT HERRING.

As stated in the last Annual Report of the Board, the British Columbia production of dry-salt herring is consumed entirely in the Orient—the three main distributing territories being Kobe, Japan; Shanghai, China, and Hong Kong. It has been the aim of the Local Board to establish, through its marketing agencies, the system of *en bloc* sales. In the 1935–36 season the marketing agencies were successful in consummating such a scheme with a group of buyers in Kobe who purchased a total of 10,000 tons. Attempts to effect the same arrangement with the Shanghai and Hong Kong territories were unsuccessful, due to the chaotic conditions obtaining in China. In the 1936–37 season the Board's efforts were more successful, in that the marketing agencies were able to effect *en bloc* sales to all three territories as follows:—

	Tons.
Kobe	10,000
Shanghai	6,500
Hong Kong	2,400
Total	18,900

The marketing of entire quantities as noted above on an outright sale basis has never before been accomplished in the history of the British Columbia dry-salt herring industry. The above quantities were all covered by irrevocable letters of credit without recourse established in Vancouver banks. The amounts covered by these letters of credit were: Kobe, $288,950; Shanghai, $191,700; and Hong Kong, $72,720; a total of $553,370.

In determining the total marketable quantity of dry-salt herring for the current season the Board secured from the Canadian Government Trade Commissioners at Kobe, Shanghai, and Hong Kong estimates as to what volume their respective territories could handle. Based on the information received from the Trade Commissioners, the Board determined, on October 1st, the following marketable quantities:—

	Tons.
Kobe	10,000
Shanghai	6,500
Hong Kong	4,500
Total	21,000

Eighteen producers were licensed by the Provincial Government this season to produce dry-salt herring. Five of these licences were held by producers having plants located on the west coast of Vancouver Island, the remaining thirteen being located on the east coast. It developed, however, that four of the west-coast operators transferred their operations to the east coast, while one east-coast producer transferred to the west coast, thus making sixteen operators on the east coast and two on the west coast.

Two holders of Provincial herring dry-saltery licences were new operators (one east coast and one west coast), the remaining sixteen operators having been consistent producers of dry-salt herring. The Board determined that the sixteen consistent producers should be permitted to market an equal proportion of the total marketable quantity, with the new plants marketing the minimum quantity determined by the Board. This arrangement worked out to the satisfaction of all concerned, with the exception of the one new operator on the east coast who

complained of the marketable quantity allocated to him. It was pointed out by the Board that the marketable quantities had been arrived at on an equitable basis; i.e., the ability of those operators to produce. The operator who complained had neither the plant nor the equipment to produce dry-salt herring and would have been compelled in any event to join forces with another operator to produce his marketable quantity.

In connection with the marketable quantity for the Kobe territory—namely, 10,000 tons—two groups of buyers were in touch with the marketing agencies for the purchase of the tonnage. For the Kobe market the marketing agencies had decided upon the following schedule of monthly shipments and prices on an *en bloc* basis:—

October	600 tons at $35.00 per ton.
November	2,000 tons at 32.50 per ton.
December	2,700 tons at 29.50 per ton.
January	2,800 tons at 26.50 per ton.
February	1,400 tons at 26.50 per ton.
March	500 tons at 24.00 per ton.

The average price per ton on 10,000 tons was $28.89½ c.i.f. Kobe.

It is perhaps well at this point to mention the keenness displayed by the two groups of buyers for the Kobe territory. Messrs. Kobe Salt Herring Importers' Association (the group who purchased the 10,000 tons in the 1935–36 season) sent two of its representatives to Vancouver for the purpose of ensuring their participation in the business. The other Kobe group sent a representative from their Seattle office. Both groups were prepared to contract with the marketing agencies at the announced prices, but due to one of the buyers desiring to incorporate certain ambiguous clauses and conditions in the sales contract it was decided, in the interests of the producers, that the contract offered could not be accepted. Accordingly, a contract was entered into with Messrs. Kobe Salt Herring Importers' Association by the marketing agencies for the 10,000 tons for the Kobe territory. Messrs. Kobe Salt Herring Importers' Association established irrevocable letters of credit for the entire amount of $288,950 without delay, and shipments went forward regularly.

The marketing agencies had advised the buyers in Shanghai of the terms and conditions of sale, which were as follows:—

October	400 tons at $36.00 per ton.
November	1,200 tons at 33.00 per ton.
December	2,000 tons at 30.00 per ton.
January	1,700 tons at 27.00 per ton.
February	1,200 tons at 26.50 per ton.
Total	6,500 at average price per ton c.i.f. Shanghai, $29.49.

Following lengthy negotiations between the marketing agencies and the Shanghai importers, on October 23rd it was reported to the Board that two of the Shanghai buyers had purchased, on joint account, the total quantity of 6,500 tons and that irrevocable letters of credit totalling $191,700 had been established.

During this time the marketing agencies had been in communication with the Hong Kong buyers in an effort to get them to purchase the quantity allocated for their territory—namely, 4,500 tons. Hong Kong, unfortunately, is the most difficult market of the three distributing centres, the importers there endeavouring at all times to force matters into their own hands. After further consultation by cable with the Canadian Trade Commissioner, it became increasingly evident that it was going to be impossible to market the entire tonnage of 4,500 tons. In view of this and considering it extremely advisable to protect the producers from having distress cargo, and also taking into consideration the matter of jeopardizing the marketing arrangements with Kobe and Shanghai territories, the Board on October 31st advised all producers of the situation, stating that under the circumstances it had been found necessary to reduce the total marketable quantity of 21,000 tons by 7 per cent. This meant that the Hong Kong allotment was reduced to 3,030 tons. The marketing agencies reported that the best that could be done with Hong Kong was a total of 2,400 tons. After again reviewing the

situation, the Board determined that it was necessary to reduce the total marketable quantity by another 3 per cent., making a total reduction of 10 per cent. As a result the marketing agencies were successful in effecting the sale of 2,400 tons to the Hong Kong territory, as per the following schedule:—

November	400	tons at $33.50 per ton.
December	800	tons at 31.00 per ton.
January	800	tons at 29.40 per ton.
February	400	tons at 27.50 per ton.
Total	2,400	tons at average price c.i.f. Hong Kong, $30.30.

As in the case of the other two markets, the Hong Kong buyers established irrevocable letters of credit amounting to $72,720 covering the above quantities.

In order that all producers would participate equally in the sales effected by the marketing agencies, the Local Board determined that a monthly pooling arrangement should be entered into. The mechanics of this pooling arrangement were that for the three distributing centres each producer would receive monthly shipping orders from the marketing agencies on a pro rata basis, according to his relationship to the total marketable quantity. If a producer in a given month was not in a position to fulfil the shipping orders given him by the marketing agencies he forfeited his share for that month. This arrangement worked out to the satisfaction of all concerned, the producers expressing themselves as being pleased with the Board's innovation.

One important point which was established, during the season under review, was the lessening of the price spread between shipments. In the past it developed that high prices were paid for early shipments in October, whereas November shipments dropped as much as $18 per ton, with a corresponding reduction in price for later shipments. During the 1936–37 season it will be noted that the spread was gradual, the intention being to average out the price over the season in a more equitable manner.

SUMMARY.

The purpose of the Board since its inception has been to obtain an increased return for the products to the producer, coupled with orderly marketing. Conditions obtaining in the British Columbia salt-fish industry prior to the formation of the Board have been covered in previous reports. Suffice it to say that the practice in vogue prior to the establishment of the Board was to ship on consignment. Naturally, consignment shipments were not conducive to a fair return to the producer.

With respect to dry-salt herring, the Board in its first season of operation adopted the policy of having established irrevocable letters of credit prior to shipment. The following average c.i.f. prices per ton for dry-salt herring for the past ten years bear out the contention that the Board has been successful in gradually increasing the return to the producer. The last three years of the table cover the years of the Board's operations.

Year.	Average Price per Ton.	Year	Average Price per Ton.
1927	$28.31	1932	$15.85
1928	27.80	1933	19.85
1929	27.03	1934	27.11
1930	23.85	1935	28.45
1931	19.70	1936	29.28

In the case of dry-salt salmon the situation is a little different, in that owing to the fact that dry-salt salmon is exported exclusively to Japan it has not been possible to bring about the elimination entirely of consignment shipments. The Board, however, pursued the policy of making it a condition of sale by the marketing agencies that a minimum guaranteed advance per box, equal, so far as possible, to the value of the product, was established by irrevocable letters of credit. The following figures covering dry-salt salmon for the past six years indicate

the success of the Board's efforts in obtaining a higher minimum guaranteed advance to the producer:—

Year.	Fraser River Quality.	Island Quality.	Queen Charlotte Quality.
1931	$15.50	$11.00	$10.00
1932	6.50	5.50	5.50
1933	6.50	6.00	6.00
1934	13.00	12.00	10.00
1935	15.00	13.00	12.50
1936	12.50	10.00	9.50

It is noted in the above table that the minimum guaranteed advance per box for 1936 was not equal to that of 1935. This is caused, as mentioned earlier in this report, by the unusual quantity of salt salmon available in Japan from that country's own production. In the first year of the Board's operation, 1934, the season was too far advanced by the time the Board came into existence to endeavour to regulate the marketing of dry-salt salmon.

The work of the Board was carried on in the most amicable manner, the members at all times devoting their energy and time to the furtherance of the interests of the producers. A total of twenty-three meetings was held by the Board during the season under review.

In closing this report, it is considered proper to incorporate a few words as to the future. The Canadian Government Trade Commissioners in the Orient have all advised that they strongly recommend the continuance of regulation by some competent authority. The buyers in the Orient have also expressed the hope that the regulation of the products will be continued. Certainly, the confidence which has been built up during the past three years with the buyers of British Columbia salt fish would seem to be worth maintaining. In addition, the majority of the salt-fish packers have stated their desire for continuation of regulated marketing of the products.

The tolls levied by the Board during the season under review were the same as the previous season—namely, 10 cents per box on dry-salt salmon and 8 cents per box on dry-salt herring, equal to 40 cents per ton for each of the regulated products.

Respectfully submitted.

BRITISH COLUMBIA SALT-FISH BOARD.

HUGH DALTON, *Chairman.*
A. J. BLACKWELL, *Member.*
K. KIMURA, *Member.*
G. CRAWFORD, *Member.*
R. SUZUMOTO, *Member.*

G. R. CLARK,
Secretary.

PACK OF BRITISH COLUMBIA SALMON, SEASON 1936.

SHOWING THE ORIGIN OF SALMON CAUGHT IN EACH DISTRICT.

District.	Sockeye.	Springs.	Steel-heads.	Cohoes.	Pinks.	Chums.	Grand Total (Cases).
Fraser River	184,854	15,126	.....	28,716	.....	31,565	260,261
Queen Charlotte Islands	85	227	.....	19,920	89,355	69,304	178,891
Nass River	28,562½	2,167	496	11,842	75,887½	20,620½	139,575½
Skeena River	81,973	4,551½	33	25,390	91,389	15,297½	218,634
Rivers Inlet	46,351	581½	19	7,122½	6,432½	11,505	72,011½
Smith Inlet	12,788	30	42	310	65	1,653	14,888
Central Area	27,499	830	373	45,824	246,378	99,592	420,496
Vancouver Island	32,696½	6,340	105	90,625½	82,028½	347,951	559,746½
Totals	414,809	29,853	1,068	229,750	591,535½	597,488	1,864,503½

In addition to the above table, 216 cases of Alaska sockeye and 16,316 cases of Alaska cohoes were packed at canneries in British Columbia.

29,516 cases of bluebacks are combined with cohoes in this table.

In the above table, 23,153 cases of sockeye caught in Johnstone Strait are credited to the Fraser River. Prior to 1936 they were shown in the Vancouver Island District pack.

STATEMENT SHOWING THE SALMON-PACK OF THE PROVINCE, BY DISTRICTS AND SPECIES, FROM 1921 TO 1936, INCLUSIVE.

FRASER RIVER.

	1936.	1935.	1934.	1933.	1932.	1931.	1930.	1929.
Sockeyes	184,854	62,822	139,238	52,465	65,769	40,947	103,692	61,569
Springs, Red	6,675	4,205	5,150	5,579	18,298	9,740	11,366	3,305
Springs, White	8,451	5,196	11,068	.....	10,403	.....	9,761	6,699
Chums	31,565	8,227	104,092	34,391	14,948	251	68,946	144,159
Pinks	.....	111,328	2,199	92,746	385	13,307	30,754	158,208
Cohoes	28,716	24,950	11,392	13,901	16,815	8,165	25,585	40,520
Bluebacks and Steelheads	.....	.....	.....	.....	23	657	27,879	12,013
Totals	260,261	216,728	273,139	199,082	126,641	73,067	277,983	426,473

	1928.	1927.	1926.	1925.	1924.	1923.	1922.	1921.
Sockeyes	29,299	61,393	85,689	35,385	39,743	31,655	51,832	39,631
Springs, Red	1,173	7,925	12,783	7,989	2,982	3,854	10,561	11,360
Springs, White	3,909	10,528	20,169	25,701	4,648	4,279	6,300	5,949
Chums	193,106	67,259	88,495	66,111	109,495	103,248	17,895	11,233
Pinks	2,881	102,536	32,256	99,800	31,968	63,645	29,578	8,178
Cohoes	27,061	24,079	21,783	36,717	21,401	20,173	23,587	29,978
Bluebacks and Steelheads	795	10,658	13,776	5,152	1,822	15	817	1,331
Totals	258,224	284,378	274,951	276,855	212,059	226,869	140,570	107,650

STATEMENT SHOWING THE SALMON-PACK OF THE PROVINCE, BY DISTRICTS AND SPECIES, FROM 1921 TO 1936, INCLUSIVE—*Contd.*

Skeena River.

	1936.	1935.	1934.	1933.	1932.	1931.	1930.	1929.
Sockeyes	81,973	52,879	70,655	30,506	59,916	93,023	132,372	78,017
Springs	4,551½	4,039	8,300	3,297	28,269	9,857	7,501	4,324
Chums	15,297½	8,122	24,388	15,714	38,549	3,893	5,187	4,908
Pinks	91,389	81,868	126,163	95,783	58,261	44,807	275,642	95,305
Cohoes	25,390	23,498	54,456	39,896	48,312	10,637	29,617	37,678
Steelhead Trout	33	14	114	267	404	768	58	13
Totals	218,634	170,420	284,096	185,463	233,711	162,986	450,377	220,245

	1928.	1927.	1926.	1925.	1924.	1923.	1922.	1921.
Sockeyes	34,559	83,996	82,360	81,146	144,747	131,731	96,277	41,018
Springs	6,420	19,038	30,594	23,445	12,028	12,247	14,176	21,766
Chums	17,716	19,006	63,527	74,308	25,588	16,527	39,758	1,993
Pinks	209,579	38,768	210,081	130,079	181,313	145,973	301,655	124,457
Cohoes	30,194	26,326	30,208	39,168	26,968	31,967	24,699	45,033
Steelhead Trout	241	582	754	713	214	418	1,050	498
Totals	298,709	187,716	407,524	348,859	390,858	338,863	477,915	234,765

Rivers Inlet.

	1936.	1935.	1934.	1933.	1932.	1931.	1930.	1929.
Sockeyes	46,351	135,038	76,923	83,507	69,732	76,428	119,170	70,260
Springs	581½	429	433	449	459	325	434	342
Chums	11,505	7,136	895	677	944	429	492	989
Pinks	6,432½	4,554	2,815	5,059	3,483	5,089	18,023	2,386
Cohoes	7,122½	8,375	4,852	3,446	7,062	6,571	756	1,120
Steelhead Trout	19	39	79	82	29	32	105	29
Totals	72,011½	155,571	86,000	93,220	81,709	88,874	138,980	75,126

	1928.	1927.	1926.	1925.	1924.	1923.	1922.	1921.
Sockeyes	60,044	65,269	65,581	192,323*	94,891	116,850	53,584	48,615
Springs	468	608	685	496	545	599	323	364
Chums	3,594	1,122	11,727	11,510	4,924	3,242	311	173
Pinks	16,546	671	12,815	8,625	15,105	10,057	24,292	5,303
Cohoes	868	2,094	7,286	4,946	1,980	1,526	1,120	4,718
Steelhead Trout	7	9	11	.....	.....	.....	82	97
Totals	81,527	69,773	98,105	217,900	117,445	132,274	79,712	59,272

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

STATEMENT SHOWING THE SALMON-PACK OF THE PROVINCE, BY DISTRICTS AND SPECIES, FROM 1921 TO 1936, INCLUSIVE—*Contd.*

Smith Inlet, 1926–36.*

	1936.	1935.	1934.	1933.	1932.	1931.
Sockeyes	12,788	31,648	14,607	37,369	25,488	12,867
Springs, Red	2	214	164	354	46	122
Springs, White	28	2	.....	.....	2	.....
Cohoes	310	1,201	3,941	5,068	273	112
Pinks	65	4,412	6,953	19,995	1,148	824
Chums	1,653	12,427	15,548	8,841	165	133
Bluebacks and Steelheads	42	24	43	87	20	36
Totals	14,888	49,928	41,256	71,714	27,142	14,094

	1930.	1929.	1928.	1927.	1926.
Sockeyes	32,057	9,683	33,442	22,682	17,921
Springs, Red	268	18	108	270	73
Springs, White	22	60	178	79	39
Cohoes	1,460	275	230	2,990	164
Pinks	13,615	853	167	732	689
Chums	1,660	113	19	2,605	31
Bluebacks and Steelheads	103	12	6	8	.....
Totals	52,185	11,014	34,150	29,366	18,917

* Previously reported in Queen Charlotte and other Districts.

Nass River.

	1936.	1935.	1934.	1933.	1932.	1931.	1930.	1929.
Sockeyes	28,562½	12,712	28,701	9,757	14,154	16,929	26,405	16,077
Springs	2,167	560	654	1,296	4,408	1,439	1,891	352
Chums	20,620½	17,481	2,648	1,775	14,515	392	3,978	1,212
Pinks	75,887½	25,508	32,964	44,306	44,629	5,178	79,976	10,342
Cohoes	11,842	21,810	9,935	3,251	7,955	8,943	1,123	1,202
Steelhead Trout	496	143	311	49	10	.....	84	.....
Totals	139,575½	78,214	75,213	60,434	85,671	32,881	113,460	29,185

	1928.	1927.	1926.	1925.	1924.	1923.	1922.	1921.
Sockeyes	5,540	12,026	15,929	18,945	33,590	17,821	31,277	9,364
Springs	1,846	3,824	5,964	3,757	2,725	3,314	2,062	2,088
Chums	3,538	3,307	15,392	22,504	26,612	25,791	11,277	2,176
Pinks	83,183	16,609	50,815	35,530	72,496	44,165	75,687	29,488
Cohoes	10,734	3,966	4,274	8,027	6,481	7,894	3,533	8,236
Steelhead Trout	36	96	375	245	1,035	595	235	413
Totals	104,877	39,828	92,749	89,008	142,939	99,580	124,071	51,765

STATEMENT SHOWING THE SALMON-PACK OF THE PROVINCE, BY DISTRICTS AND SPECIES, FROM 1921 TO 1936, INCLUSIVE—*Contd.*

Vancouver Island District, 1927–36.

	1936.	1935.	1934.	1933.	1932.
Sockeyes	32,696½	22,928	27,282	18,397	27,611
Springs	6,340	6,525	1,630	4,875	10,559
Chums	347,951	143,960	210,239	96,642	70,629
Pinks	82,028½	191,627	54,526	172,945	33,403
Cohoes	90,625	104,366	78,670	60,019	35,132
Steelheads and Bluebacks	105	21	.....	147	28,596
Totals	559,746	469,427	372,347	353,025	205,930

	1931.	1930.	1929.	1928.	1927.
Sockeyes	22,199	24,784	10,340	14,248	24,835
Springs	4,055	3,431	1,645	2,269	6,769
Chums	16,329	177,856	162,246	303,474	220,270
Pinks	81,965	89,941	74,001	41,885	52,561
Cohoes	26,310	30,206	35,504	23,345	58,834
Steelheads and Bluebacks	24,638	14,177	11,118	5,249	10,194
Totals	175,541	340,395	294,854	390,470	373,463

Queen Charlotte and other Districts.

	1936.	1935.	1934.	1933.	1932.	1931.	1930.	1929.
Sockeyes	27,584	32,417	20,438	26,106	21,685	29,071	39,198	35,331
Springs	1,057	750	2,374	4,416	3,514	1,608	1,852	1,020
Chums	168,896	212,251	155,371	135,590	167,011	34,570	143,781	111,263
Pinks	335,733	95,669	210,734	101,701	82,449	55,825	600,986	136,758
Cohoes	65,744	47,292	62,165	33,471	44,977	16,141	61,418	56,938
Steelheads	373	355	733	827	591	466	1,204	575
Totals	599,387	388,734	451,815	302,111	320,227	137,661	848,439	341,873

	1928.	1927.	1926.	1925.	1924.	1923.	1922.	1921.
Sockeyes	59,852	60,533	62,383*	49,962	40,926	24,584	47,107	18,350
Springs	2,806	7,826	3,650	5,002	4,245	2,711	4,988	4,995
Chums	341,802	252,230	348,682	305,256	195,357	148,727	80,485	21,412
Pinks	438,298	36,481	380,243	120,747	141,878	146,943	113,824	14,818
Cohoes	58,455	47,433	47,183	40,269	26,031	29,142	31,331	18,203
Steelheads	609	973	973	1,520	497	732	409	2,790
Totals	901,822	405,476	844,114	522,756	408,934	352,839	278,144	80,568

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

STATEMENT SHOWING THE SALMON-PACK OF THE PROVINCE, BY DISTRICTS AND SPECIES, FROM 1921 TO 1936, INCLUSIVE—*Cont'd.*

TOTAL PACKED BY DISTRICTS IN 1921 TO 1936, INCLUSIVE.

	1936.	1935.	1934.	1933.	1932.	1931.	1930.	1929.
Fraser	260,261	216,728	273,139	199,082	126,641	73,067	277,983	426,473
Skeena	218,634	170,420	284,096	185,463	233,711	162,986	450,377	220,245
Rivers Inlet	72,011½	155,571	86,000	93,220	81,709	88,874	138,980	75,126
Smith Inlet	14,888	49,928	41,256	71,714	27,142	14,094	52,185	11,014
Nass River	139,575½	78,214	75,213	60,434	85,671	32,881	113,460	29,185
Vancouver Island	559,746½	469,427	372,347	353,025	205,930	175,541	340,395	294,854
Other Districts	599,387	388,734	451,815	302,111	320,227	137,661	848,439	341,873
Grand totals	1,864,503½	1,529,022	1,583,866	1,265,049	1,081,031	685,104	2,221,819	1,398,770

	1928.	1927.	1926.	1925.	1924.	1923.	1922.	1921.
Fraser	258,224	284,378	274,951	276,855	212,059	226,869	140,570	107,650
Skeena	298,709	187,716	407,524	348,859	390,858	338,863	477,915	234,765
Rivers Inlet*	81,527	69,773	98,105	217,900	117,445	132,274	79,712	59,272
Smith Inlet	34,150	29,366	18,917	33,998	11,776	11,979	5,862	.....
Nass River	104,877	39,828	92,749	89,008	142,939	99,580	124,071	51,765
Vancouver Island	390,470	373,463	347,722	263,904	277,267	191,252	185,524	69,528
Other Districts	901,822	405,473	844,139*	522,756	604,745	352,839	278,144	80,568
Grand totals	2,035,629	1,360,634	2,065,190	1,719,282	1,745,213	1,341,677	1,285,946	603,548

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

STATEMENT SHOWING THE SOCKEYE-PACK OF THE ENTIRE FRASER RIVER SYSTEM FROM 1894 TO 1936, INCLUSIVE.

	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.
Fraser River, B.C.	363,967	395,984	356,984	860,459	240,000	486,409	170,889	974,911	293,477
State of Washington	41,781	65,143	72,979	312,048	252,000	499,646	228,704	1,105,096	339,556
Totals	405,748	461,127	429,963	1,172,507	492,000	986,055	399,593	2,080,007	633,033

	1903.	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911.
Fraser River, B.C.	204,809	72,688	837,489	183,007	59,815	74,574	585,435	150,432	58,487
State of Washington	167,211	123,419	837,122	182,241	96,974	170,951	1,097,904	248,014	127,761
Totals	372,020	196,107	1,674,611	365,248	156,789	245,525	1,683,339	398,446	186,248

	1912.	1913.	1914.	1915.	1916.	1917.	1918.	1919.	1920.
Fraser River, B.C.	123,879	719,796	198,183	91,130	32,146	148,164	19,697	38,854	48,399
State of Washington	184,680	1,673,099	335,230	64,584	84,637	411,538	50,723	64,364	62,654
Totals	308,559	2,392,895	533,413	155,714	116,783	559,702	70,420	103,200	111,053

	1921.	1922.	1923.	1924.	1925.	1926.	1927.	1928.	1929.
Fraser River, B.C.	39,631	51,832	31,655	39,743	35,385	85,689	61,393	29,299	61,569
State of Washington	102,967	48,566	47,402	69,369	112,023	44,673	97,594	61,044	111,898
Totals	142,598	100,398	79,057	109,112	147,408	130,362	158,987	90,343	173,464

	1930.	1931.	1932.	1933.	1934.	1935.	1936.		
Fraser River, B.C.	103,692	40,947	65,769	52,465	139,238	62,822	184,854	.....	.....
State of Washington	352,194	87,211	81,188	126,604	352,579	54,677	59,505	.....	.....
Totals	455,886	128,158	146,957	179,069	491,817	117,499	244,359	.....	.....

STATEMENT SHOWING THE SOCKEYE-PACK OF THE PROVINCE, BY DISTRICTS, 1921 TO 1936, INCLUSIVE.

	1936.	1935.	1934.	1933.	1932.	1931.	1930.	1929.
Fraser River	183,120	62,822	139,238	52,465	65,769	40,947	103,692	61,569
Skeena River	81,973	52,879	70,655	30,506	59,916	93,023	132,372	78,017
Rivers Inlet	46,351	135,038	76,923	83,507	69,732	76,428	119,170	70,260
Smith Inlet	12,788	31,648	14,607	37,369	25,488	12,867	32,057	9,683
Nass River	28,562½	12,712	28,701	9,757	14,154	16,929	26,405	16,077
Vancouver Island	34,430½	22,928	27,282	18,397	27,611	22,199	24,784	10,340
Other Districts	27,584	32,417	20,438	26,106	21,685	29,071	39,198	35,331
Totals	414,809	350,444	377,844	258,107	284,355	291,464	477,678	281,277

	1928.	1927.	1926.	1925.	1924.	1923.	1922.	1921.
Fraser River	29,299	61,393	85,689	35,385	39,743	31,655	51,832	39,631
Skeena River	34,559	83,996	82,360	81,146	144,747	131,731	96,277	41,018
Rivers Inlet	60,044	65,239	65,581	192,323	94,891	116,850	53,584	48,615
Smith Inlet	33,442	22,682	17,921	33,764	11,435	11,864	.....	.....
Nass River	5,540	12,026	15,929	18,945	33,590	17,821	31,277	9,364
Vancouver Island	14,248	24,835	25,070	14,757	15,618	12,006	15,147	6,936
Other Districts	26,410	37,851	44,462	16,198	20,579	12,720	47,107	18,350
Totals	203,542	308,052	337,012	392,518	369,603	334,647	295,224	163,914

216 cases of Alaska sockeye packed in British Columbia canneries are not shown in the above table for the year 1936.

STATEMENT SHOWING THE PILCHARD INDUSTRY OF THE PROVINCE, 1920 TO 1936, 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	1,726,851	98,821	1,654,575	2,856,579	15,823	1,538
1930	1,501,404	55,166	1,438,840	3,204,058	13,934	926
1931	1,472,085	17,336	1,456,846	2,551,914	14,200	1,552
1932	886,964	4,622	876,700	1,315,864	8,842	1,603
1933	120,999	2,946	119,545	275,879	1,108	20
1934	860,103	35,437	845,849	1,635,123	7,628	40
1935	911,411	27,184	896,586	1,634,592	8,666	521
1936	889,037	35,007	.....	1,271,144	8,561	580

PRODUCTION OF FISH OIL AND MEAL, 1920 TO 1936 (OTHER THAN FROM PILCHARD).

Year.	From Whales.			From other Sources.	
	Whalebone and Meal.	Fertilizer.	Oil.	Meal and Fertilizer.	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	468,203	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	3,626	459,575
1930	273	581	525,533	3,335	243,009
1931	-----	-------	----------	5,647	352,492
1932	-----	-------	----------	6,608	231,690
1933	249	223	509,310	5,583	497,643
1934	340	631	813,724	5,028	441,735
1935	211	354	426,772	7,509	588,629
1936	332	687	763,740	13,197	1,143,206

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