PROVINCE OF BRITISH COLUMBIA

Provincial Department of Fisheries

REPORT

WITH APPENDICES

For the Year Ended December 31st

1949

VICTORIA, B.C.
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1950

To His Honour COLONEL CLARENCE WALLACE, C.B.E.,
Lieutenant-Governor of the Province of British Columbia.

MAY IT PLEASE YOUR HONOUR:

I beg to submit herewith the Annual Report of the Provincial Department of Fisheries for the year ended December 31st, 1949.

LESLIE HARVEY EYRES,
Minister of Fisheries.

Department of Fisheries,
Minister of Fisheries' Office,
Victoria, B.C.

Honourable Leslie H. Eyres,
Minister of Fisheries, Victoria, B.C.

SIR,—I have the honour to submit herewith the Annual Report of the Provincial Department of Fisheries for the year ended December 31st, 1949.

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

GEORGE J. ALEXANDER,
Deputy Minister.

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Report of the Provincial Department of Fisheries for 1949

VALUE OF BRITISH COLUMBIA'S FISHERIES IN 1949 SHOWS A DECREASE

The total marketed value of the fisheries products of British Columbia for 1949 amounted to $56,456,260. This was a decrease from the year previous of $2,247,543, or approximately 3.8 per cent less than the marketed value of fisheries products in 1948. The principal species, as marketed in 1949, were salmon, with a value of $35,897,732; herring, with a value of $9,412,786; and halibut, with a marketed value of $4,356,310. The salmon production in 1949 was $773,408 less than the production in 1948. The value of the herring production in 1949 showed a decrease from the year previous of $1,072,304, and the value of the 1949 halibut-catch also dropped $291,561.

In 1949 the total fish and shell-fish landed amounted to 5,463,149 hundredweight, with a landed value of $27,260,217.

The total value of vessels, boats, premises, gear, and other equipment employed in catching and landing fish in British Columbia in 1949 amounted to $30,747,565. This figure is compared with $30,913,279 for capital similarly employed in 1948.

In 1949 there was a total of 12,235 persons employed in catching and landing the fish in British Columbia and 3,455 persons engaged in processing plants, canneries, etc. Of this latter figure, 2,516 were males and 939 were females. These figures for employment are compared with a total of 16,406 persons employed in 1948, of whom 12,226 were engaged in primary occupations, such as fishing and landing the fish, and 4,180 in fish-processing plants.

The above figures were supplied by the Dominion Bureau of Statistics, Ottawa, and are hereby gratefully acknowledged.

THE CANNED-SALMON PACK FOR BRITISH COLUMBIA, 1949

The total canned-salmon pack for British Columbia in 1949 amounted to 1,439,866 cases, according to annual returns submitted to the Provincial Department of Fisheries by the licensed canners. The 1949 canned-salmon pack was 101,595 cases more than were packed in 1948. The pack in 1949, however, was 39,947 cases less than the average for the immediately preceding five years. In 1949 the pack consisted of 259,821 cases of sockeye, 21,184 cases of springs, 2,373 cases of steelheads, 215,944 cases of cohoe, 709,987 cases of pinks, and 230,556 cases of chums. In the above figures 6,955 cases of bluebacks are combined with cohoes, and in each instance the half-cases have been dropped.

Again, in 1949, the sockeye-salmon pack for British Columbia was disappointingly small. The 1949 sockeye-pack was 76,094 cases below the average for the immediately preceding five-year period and was also 1,409 cases less than the comparatively small pack put up in 1948. The bulk of British Columbia sockeye is considered to be four-year fish. If so, this would make 1945 the cycle-year for this species. In that year the total sockeye-pack for British Columbia was 329,001 cases, or 69,180 cases greater than were packed in the 1949 season. In the preceding cycle-year, 1941, the total sockeye-salmon pack for British Columbia amounted to 455,298 cases. When compared with

the previous two cycle-years, one will readily agree that the pack in 1949 was most disappointing.

The canned spring-salmon pack in British Columbia is never an indication of the size of the run of this species because large quantities of spring salmon find a ready market in the fresh- and frozen-fish trade. The 1949 canned-salmon pack of spring salmon, amounting to 21,184 cases, was above the 1948 pack, in which year 16,445 cases were packed, and 7,473 cases greater than the five-year average pack of this species.

Steelheads are not salmon, but a few are canned each year, those which are caught incidentally while fishing for other species. In 1949 the steelhead-pack amounted to 2,373 cases. This figure is compared with 5,663 cases of steelheads canned in 1948 and 3,260 cases in 1947.

The canned cohoe-salmon pack in 1949, amounting to 215,944 cases, while slightly lower than the pack of this species in 1948, must be considered as reasonably satisfactory. The 1948 cohoe-pack amounted to 221,804 cases, while the pack for this species in 1947 was 146,293 cases. The 1949 pack was 35,328 cases above the average annual pack for cohoe salmon in British Columbia for the previous five-year period.

The pink-salmon pack in 1949, amounting to 709,987 cases, was 195,064 cases greater than the average annual pack of this species for the previous five-year period. The 1949 pack of pinks was 388,266 cases greater than were packed in 1948 and 109,200 cases greater than the pack for this species in the immediately preceding cycle-year, 1947. It will be recalled that this cycle produced a pack of 825,513 cases of pinks in British Columbia in 1945.

In 1949 chum salmon were canned to the extent of 230,556 cases. The 1949 pack of this species was 280,848 cases less than were packed in 1948 and 200,423 cases less than the average annual pack of chums in British Columbia for the previous five-year period. The pack of chum salmon, however, is not necessarily an indication of the size of the runs of this species to British Columbia waters. Large quantities of chum salmon are frozen each season for the winter trade, and these quantities should be taken into consideration when evaluating the size of the run of chum salmon.

In comparing the canned-salmon pack figures of any of the species of salmon which are canned in British Columbia, the reader is referred to the text in the next section of this Report for a breakdown of the figures for each species by districts. The reader should also take into consideration the escapement to the spawning-beds.

In the Appendix to this Report there will be found a report on the spawning-beds of British Columbia, which has been supplied by the Chief Supervisor of Fisheries for the Federal Department of Fisheries.

BRITISH COLUMBIA'S CANNED-SALMON PACK BY DISTRICTS

Fraser River

The total canned-salmon pack in British Columbia from Canadian-caught fish on the Fraser River in 1949 amounted to 189,938 cases. The total Fraser River pack in 1949, while slightly greater than the packs of 1948 and 1947, was, nevertheless, 30,185 cases less than the average annual pack for the Fraser River for the previous five-year period.

In 1949 the Fraser River pack consisted of 96,159 cases of sockeye, 9,889 cases of springs, 214 cases of steelheads, 10,286 cases of cohoes, 66,626 cases of pinks, and 6,763 cases of chums.

Sockeye Salmon.—In 1949 Canadian fishermen caught sockeye salmon to the equivalent of 96,159 cases from Fraser River run fish. The 1949 Fraser River Canadian sockeye-salmon pack was 31,336 cases above the pack figure for 1948. The 1949 pack was, nevertheless, slightly below the five-year average for this species. The pack of salmon comprising the 1949 run was the progeny of the run of 1945. In that year the sockeye salmon packed from fish caught by Canadian fishermen on the Fraser River amounted to 79,977 cases.

The Fraser River sockeye-salmon fishery, owing to the international character of the runs of fish, is regulated by an international commission under treaty between Canada and the United States. The commission is composed of six members, three of whom are appointed by the United States Government and three appointed by the Canadian Government. According to figures supplied to this office by the International Pacific Salmon Fisheries Commission, the total catch of sockeye on the Fraser River in 1949 amounted to 161,176 cases. The Commission reported that, of this amount, 80,547 cases were caught by United States fishermen and 80,629 cases were accounted for by Canadian fishermen. According to International Pacific Salmon Fisheries Commission figures, the percentages are as follows: Canadian gear, 50.02 per cent; American gear, 49.98 per cent. There is a slight discrepancy in the figures supplied by the International Pacific Salmon Fisheries Commission and the figures computed from returns made by the licensed canners to the Provincial Department of Fisheries, due to the fact that the Canadian figures include the sockeye salmon caught in Johnstone Strait, which are known to be proceeding to the Fraser River. For convenience the table of percentages is included in this section from 1933 to 1949, inclusive:—

	American Per Cent	Canadian Per Cent
1933	71.00	29.00
1934	72.00	28.00
1935	47.00	53.00
1936	25.00	75.00
1937	38.00	62.00
1938	42.00	58.00
1939	44.50	55.50
1940	37.50	62.50
1941	39.30	60.70
1942	37.20	62.80
1943	37.42	62.58
1944	29.77	70.23
1945	39.90	60.10
1946	43.90	56.10
1947	16.60	83.40
1948	59.47	40.53
1949	49.98	50.02

For convenience the reader will find in the Appendix to this Report a table showing the total sockeye-salmon packs of the Fraser River, arranged in accordance with the four-year cycle from 1895 to 1949, inclusive, showing the catch by British Columbia and Washington fishermen in the respective years.

Spring Salmon.—In 1949 the pack of spring salmon on the Fraser River amounted to 9,889 cases. This pack is compared with the packs of spring salmon in previous years, which were, in 1948, 2,955 cases; in 1947, 1,455 cases; and, in 1946, 1,096 cases. The 1949 pack of spring salmon was the largest pack of spring salmon on the Fraser River since 1944, when the pack amounted to 12,577 cases. It will be recalled that the spring-salmon catch, as indicated by the canned-salmon figures, is not necessarily indicative of the size of the run of this species, owing to the large number of spring salmon which find a ready market in the fresh- and frozen-fish trades.

Cohoe Salmon.—There was a total of 10,286 cases of cohoe salmon canned from Fraser River caught fish in 1949. The cohoe-salmon pack in 1948 amounted to 16,102 cases, which was the largest pack of this species on the Fraser River since 1941. In 1949 the Fraser River cohoe-pack, while considerably below the amount packed in the year previous, was, nevertheless, equal to the five-year average for this river system.

Pink Salmon.—Pink salmon run to the Fraser River in the odd-numbered years, and 1949 was a pink-salmon year. The total pack of pink salmon in 1949 amounted to

66,626 cases. The 1949 run of pinks was disappointingly small. In the previous cycle-year, 1947, the pack of pinks on the Fraser amounted to 113,136 cases, while in 1945, the preceding cycle-year, 95,748 cases were canned. The 1949 pink-salmon pack on the Fraser River was 14,926 cases less than the average five-year cycle pack for this species for the previous five cycle-years.

Chum Salmon.—The Fraser River in 1949 produced a chum-salmon pack amounting to 6,763 cases. This is compared with 20,209 cases in 1948, 16,475 cases in 1947, 60,713 cases in 1946, and 27,610 cases in 1945. The 1949 pack of chum salmon on the Fraser River was the smallest pack put up on this river system in recent past years. It should be pointed out, however, that chum salmon are frozen to quite an extent, and the Fraser River chum-salmon pack would, no doubt, have been larger had greater quantities of chums been diverted to the canneries instead of being frozen. Another factor which, in recent years, has distorted the pack figures on the Fraser River (especially for chum salmon) is the growing practice of shipping chum salmon to the United States for canning in the State of Washington. In recent past years United States canners have been able to pay considerably higher prices for chum salmon than Canadian operators could pay and, consequently, large quantities of chum salmon have been finding a market south of the line.

In considering the canned-salmon pack as a measure of the total runs, one must take into account the escapement to the spawning-beds. There will be found in the Appendix to this Report a detailed statement of the escapement to the various spawning-beds of the different river systems. The reader is referred to the salmon-spawning report for British Columbia, which will be found of immense value in appraising the salmon runs to the different river systems.

Skeena River

The total canned-salmon pack on the Skeena River in 1949 amounted to 129,027 cases. This was 64,408 cases less than the total pack for this river system in the year 1948. The total pack for the Skeena River in 1949 was 16,886 cases less than the average annual pack for this river system for the previous five-year period. In 1949 the pack consisted of 65,937 cases of sockeye, 2,507 cases of springs, 1,283 cases of steelheads, 21,333 cases of cohoes, 33,069 cases of pinks, and 4,896 cases of chums.

Sockeye Salmon.—The canned sockeye-salmon pack of 65,937 cases on the Skeena River for 1949 was again disappointingly small. In 1945, the cycle-year for Skeena River sockeye, the canned-salmon pack amounted to 104,279 cases, and in the previous cycle-year, 1941, the total pack amounted to 81,767 cases. In view of the pack for 1945, it was hoped that this cycle was increasing, but the short pack in 1949 would indicate that some factor is at work here which is not yet understood. The 1949 pack of Skeena River sockeye was 5,452 cases less than the average annual pack for this river system for the immediately preceding five-year period. The 1949 Skeena River sockeye-salmon pack was 941 cases above the average annual pack for the five preceding cycle-years. This period takes in that part of the period of very low production on the Skeena River, which has been commented on in the Report of this Department in previous years.

Spring Salmon.—The Skeena River spring-salmon pack, like the pack for this species on other river systems, is never indicative of the run to that particular river system, as spring salmon find an outlet chiefly in the fresh- and frozen-fish markets. In 1949 the Skeena River produced a pack of 2,507 cases of spring salmon. This is compared with the pack for 1948, when 4,018 cases were canned. The 1947 pack amounted to 2,113 cases and the 1946 pack, 2,439 cases. The Skeena River spring-salmon pack in 1949 was 185 cases less than the average annual pack for this species for the previous five-year period.

Cohoe Salmon.—Cohoe salmon are never packed in large quantities on the Skeena River. This species, like spring salmon, finds a considerable market in the fresh- and frozen-fish trade. In 1949 the Skeena River produced 21,333 cases of cohoe salmon.

The 1949 pack of cohoes on the Skeena River was 3,767 cases less than the average annual pack for this river system for the previous five-year period.

Pink Salmon.—The 1949 pink-salmon pack for the Skeena River was not as large as anticipated. The 33,069 cases of pink salmon in 1949 were the progeny of the 1947 run. In that year the Skeena River produced 13,190 cases. It must be remembered, however, that this cycle has been producing in the neighbourhood of 50,000 cases per year until 1945. It would seem that with proper management this cycle is capable of producing at least an average of twice the 1949 Skeena River pink-salmon pack. It is interesting to note that in 1945 there were 69,783 cases of pink salmon canned on the Skeena River, while in 1943, 54,509 cases were canned. In 1941, again in the same cycle, 50,537 cases were canned, and in 1939 the pack amounted to 95,236 cases. The pink-salmon pack on the Skeena in 1949 was 11,148 cases less than the average pack of this species for the five preceding cycle-years and was 22,268 cases less than the average pack for the previous ten cycle-years.

Chum Salmon.—The Skeena River is never a large producer of chum salmon, and the 4,896 cases of this species canned on the Skeena in 1949 was no exception. The 1949 pack of chum salmon was 6,967 cases less than were packed in the year previous and 4,188 cases less than the average annual pack of chum salmon on the Skeena River for the previous five-year period.

Nass River

The total canned-salmon pack on the Nass River in 1949 amounted to 58,336 cases. The Nass River pack in 1949 was greater than in any year since 1944, when 61,096 cases of all varieties were canned from fish running to this river system. The Nass River pack in 1949 was 14,413 cases above the average annual pack for this river system for the previous five-year period. The 1949 pack was composed of 9,268 cases of sockeye, 174 cases of springs, 51 cases of steelheads, 6,665 cases of cohoe, 34,324 cases of pinks, and 7,854 cases of chums.

Sockeye Salmon.—The 9,268 cases of sockeye salmon canned on the Nass River in 1949 was the smallest pack of sockeye put up on this river since 1945, one of the cycle-years. In that year the pack amounted to 9,899 cases. It should be explained that Nass River sockeye are the progeny of the runs four and five years previous. The run in 1944 produced 13,083 cases. The 1949 sockeye-pack was 1,874 cases less than the average annual pack of this species for the previous five-year period.

Spring Salmon.—On the Nass River, as on most of the salmon-rivers in British Columbia, spring salmon are never a large factor in the canned-salmon pack owing to the fact that this species finds an outlet in the fresh and frozen condition. The Nass River, in 1949, produced a pack of 174 cases of spring salmon, most of which were caught incidentally while fishing for other species. The 1949 pack is compared with the pack for 1948, when 416 cases were canned, and 1947, when the pack amounted to 398 cases. In 1946 the Nass River produced 472 cases of spring salmon.

Cohoe Salmon.—The cohoe-salmon pack on the Nass River in 1949, amounting to 6,665 cases, was 2,289 cases less than were canned on this river in the year previous. The 1949 pack of cohoe on the Nass was also 1,099 cases greater than the average annual pack for this species for the immediately preceding five years.

Pink Salmon.—Pink salmon canned on the Nass River in 1949 produced a pack of 33,069 cases. This must be considered as reasonably satisfactory when it is recalled that the pink-salmon pack on this river system in 1948 amounted to only 8,565 cases and the 1947 pack, the cycle-year, produced 5,047 cases. However, this same cycle is capable of producing larger packs, as is evinced by the packs previous to 1945 when, in that year, 35,918 cases were canned. Again, in 1943, the pack amounted to 17,669 cases. In 1941 the pack was 22,667 cases and in 1939, 26,370 cases.

Chum Salmon.—Chum salmon are never a large factor in the Nass River canned-salmon production. In 1949 the pack of this species amounted to 7,854 cases. This figure is contrasted with the pack figures for 1948, when 7,272 cases were canned, and with 1947, when 8,925 cases were canned. In 1946 the Nass River produced a pack of chum salmon amounting to 13,810 cases, while in 1945 the pack was only 4,981 cases.

In any analyses of the salmon runs to the various river systems, based on the canned-salmon pack, the reader is advised to refer to the conditions prevailing on the spawning-beds for the years in question. There will be found in the Appendix to this Report a report on the conditions on the spawning-beds, supplied by the Chief Supervisor of Fisheries for British Columbia.

Rivers Inlet

The total canned-salmon pack on Rivers Inlet in 1949 amounted to 70,210 cases. The pack on this inlet in 1949 was 1,907 cases less than the total amount packed in 1948 and 43,786 cases less than the average annual pack for Rivers Inlet for the previous five-year period. In 1949 the Rivers Inlet pack of canned salmon was composed of 39,494 cases of sockeye, 743 cases of springs, 239 cases of steelheads, 5,978 cases of cohoe, 11,937 cases of pinks, and 11,819 cases of chums.

Sockeye Salmon.—Rivers Inlet, in 1949, produced a pack of sockeye salmon amounting to 39,494 cases. This was 1,829 cases greater than the amount packed in 1948 but was 50,241 cases less than the pack in 1945, one of the cycle-years for sockeye in Rivers Inlet. In 1944, which would correspond with the five-year cycle for the Rivers Inlet run, the pack was 36,582 cases. The 1949 pack was 36,566 cases less than the average annual pack of sockeye for this inlet for the previous five years.

A close examination of the sockeye-salmon pack figures for Rivers Inlet over the years would seem to indicate that Rivers Inlet is not producing sockeye salmon to the extent of its capabilities.

Spring Salmon.—Spring salmon are caught in Rivers Inlet incidental to fishing for other species. In 1949 the spring-salmon pack in this inlet amounted to 743 cases. This figure is compared with 899 cases in 1948, 475 cases in 1947, 1,108 cases in 1946, and 1,191 cases in 1945.

Cohoe Salmon.—Rivers Inlet is never a large producer of canned cohoe salmon, and the pack of 5,978 cases in 1949 was no exception. This figure is contrasted with 8,143 cases in 1948, 5,182 cases in 1947, 9,524 cases in 1946, and 17,516 cases in 1945.

Pink Salmon.—Pink salmon are never a very large factor in the Rivers Inlet canned-salmon pack. In 1949 Rivers Inlet produced 11,937 cases of pink salmon. This was 1,554 cases less than the pink-salmon pack for the year previous but was 2,912 cases above the cycle-year 1947.

Chum Salmon.—Up until 1935 chum salmon were not fished in Rivers Inlet, except those caught incidental to the sockeye-fishery. Since 1935 Rivers Inlet has continued to produce considerable quantities of chum salmon and in 1949 this inlet produced a pack of 11,819 cases. The 1949 pack was 333 cases above the pack for 1948 but was considerably less than the five-year average for this species, the five-year average being 18,273 cases.

Smith Inlet

The total canned-salmon pack for Smith Inlet in 1949 amounted to 19,083 cases, composed of 13,189 cases of sockeye, 159 cases of springs, 56 cases of steelheads, 785 cases of cohoe, 2,533 cases of pinks, and 2,361 cases of chums.

Sockeye Salmon.—The canned sockeye-salmon pack from Smith Inlet caught fish, amounting to 13,189 cases, was 2,733 cases greater than were canned in 1948. The 1949 pack, however, was 1,825 cases less than the pack in 1945, the cycle-year. The 1949 pack was 4,766 cases less than the average annual pack of sockeye produced in Smith Inlet over the past five years.

Spring Salmon.—In 1949 there were caught and canned in Smith Inlet sufficient spring salmon to fill 159 cases. These fish were caught incidental to the sockeye-fishery and are compared with the packs in recent past years, as follows: 1948, 186 cases; 1947, 43 cases; 1946, 45 cases; and 1945, 26 cases.

Cohoe Salmon.—Cohoe, like spring salmon, are not particularly fished in Smith Inlet. The pack represents the quantity caught incidental to fishing for sockeye. In 1949 the cohoe-pack in Smith Inlet amounted to 785 cases, compared with 929 cases in 1948, 348 cases in 1947, 177 cases in 1946, and 560 cases in 1945.

Pink Salmon.—The production of pink salmon in Smith Inlet in 1949 amounted to 2,533 cases. This figure is compared with 1,481 cases in 1948, 1,054 cases in 1947, 235 cases in 1946, and 2,362 cases in 1945. Pink salmon canned in Smith Inlet are also caught incidental to the sockeye fishery.

Chum Salmon.—In recent past years there has been a small fall chum-salmon fishery in Smith Inlet conducted by the seine fleet. In 1949 this was recorded as having produced 2,361 cases of chums. The pack in 1948 was 1,521 cases and in 1947, 7,910 cases. In 1946 chum salmon were canned to the extent of 8,369 cases, while in 1945 the pack was 3,692 cases. The size of the canned-chum pack in Smith Inlet is not considered indicative of the size of the run of this species.

Queen Charlotte Islands

There are only two species of salmon fished in the Queen Charlotte Islands District for canning purposes. These are pinks and chums. Large quantities of spring and cohoe salmon caught by troll in the vicinity of the Queen Charlotte Islands find an outlet in the fresh- and frozen-fish trade and, consequently, are not considered in the canned-salmon pack. A few cohoe, which were caught incidental to fishing for chums or pinks, are included in the canned-salmon pack and are so reported.

In 1949 the total canned-salmon pack from Queen Charlotte Islands caught fish was 34,544 cases. This was 92,775 cases less than were canned in the Queen Charlotte Islands in 1948. It must be remembered, however, that pink salmon are taken in the Queen Charlotte Islands only in the even-numbered years and 1949 was not a pink-salmon year. The 1949 pack for Queen Charlotte Islands caught fish consisted of 8,141 cases of cohoe, 1,550 cases of pinks, and 24,852 cases of chums.

Cohoe Salmon.—The 8,141 cases of cohoe salmon canned from Queen Charlotte Islands caught fish in 1949 are compared with 4,145 cases of this species canned in 1948. As pointed out in a previous paragraph, the canned-cohoe pack is no indication of the size of the cohoe run to the Queen Charlotte Islands, as large quantities of this species are caught by troll and find a market in the fresh- and frozen-fish trade. The canned-cohoe pack is made up of fish caught incidentally while fishing for chums. For convenience the pack figures are given for the immediate past years. In 1947 the cohoe-pack was 392 cases; in 1946, 1,192 cases; in 1945, 1,108 cases; in 1944, 19,615 cases; and in 1943, 14,488 cases.

Pink Salmon.—As pointed out in a previous paragraph, pink salmon frequent the waters off the Queen Charlotte Islands only in the even-numbered years. There was no pink-salmon run to the Queen Charlotte Islands in 1949. The 1,550 cases of pink salmon canned from Queen Charlotte Islands caught fish were those caught incidentally while fishing for chum salmon.

Chum Salmon.—The Queen Charlotte Islands produced 24,852 cases of canned chum salmon in 1949. This was 46,435 cases less than were canned the year previous and 6,704 cases less than the average annual pack of this species for the previous five-year period. If chum salmon are considered to be four-year fish, then the 1949 run was the progeny of the 1941–45 cycle. In 1941 the run produced 76,745 cases of chums, while in 1945 the pack amounted to 12,132 cases.

Central Area

For statistical purposes the Central Area comprises all of the salmon-fishing areas off the coast of British Columbia between Cape Calvert and the Skeena River, except Rivers Inlet. The salmon-fishing in this area is conducted on many different runs of salmon in the various parts of the district, and, as a consequence, the size of the pack in this area is no indication of the magnitude of the different runs to the various streams.

In 1949 the total canned-salmon pack credited to the Central Area amounted to 351,420 cases of all species. This figure is compared with the pack figures for 1948, when the Central Area produced 439,995 cases, and 1947, when 440,951 cases of all species were canned. In 1949 the total pack for the Central Area was 77,336 cases less than the average annual pack for the previous five-year period. The 1949 pack consisted of 16,140 cases of sockeye, 1,007 cases of springs, 355 cases of steelheads, 44,169 cases of cohoes, 173,456 cases of pinks, and 116,292 cases of chums.

Sockeye Salmon.—The sockeye-pack for the Central Area in 1949, of 16,140 cases, is compared with the pack of this species in 1948, when 23,246 cases of sockeye were canned, and with the cycle-year 1945, when the pack was reported as 24,109 cases. The sockeye-pack in the Central Area in 1949 was 2,550 cases less than the five-year average for this species in this district.

Spring Salmon.—Spring salmon are caught and canned in the Central Area to some extent, but, as in other areas, the canned spring-salmon pack is made up of fish which are caught incidentally while fishing for other species, and, therefore, the pack is not a measure of the size of the run. In 1949 the spring-salmon pack amounted to 1,007 cases, while in 1948, 1,195 cases of this species were canned in the Central Area. In the immediately preceding years, 1947 produced a pack of 514 cases, while in 1946, 656 cases were canned. The pack in 1945 amounted to 542 cases of spring salmon.

Cohoe Salmon.—The Central Area produced 44,169 cases of cohoe salmon in 1949. This exceeded the pack for 1948 by 5,353 cases and was 9,206 cases above the five-year average.

Pink Salmon.—The Central Area has always been considered a high-production area for pink salmon and has produced as high as 370,000 cases in a season. In comparatively recent years, however, the pack figures for pink salmon in this area have been considerably less than this amount. The 173,456 cases of pink salmon canned in the Central Area in 1949 were 21,256 cases greater than the pack of this species in 1948 and 72,215 cases greater than the pink-salmon pack in 1947, which was the cycle-year for this species in the Central Area. However, in 1945, the previous cycle-year, the Central Area produced 364,385 cases, while in 1943, the cycle-year before that, the pack amounted to 288,109 cases. The 1949 pack of pink salmon was 25,208 cases less than the average pack for the previous five cycle-years.

Chum Salmon.—In 1949 the Central Area produced a chum-salmon pack amounting to 116,292 cases. This was 109,394 cases less than the chum-salmon pack for the year previous. The 1949 pack was also 82,814 cases below the average annual pack for this species for the previous five-year period.

Vancouver Island

The total canned-salmon pack from fish caught in the Vancouver Island District in 1949 amounted to 538,370 cases of all species. This is compared with 317,572 cases in 1948 and 55,294 cases in 1947. In 1946 the pack amounted to 264,922 cases, while in 1945, 492,281 cases were canned. The 1949 pack consisted of 19,486 cases of sockeye, 6,361 cases of springs, 151 cases of steelheads, 98,958 cases of cohoe, 361,783 cases of pinks, and 51,629 cases of chums. Vancouver Island, like the Central Area, supports numerous races of salmon running to the different watersheds. In this breakdown no attempt is made to deal with the various races separately. It should be men-

tioned, however, that sockeye salmon caught in the Sooke traps are not credited to Vancouver Island, but are credited to the Fraser River, where most of them are known to migrate. Similarly, sockeye salmon caught in Johnstone Strait between Vancouver Island and the Mainland are also credited to the Fraser River in this Report and are not credited to Vancouver Island.

Sockeye Salmon.—The Vancouver Island District, with the exceptions noted above, produced a sockeye-salmon pack of 19,486 cases in 1949. This was 9,505 cases greater than were packed from Vancouver Island caught fish in 1948. The 1949 sockeye-pack for Vancouver Island was 2,401 cases above the previous five-year average.

Spring Salmon.—Large quantities of spring salmon are caught each year by trolling in the waters off the west coast of Vancouver Island. Most of these fish, however, find a market in the fresh- and frozen-fish trade or as mild-cured salmon. The troll-caught salmon on the lower west coast of Vancouver Island also find a market principally as fresh, frozen, or mild-cured. Because of these other outlets, the canned-salmon pack figures for spring salmon in the Vancouver Island District are nowise indicative of the catch of this species. In 1949 the total Vancouver Island canned spring-salmon pack was 6,391 cases. In 1948 the canned-salmon pack for this species was 6,622 cases, while in 1947, 4,942 cases were canned.

Cohoe Salmon.—In 1949, 98,958 cases of cohoe salmon were canned from Vancouver Island caught fish. This was 10,981 cases less than the pack in 1948 and 14,740 cases greater than the average annual pack for the five preceding years.

Pink Salmon.—In 1949 Vancouver Island was credited with having produced a pack of 361,783 cases of pink salmon. In 1947, the cycle-year for this species, the Vancouver Island District was credited with having produced sufficient pink salmon to fill 355,992 cases, while in the previous cycle-year, 1945, 242,590 cases were canned.

Chum Salmon.—Vancouver Island, in 1949, produced 51,629 cases of canned chum salmon. This is compared with the chum-salmon packs for the previous five years, which are as follows: 1948, 147,227 cases; 1947, 99,679 cases; 1946, 190,313 cases; and 1945, the cycle-year for this species, 136,724 cases.

REVIEW OF BRITISH COLUMBIA'S SALMON-CANNING INDUSTRY, 1949

In 1949 the Department of Fisheries licensed twenty-four salmon-canneries, all of which operated. The total number of salmon-canneries operated in 1949 was three less than were licensed to operate in 1948. The operating canneries in 1949 were located as follows: Skeena River, 6; Central Area, 3; Rivers Inlet, 1; Johnstone Strait, 2; Fraser River and Lower Mainland, 11; and west coast of Vancouver Island, 1.

The distribution of the salmon-canneries operated in 1949 was somewhat similar to the distribution of those which operated in 1948, except that on the Skeena River in 1949 six canneries operated, while seven operated on the Skeena River in 1948. Again, in Johnstone Strait in 1949 there were two canneries operated, while only one operated in this area in 1948. On the Fraser River and Lower Mainland in 1949 eleven canneries operated, compared with twelve in this district in 1948, and on the west coast of Vancouver Island one salmon-cannery operated in 1949, compared with three in 1948. There were no salmon-canneries operated in the Queen Charlotte Islands or on the Nass River in 1949. This is the fifth consecutive year in which no canneries have been operated in these two areas, and it would appear that the plants in these areas have been relegated to the status of fish camps. The salmon-catch from both of these areas was again transported to salmon-canneries operating in other districts.

In previous Reports of this Department, attention has been drawn to the growing tendency of the salmon-canners to concentrate the packing of salmon in fewer canneries. The liberal use of ice during the salmon-canning season, together with modern, fast

packers, have made it possible for the operators to transport fresh salmon over greater distances. This has been made necessary due to high production costs since the beginning of World War II, and the operators have been forced to reduce their production costs. One way of doing this is by operating fewer canneries. The practice of consolidating operations apparently is continuing, and each year fewer canneries are being licensed to operate. Not only are single companies concentrating their canning operations in fewer canneries, but different companies have made mutual agreements amongst themselves to can each other's fish in certain instances, and this seemingly has been to the mutual benefit of the companies. The continued increase in production costs, together with keener competition for the consumer's dollar, will continue to force the salmon-cannery operators to keep down production costs. It should be pointed out, however, that the cost of producing canned salmon can be only partially reduced by this method. The largest portion of the cost of a case of canned salmon is the cost of the raw fish, and until such time as the price of raw fish levels off, the cost of producing canned salmon will continue to rise, regardless of the concentration of operating canneries.

In 1947, after September 1st, there commenced the movement of large quantities of chum salmon to the United States for processing in American canneries. This practice continued in 1948, and in 1949 the chum-salmon season, so far as Canadian canners were concerned, might as well have closed on September 1st, as practically all of the chum salmon for canning purposes caught after that date found a market and were canned in United States canneries. This is not to say that all of British Columbia's chum-salmon production after September 1st was exported, as large quantities were frozen by Canadian freezers. It should be pointed out, however, that the export of raw fish which would ordinarily be canned in British Columbia has had the effect of reducing the British Columbia canned-salmon pack to less than what it would have been if all the fish caught in British Columbia had been canned here. It should also be pointed out that practically all of the exported chum salmon was caught in the Lower Mainland and Vancouver Island Districts, so that in considering the pack of chum salmon for these areas, due allowance should be made for the large quantities which are exported and which were formerly canned in British Columbia.

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

Pilchard-canneries.—For the past few years the pilchard run off the coast of Vancouver Island has not materialized, and again, in 1949, the pilchards did not put in an appearance. No pilchard-cannery licences were issued in 1949, although two licences were issued in the previous year. One cannery did not operate and the other put up a small pack of anchovies. There has been no pilchard fishery off the coast of British Columbia for several years.

Herring-canneries.—In 1949 five canneries were licensed to can herring. This was one more than was licensed in the year previous. The five canneries produced a pack of 77,913 cases of canned herring, compared with 92,791 cases canned by four canneries in 1948. During the war years, and immediately following the war, the canned-herring business in British Columbia attained quite large proportions. The pack in 1947, when eighteen herring-canneries were licensed to operate, reached a total of 1,283,670 cases. It must be remembered, however, that the canned-herring pack during the war was used chiefly for emergency feeding for troops and others, but since conditions have returned to post-war normal, the demand for canned herring has lessened very materially, hence the comparatively small packs in the latter years.

Tuna-fish Canneries.—The first commercial tuna-fish canning operations were conducted in British Columbia in 1948. This does not mean that this was the first time that tuna were caught in British Columbia waters, but rather that the first commercial canning of tuna commenced in 1948. Previous to that year, tuna caught in British

Columbia waters or offshore were mostly frozen and shipped to American canneries for processing. In 1948 there was a decided change in policy, and three canneries were licensed, all of which operated. In that year the three canneries produced a total pack of 40,436 cases of canned tuna. In 1949 four plants were licensed to operate, which produced a pack of canned tuna amounting to 48,507 cases.

Shell-fish Canneries.—Under this heading those plants which are concerned with the canning of various species of shell-fish are reviewed. In 1949 there were six shell-fish canneries licensed to operate by the Provincial Department of Fisheries. This was three less than were licensed in 1948. In 1949 the shell-fish canneries produced 6,409 cases of clams, 8,877 cases of crabs, 4,906 cases of oysters, and 120 cases of abalone. These pack figures are contrasted with the year previous, when nine shell-fish canneries were operated, which produced a pack of 11,811 cases of clams, 7,584 cases of crabs, 2,001 cases of oysters, 1,679 cases of shrimps, and 187 cases of abalone.

MILD-CURED SALMON

In 1949 eight plants were licensed to mild-cure salmon. Seven of these actually operated. These seven plants produced 1,212 tierces of mild-cured salmon. In the year previous there were six plants licensed to operate under this heading, and these six plants produced a total of 1,014 tierces of mild-cured salmon.

DRY-SALT SALMON

Previous to 1939 various amounts of chum salmon were dry-salted in British Columbia for shipment to the Orient. In some years the production of this product reached fairly large proportions. During the war years the Provincial Government declined to issue licences for salmon dry-salteries in order to divert as much of the salmon-catch as possible to the salmon canners and freezers. In 1947 there were two salmon dry-saltery licences issued. These were the first two licences issued since the end of hostilities, but in that year no operation was conducted at either plant. In 1948 there were no salmon dry-saltery licences issued, nor were there any salmon dry-saltery licences issued in 1949.

DRY-SALT HERRING

In British Columbia, previous to World War II, herring were dry-salted in large quantities, the product being shipped to the Orient. Since the outbreak of the war the bulk of British Columbia's herring-catch has been canned or reduced to meal and oil, and in order to divert as much as possible of the herring-catch to the canneries during the war years, no herring dry-salteries were permitted to operate in British Columbia. However, in 1945, U.N.R.R.A. requested a certain amount of dry-salt herring for relief feeding in China, and herring dry-salting was again permitted in British Columbia. In 1947 five herring dry-salteries were licensed to operate. In 1948 one herring dry-saltery operated in British Columbia and produced a very small pack. There were four herring dry-saltery licences issued in 1949, three of which operated. The three operating plants produced a total of 3,858 tons of dry-salt herring, all of which was shipped to the Orient. It is not anticipated that the herring-salting business will reach anything like its former proportions so long as conditions remain unsettled in the Orient, particularly in China.

PICKLED HERRING

There was no activity under this heading in 1949.

HALIBUT-FISHERY

The halibut-fishery on the Pacific coast of North America is regulated by the International Fisheries Commission under treaty between Canada and the United States. The

fishery is a deep-sea fishery and is shared in by the nationals of these two countries. The Commission regulates the fishery on a quota basis and, on that account, there is very little flucutation in the total amount of halibut landed from year to year, except when the quotas are changed for any reason. For the purpose of regulation, the coast has been divided into five areas, the principal areas, from the standpoint of production, being Areas 2 and 3. Area 2 comprises the waters off the coasts of Washington and British Columbia from the approximate vicinity of Willapa Harbour in the south to Cape Spencer in the north. Area 3 comprises the waters from the northern boundary of Area 2 to the Aleutian Islands. The other three areas, 1A, 1B, and 4, from which production is small, comprise the waters south of Area 2 and the Bering Sea respectively.

The 1949 catch-limit from Area 2 was 25,500,000 pounds of saleable halibut and for Area 3, 28,000,000 pounds. In Area 4 the limit was 500,000 pounds of saleable halibut, while no limit was placed on the amount which might have been taken from Areas 1A and 1B. These quotas are exclusive of the halibut caught incidentally while fishing for other species with set-lines in areas which are closed to halibut-fishing.

The total landings of halibut by all vessels in all ports on the Pacific Coast in 1949 amounted to 54,995,000 pounds. This figure is compared with the total landings in 1948 of 55,516,000 pounds. Of this total, Area 2 in 1949 produced 26,064,000 pounds, while 28,479,000 pounds were caught in Area 3. The figures for the respective areas in 1948 were: Area 2, 27,358,000 pounds, and Area 3, 27,917,000 pounds. Again, in 1949, Area 4 had no production, but in Areas 1A and 1B the production amounted to 452,000 pounds. This latter figure is compared with 241,000 pounds from Areas 1A and 1B (formerly Area 1) in 1948. Of these totals, there were landed by all vessels in Canadian ports in 1949 a total of 32,269,000 pounds. Of this amount, Area 2 supplied 14,142,000 pounds, while 8,127,000 pounds of the total were caught in Area 3. Of the total amount of halibut landed in Canadian ports by all vessels, Canadian vessels accounted for 18,063,000 pounds, of which 13,529,000 pounds were caught in Area 2 and 4,534,000 pounds were taken from Area 3.

In addition to the total landings by Canadian vessels in Canadian ports, Canadian vessels also landed in United States ports a total of 787,000 pounds of halibut, 59,000 pounds of which were taken in Area 2 and 628,000 pounds in Area 3. United States vessels landed in Canadian ports a total of 4,205,000 pounds.

The average open-market price paid for Canadian halibut in Prince Rupert in 1949 was 17.05 cents per pound and 17.17 cents per pound for Canadian landings in all British Columbia ports. These prices are compared with the average Prince Rupert price of 16.5 cents per pound and 16.2 cents per pound for all Canadian landings in all British Columbia ports in 1948.

Halibut-livers, because of their high vitamin content, have been a source of revenue to halibut-fishermen for a number of years. The value of halibut-livers to United States and Canadian fishermen in 1949 was $753,000, of which Canadian fishermen received $164,000 and United States fishermen received $589,000 for their share of the liver sales. The total value of halibut-liver production in 1948 was $1,759,000, of which $415,000 accrued to Canadian fishermen.

In addition to the money received by the halibut-fishermen for halibut-livers, halibut-viscera is now marketed, and in 1949 this was worth $248,000, of which $17,000 accrued to Canadian fishermen and $171,000 to United States fishermen.

The above dollar values for livers and viscera are computed on the basis of the approximate prices paid by the Fishermen's Co-operatives, who handled most of the production of livers and viscera in both countries.

The statistical information, quoted above, in connection with the Pacific halibut-fishery was supplied by the International Fisheries Commission and is hereby gratefully acknowledged.

FISH OIL AND MEAL

The production of fish-oil and edible fish-meal has been an important branch of British Columbia's fisheries for a number of years. Previous to the war, pilchards and herring were the principal species used for the production of oil and meal. Since the outbreak of World War II and the subsequent increase in the demand for natural sources of vitamins, other species have been found to yield oils of even higher vitamin content, and the increased demand for these products has stimulated activity in this field. In recent months, however, the increasing production of synthetic Vitamin A has lessened the demand for fish-liver oils as a natural source of this vitamin, and it is felt that if the price of synthetic Vitamin A falls much lower, the market for livers containing this vitamin may soon disappear.

The various fish-livers, cannery-waste, and viscera are all utilized for the production of fish-oil, much of which finds a market in the pharmaceutical trade. In addition to the production of high-vitamin oils from British Columbia's various fish and fish-livers, in recent years considerable activity has been manifest in the use of cannery-waste and viscera for the production of other pharmaceutical products. This business is now reaching quite large proportions. In addition to the high-vitamin oils used in the medicinal field, British Columbia's fish-oils of lower vitamin potency find an outlet in many manufacturing processes. Other vitamin-bearing oils produced in British Columbia are sold in large quantities for the feeding of poultry and live stock.

Fish-liver Oil.—As mentioned in the previous paragraph, fish-livers and fish-viscera are an important source of high-vitamin oils, and since the outbreak of the war there has been considerable activity in the production of vitamin oils from this source. In 1949 there were six plants licensed to process fish-livers in British Columbia. These six plants processed 3,990,956 pounds of liver, which produced 12,079,015 million U.S.P. units of Vitamin A. In the year previous, six reduction plants operated, and these plants processed 3,872,823 pounds of fish-livers, which produced 10,121,374 million U.S.P. units of Vitamin A. Previous to 1947 the production of vitamin oils has been reported in imperial gallons. This was contrary to the usual means of measuring the production of high-vitamin oils, and commencing with the Report of this Department for 1947, and subsequently, this production is reported in million U.S.P. units.

Pilchard-reduction.—For five consecutive years the pilchard runs to British Columbia have been a complete failure. Biologists charged with the investigation of this fishery are not optimistic that this condition will materially improve in the near future. There was no pilchard run in 1949.

It might be mentioned here that these fish are not native to British Columbia waters, but migrate from California, where they are spawned in the ocean. There is a large fishery in California conducted on the same body of fish that formerly migrated to British Columbia. This fishery is fished very heavily in California, and it may be that the heavy fishing there has had some bearing on the migration habits of the species.

Herring-reduction.—The winter herring-fishery in British Columbia has developed into a very important branch of the fishing industry. The season runs from October through to March, and, although a few herring are caught previous to October, the season actually get under way about the middle of November. Since the end of the war there has been a material change in the utilization of the herring-catch. Most of the catch is now reduced to meal and oil, but during the war years the bulk of the herring-catch was canned for emergency feeding purposes. This fact should be kept in mind when figures are being compared with similar figures during the war years in connection with the herring-fishery and herring-reduction.

In 1949 there were seventeen plants licensed to operate on herring-reduction in British Columbia. Sixteen of these plants operated and produced 30,081 tons of meal

and 3,823,643 imperial gallons of oil. In the year previous, seventeen plants operated and produced 31,340 tons of meal and 2,614,925 imperial gallons of oil.

Whale-reduction.—In 1948 the hunting and reduction of whales was again resumed in British Columbia after a period of inactivity. In 1949 one plant operated on the reduction of whales. This plant processed 255 whales and produced 921 tons of meal, 21 tons of fertilizer, 215,919 imperial gallons of whale-oil, and 96,136 imperial gallons of sperm-oil.

Miscellaneous Reduction.—Dogfish and fish-offal reduction plants are licensed by the Provincial Department of Fisheries under miscellaneous reduction licences. These plants operate on cannery-waste and on the carcasses of dogfish and produce meal and oil for various purposes. The oil produced from the carcasses of dogfish is not to be confused with the oil produced from dogfish-livers, the latter being a high-potency oil, which is reported in another section of this Report.

In 1949 there were sixteen fish-offal reduction plants licensed by the Department. One of these did not operate. The fifteen operating plants produced 1,622 tons of meal and 174,431 imperial gallons of oil. The 1949 production figures are compared with those for 1948, when thirteen fish-offal reduction plants produced 1,172 tons of meal and 141,099 imperial gallons of oil.

NET-FISHING IN NON-TIDAL WATERS

Under section 24 of the Special Fishery Regulations for British Columbia, fishing with nets in certain specified non-tidal waters within the Province is permissible under licence from the Provincial Minister of Fisheries. This fishery is confined almost exclusively to the residents living within reasonable distance of the lakes mentioned. In the Appendix to this Report there again appears a table showing the name and number of lakes in which net-fishing has been permitted, together with the number and approximate weight of the various species of fish taken from each lake.

It will be noted that there are three different kinds of fishing licences issued for net-fishing in the non-tidal waters of the Province—namely, fur-farm, ordinary, and sturgeon. In the 1949–50 season there were fourteen licences issued to fur-farmers, compared with twenty-three in the year previous. The coarse fish taken under these licences are used for feeding fur-bearing animals held in captivity.

There were 301 ordinary fishing licences issued in 1949–50, compared with 177 in the previous season. Four sturgeon-fishing licences were issued in the 1949–50 season, the same as in the preceding year.

For a detailed account of the fish taken by licensed nets in the different waters of the Province, the reader is referred to the table above mentioned appearing in the Appendix.

VALUE OF THE CANADIAN FISHERIES AND THE STANDING OF THE PROVINCES, 1948

The value of the fisheries products of Canada for the year 1948 totalled $139,748,941. During that year British Columbia produced fisheries products to the value of $58,703,803 or 42 per cent of Canada's total. British Columbia in 1948 led all of the Provinces in the Dominion in respect to the production of fisheries wealth. Her output exceeded that of Nova Scotia, second in rank, by $22,612,983.

The market value of the fisheries products of British Columbia in 1948 was $38,853 more than in the year previous. There was an increase in the value of salmon amounting to $1,150,686.

The capital employed in 1948 in the primary fishing industry was $67,289,244.

The number of persons engaged in the fisheries of British Columbia in 1948 was 16,406, or 19.6 per cent of Canada's total fishery workers. Of those engaged in British Columbia, 12,226 were employed in catching and handling the catches and 4,180 in

packing, curing, and in fish-reduction plants. The total number engaged in the fisheries of British Columbia in 1948 was 472 less than in the preceding year.

The following statement gives the value of fishery products of the Provinces of Canada for the years 1944 to 1948, inclusive:—

Province	1944	1945	1946	1947	1948
British Columbia	$34,900,990	$44,531,858	$43,817,147	$58,764,950	$58,703,803
Nova Scotia	23,662,055	30,706,900	34,270,761	26,658,915	36,090,820
New Brunswick	11,968,692	13,270,376	16,419,983	17,131,690	20,122,378
Quebec	5,361,567	7,727,222	7,927,022	5,316,999	6,393,635
Ontario	4,938,193	7,261,661	6,296,658	5,403,662	5,942,723
Manitoba	3,581,795	4,263,670	4,871,037	5,329,448	5,414,583
Prince Edward Island	2,598,975	3,076,811	4,470,877	2,897,284	3,634,376
Alberta	929,887	1,450,502	1,399,083	856,609	1,527,834
Saskatchewan	1,482,223	1,286,361	1,148,886	1,170,930	1,282,437
Northwest Territories	.....	112,131	558,264	530,948	636,352
Yukon	3,131	3,138	5,014	7,474	*
Totals	$89,427,508	$113,690,630	$121,124,732	$124,068,909	$139,748,941

* Not available.

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 1944 to 1948, inclusive, is given in the following table:—

Species	1944	1945	1946	1947	1948
Salmon	$15,623,223	$25,424,954	$24,346,483	$35,692,625	$36,671,140
Halibut	2,679,657	3,042,390	3,708,819	5,296,942	4,120,003
Halibut livers and viscera oil	257,288	275,825	300,303	647,002	527,868
Herring	6,758,626	8,423,136	9,574,643	12,094,582	10,485,090
Pilchard	2,222,181	1,439,145	213,753	41,750	.....
Mackerel	780	.....	.....	.....	.....
Grey cod	.....	.....	.....	108,130	134,494
Ling cod	1,353,900	1,296,639	1,319,501	596,886	878,972
Clams	174,673	206,045	349,804	369,788	107,546
Black cod	414,753	368,408	446,008	268,165	564,888
Crabs	52,495	77,958	217,792	297,533	326,263
Soles	271,231	438,219	848,004	515,148	1,170,890
Prawns	.....	.....	.....	55	.....
Shrimps	10,451	24,025	40,431	48,538	84,910
Oysters	149,754	105,596	258,964	239,099	214,495
Abalones	.....	6,370	150	7,101	4,838
Flounders	132,136	90,786	25,765	10,629	15,661
Red cod	284,828	284,759	214,882	78,435	131,910
Perch	13,741	16,174	15,970	8,070	5,731
Smelts	3,278	5,076	10,326	11,328	10,053
Sturgeon	3,915	6,521	6,070	10,142	5,502
Octopus	1,444	5,802	3,705	514	2,199
Skate	5,866	4,685	4,486	3,861	5,208
Eulachons	16,456	24,091	11,337	36,732	30,224
Whiting	540	50	180	.....	.....
Sardines	.....	.....	.....	.....	.....
Trout	.....	.....	.....	.....	.....
Grayfish, etc.—					
Fresh	.....	.....	.....	.....	.....
Livers	60,930	10,634	12,258	43,121	11,057
Liver-oil	3,661,131	2,337,267	1,098,569	1,439,861	1,634,388
Body-oil	8,263	.....	.....	.....	.....
Meal	21,136	.....	.....	.....	.....
Whales	.....	.....	.....	.....	.....
Fur-seals	730	.....	620	987	296
Hair-seals	50	.....	.....	.....	.....
Anchovies	261,160	82,545	615,106	537,787	88,305
Tuna	93,373	319,404	122,892	233,096	990,424
Shark-livers	12,564	6,548	4,375	21,147	2,822
Shark-liver oil	323,068	187,866	37,625	23,160	23,435
Ratfish-livers	.....	2,679	1,199	2,657	242
Miscellaneous	29,429	18,531	7,127	80,079	454,949
Totals	$34,900,990	$44,531,858	$43,817,147	$58,764,950	$58,703,803

CONDITION OF BRITISH COLUMBIA'S SALMON-SPAWNING GROUNDS

We are indebted to the Chief Supervisor of Fisheries for the Federal Government and the officers of his Department who conducted the investigations for furnishing us with a copy of the Department's report on the salmon-spawning grounds of British Columbia. His courtesy in supplying us with this report is gratefully acknowledged.

The Chief Supervisor's report on the condition of British Columbia's salmon-spawning grounds will be found in full in the Appendix to this Report.

CONTRIBUTIONS TO THE LIFE-HISTORY OF THE SOCKEYE SALMON (PAPER No. 35)

(Digest)

Paper No. 35 in this series is contributed by two authors new to the pages of this Report—namely, A. Andrekson, M.Sc., and D. R. Foskett, B.A., of the staff of the Pacific Biological Station at Nanaimo.

Heretofore, the work of analysing the commercial sockeye-salmon catch of British Columbia's principal sockeye-fishing rivers has been done with funds supplied by the Provincial Department of Fisheries, and for many years the data collected have been analysed by Dr. W. A. Clemens, Department of Zoology, University of British Columbia. Latterly, the extended salmon work being conducted by the Fisheries Research Board of Canada made it possible to have the material for catch analyses collected simultaneously while other field work was in progress, by a joint arrangement between the Fisheries Research Board of Canada and the Provincial Department of Fisheries. Arrangements have now been made to have this investigation continued, but, commencing with this paper, this investigation will be financed and carried forward by the Fisheries Research Board of Canada. The Provincial Department of Fisheries will continue to contribute to this series by publishing the series of papers relating to this investigation. These papers will continue in the Appendix to the Annual Report of the Provincial Department of Fisheries.

The work of Dr. W. A. Clemens in connection with this investigation and as author of this series for many years is hereby gratefully acknowledged.

In Paper No. 35 the authors point out that the outstanding feature of the sockeye-salmon runs in 1949 in British Columbia was the relatively small packs in the Skeena River, Rivers Inlet, and Nass River areas. In each case the pack was much lower than the forty-two-year averages for the Skeena River and Rivers Inlet and the thirty-seven-year average for the Nass River. For instance, the average annual pack on the Skeena River for the past forty-two years amounted to 86,349.5 cases, while the pack in 1949 for this river system was 65,937 cases. Similarly, in Rivers Inlet the average annual pack for the previous forty-two-year period amounted to 81,273.5 cases, but in 1949 the pack for this inlet amounted to 39,495 cases. On the Nass River the thirty-seven-year average pack was 20,327 cases, but in 1949 the pack amounted to only 9,268 cases. The authors point out that in any estimation of the salmon run based on pack figures, the escapement must also be taken into consideration. In 1949 the escapements in the Skeena River were reported as heavy, in Rivers Inlet as satisfactory, and in the Nass River as medium; therefore, the over-all escapement must be classed as very satisfactory.

In dealing with the separate runs to the different river systems, the authors point out that on the Skeena River in 1949 the pack of 65,937 cases was produced chiefly from the return of the 1944 and 1945 spawnings, and that although this pack was below the forty-two-year average, reports indicate that the spawning stocks were satisfactory in most of the watersheds. The Skeena, with an escapement of 509,000 sockeye, had a lower spawning population than at any time during the past five years. The reduction in the spawning sockeye at Babine, on the Skeena, was in the early runs to the area.

In connection with the Rivers Inlet sockeye run in 1949, the authors point out that the pack of sockeye on this inlet was 39,495 cases, composed of 84 per cent of four-year-old and 13.5 per cent of five-year-old fish; therefore, it is evident that the run of 1945 contributed in large part to the pack of 1949. The return in 1950 will be the product of the spawnings of 1945 and 1946. In the former year the pack was 89,735 cases and the escapement was reported as very good. In the latter year the pack was 73,320 cases and the escapement reports were indefinite.

For the Nass River the authors content themselves with observing that the pack of sockeye from the run to the Nass River in 1949 was 9,268 cases, which is the second lowest pack in the past thirty-seven years, with the escapement reported as being medium.

HERRING INVESTIGATION

The long-term investigation of the herring populations in British Columbia waters was continued in 1949–50 by members of the staff of the Pacific Biological Station working under the direction of Mr. J. C. Stevenson. The herring investigation in 1949–50 was financed by the Fisheries Research Board of Canada and the Provincial Department of Fisheries.

As in other recent years, most of the effort of the investigation was directed toward the study of the west coast of Vancouver Island herring population. Since 1946 the only limitation on this fishery has been a fixed closure date of February 5th. The results of this investigation are being compared with those for the lower east coast population, which is restricted by a fixed annual quota of 40,000 tons. The immediate object of the study is to determine whether catch quotas are effective in maintaining the level of herring populations.

In order to determine some of the causes of the large natural variation in recruitment, various other studies have been carried out on the different stages in the early life-history. These have included studies on the survival of the spawn and on the distribution abundance, growth, and survival of larvæ and juveniles.

West Coast of Vancouver Island Herring Studies

The herring-tags were recovered by four electronic detectors located in the unloading systems of certain reduction plants and by magnets located in the meal-lines of all thirteen reduction plants on the coast. This year 1,133 tags were recovered as compared with 3,170 in 1948–49. This reduced recovery was probably caused by the smaller fishery on the west coast (due largely to the small catch in Esperanza Inlet) and the reduction in the number of fish tagged on the west coast in 1949. As in past years, most of the tag recoveries were made in the sub-district in which these fish were tagged. The migration of fish from the lower east coast to the west coast was greater than that in the reverse direction. However, the movement in both directions was greater than that estimated for the previous year. There was a small intermingling of fish between west coast areas. In the west coast sub-district a larger percentage of the fish moved in a south-easterly direction than in a north-westerly direction. This is the reverse of the movement recorded in 1948–49.

This year a total of 37,300 tons of herring was caught on the west coast of Vancouver Island, as compared with 55,000 tons in 1948–49. An increase in fishing effort was recorded, and the availability was considerably less, as was the rate of exploitation. This decrease in the number of herring found on the fishing-grounds does not necessarily mean an over-all decrease in population abundance. In fact, an analysis of all the data would indicate that the initial population abundance was greater this season but that many of these fish did not move inshore in time to be taken by the fishery. Relatively greater recruitment of the 1947 year-class appears to have caused the increased abundance.

The tagging programme was continued in the spring of 1950. This programme resulted in 26,656 herring being tagged on the west coast, as compared with 21,856 in the previous year.

During the 1949–50 season ninety-three samples were taken from the west coast fishery and spawning runs. The 1947 year-class constituted over two-thirds of the west coast catch as III-year fish. This was the largest predominance of III-year fish in the west coast fishery since the 1945–46 fishing season. In spite of the reduced catch, the III-year fish were more abundant this season than in the 1948–49 catch. As a result, fish of Age IV and older formed a relatively small portion of the catch. The III-year fish predominated in all spawning-run samples, except in Quatsino Sound. (This gives support to indications of previous years that the herring of this area tend to be segregated from the rest of the west coast population.)

The extent of spawn was greater in 1950 than in 1949, but the intensity was lighter. In all areas except two the extent of spawn was greater. The reason that the over-all amount of spawn deposited seems to remain fairly consistent from year to year is that new schools move inshore after the completion of the fishery, thus maintaining the level of the spawning population.

The detailed results of the fourth year of the investigation of the west coast of Vancouver Island herring populations are given in the Appendix to this Report.

Other Herring Studies

In addition to studying the middle and lower east coasts and the west coast of Vancouver Island herring populations, data were also gathered on all the other herring-fisheries of British Columbia.

The total catch in all sub-districts this year was only 6,000 tons lower than the all-time record of 189,200 tons caught in 1948–49. Quotas were reached in lower east coast, middle east coast, northern and central sub-districts. The catch was approximately 1,000 tons short of the 10,000-ton quota in the upper east coast sub-district. Quota extensions were granted in the northern sub-district (10,000 tons in addition to a 30,000-ton quota) and the middle east coast sub-district (5,000 tons in addition to a 10,000-ton quota). Both these extensions were taken.

In the central and northern sub-districts the 1947 year-class dominated the catch in 1949–50 as III's and resulted in the largest fishery on record in the northern sub-district. In the Queen Charlotte Islands sub-district the spawning-ground reports show the herring population to be less abundant than it was two years ago. Lack of data on age composition during the period of high abundance prevents the analysis of the changes in the year-class strength which have occurred in the population.

In the lower east coast sub-district III-year fish comprised well over half of the fishery. The same year-class also dominated the spawning runs. In the middle east coast sub-district the 1947 year-class contributed greatly to the catch in both fishing areas of the sub-district. Studies of the amount of spawn deposition in the spring of 1950 indicated that the population carry-over to the 1950–51 season was apparently large. However, the 1948 year-class is not expected to be as productive as the 1947 year-class.

Trawling for herring took place around Cape Lazo in the fall of 1949 but did not prove very successful. The failure to catch fish by this method is apparently due to the lack of adequate gear to fish off the bottom. A few tons of herring were caught by seine-boats during the summer of 1949 in the vicinity of Namu.

Prediction of the expected abundance of herring on the various fishing-grounds for the 1949–50 season again proved fairly accurate.

SHELL-FISH INVESTIGATION

In the pages of this Department's Annual Report for 1948 it was reported that the Department had secured the services of a qualified biologist and was planning on obtaining suitable premises, close to the centre of the oyster-growing industry, to establish a shell-fish laboratory. These plans have been carried out and the Department of Fisheries now operates a shell-fish laboratory on the shores of Ladysmith Harbour, which is under the direction of Dr. D. B. Quayle, biologist.

In setting up an establishment of this kind, a good deal of time is required to gather together the necessary facilities and equipment and in organizing the various research problems to be undertaken. During the past year this work has gone forward, and in the Appendix to this Report there will be found a report of the biologist for 1949 dealing with the work of that branch of the Department.

The preliminary work of organizing and acquiring the necessary equipment has been completed, and the laboratory at Ladysmith is now fairly well equipped, with the exception of a proper vessel, for field work. It is hoped that a suitable boat can be obtained in the near future, which will greatly facilitate the biological investigations into the Province's various types of shell-fish, which work has been planned well ahead.

APPENDICES

CONTRIBUTIONS TO THE LIFE-HISTORY OF THE SOCKEYE SALMON (No. 35)

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INTRODUCTION

The outstanding feature of the sockeye-salmon runs in 1949 was the relatively small packs in the Skeena River, Rivers Inlet, and Nass River areas. In each case the pack was much lower than the forty-two-year averages for Skeena River and Rivers Inlet and the thirty-seven-year average for Nass River. Skeena forty-two-year average, 86,349.5 cases; 1949, 65,937 cases. Rivers Inlet forty-two-year average, 81,273.5 cases; 1949, 39,495 cases. Nass thirty-seven-year average, 20,327 cases; 1949, 9,268 cases.

The escapements in the Skeena were reported as heavy, in Rivers Inlet as satisfactory, and the Nass River as medium. The over-all escapement must thus be classed as very satisfactory.

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 are:—

3_1, 4_1—the " sea-types " or fish which migrate in their first year and mature at at the ages of three and four 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.

1. THE RIVERS INLET SOCKEYE RUN OF 1949

(1) General Characteristics

The pack of sockeye salmon at Rivers Inlet in 1949 was 39,495 cases. The run was composed of 84 per cent of four-year-old and 13.5 per cent of five-year-old fish, and it is thus evident that the run of 1945 contributed in large part to the pack of 1949.

The return in 1950 will be the product of the spawnings in 1945 and 1946. In the former year the pack was 89,735 cases and the escapement was reported as very good. In the latter year the pack was 73,320 cases and the escapement reports were indefinite.

(2) Age-groups

The data for this year's studies were obtained from day-to-day sampling of the commercial catch from June 27th to August 5th, inclusive, representing 686 fish. The 4_2 age-group is represented by 576 individuals or 84 per cent. The 5_2 age-group consists of 92 individuals or 13 per cent. This percentage of the 4_2 age-group is the highest on record for this area. The run thus consisted largely of the four-year-old fish, which were the progeny of the 1945 spawning. In 1945 the same age-group constituted only 57 per cent of the catch and a very good escapement was recorded. In 1944 the 5_2 age-group constituted 23 per cent of the run and a light escapement was recorded. Although the 4_2 age-group is high, it is not unusually so for this area, where the records of the past thirty-six years show this group to fluctuate between 3 and 81 per cent.

The 5_3 and 6_3 age-groups are represented by six and one fishes respectively (Table II).

In the 4_1 age-group there occurred 11 individuals or 1.6 per cent of the total sampling. This age-class has never before been recorded in such high numbers from this area. From Tables II and III it would appear that average lengths and weights for the 4_1 age-group fall into the expected category of being slightly longer and heavier than the 4_2 age-group.

(3) Lengths and Weights

The average lengths of the males and females of the 4_1 age-group are 25.3 and 23.0 inches respectively; of the 4_2 age-group, 20.9 and 21.4 inches respectively; and of the 5_2 age-group, 23.8 and 22.8 inches respectively. The average weights of the males and females of the 4_1 age-group are 7.4 and 5.7 pounds; of the 4_2 age-group, 4.4 and 4.3 pounds; and the 5_2 age-group, 5.9 and 5.9 pounds respectively. The 4_2 and 5_2 lengths fall within the limits of past records. The 4_2's weights are in no way out of order, but the average male's weight is a new low at 5.9 pounds, as compared to the old record of 6.2 pounds average and the thirty-three-year average of 6.9 pounds. The female 5_2's average weight is also 5.9 pounds, which equals the 1947 record for light weight in this group. The thirty-three-year average weight for female 5_2's is 6.4 pounds.

(4) Distribution of Sexes

The total number of males in the samples was 428 and of females 258, percentages of 62.4 and 37.6 respectively. In the 4_2 age-group the males greatly predominate, with a percentage of 69.8, while in the 5_2's the females predominate, with 78.3 per cent.

In the 4_1 age-group, females predominate, with a percentage of 63.6. This distribution of sexes is not unusual for this river system.

2. THE SKEENA RIVER SOCKEYE RUN OF 1949

(1) General Characteristics

The pack of 65,937 cases produced by the 1949 sockeye run was the return chiefly from the 1944 and 1945 spawnings. Though this pack is below the forty-two-year average, reports indicate that the spawning stocks were satisfactory in most of the watershed. The Skeena, with an escapement of 509,000 sockeye, had a lower spawning population than at any time during the past five years, as may be seen from the Fisheries Research Board estimates, as follows: 1944, 620,000 fish; 1945, 1,360,000 fish; 1946, 680,000 fish; 1947, 690,000 fish; and 1948, 700,000 fish.* The reduction in the spawning sockeye at Babine was in the early runs to the area.

* Due to the washout of the Babine fence in 1948 this number is an approximation from a comparison with the 1947 run.

(2) Age-groups

The data on which the 1949 study is based consists of scale samples from 1,342 sockeye. The 5_2 age-group was dominant in these fish, as 1,020 individuals or 75 per cent were of this age. Only 16 per cent, 223 fish, were in 4_2 age-group. The 5_3 and 6_3 age-groups, forming 4 and 3 per cent of the run, were represented by 57 and 43 fish respectively. The so-called sea-run sockeye—that is, those which go to sea immediately upon emergence from the gravel—were represented by one individual from the 3_1 age-group and one from the 4_1 age-group. These fish were a male 20¼ inches, 3¼ pounds, and a female 25 inches, 6¾ pounds respectively. The one jack male represented was 16½ inches in length and weighed 2 pounds. These fish have not been included in the tables.

(3) Lengths and Weights

The lengths as shown in Table VIII do not differ materially from the average of the past few years. In weight the 4_2, 5_3, and 6_3 age-classes appear normal, and the 5_2 group seems to be slightly above average.

(4) Distribution of Sexes

The total number of males in the sample was 479, and the total number of females was 863. Thus the percentages were 36 (males) and 64 (females). This 2–1 ratio was not general throughout the age-classes but was confined to the 5_2 group, as may be seen from the tables. The 4_2, 5_3, and 6_3 age-groups had a preponderance of males.

3. THE NASS RIVER SOCKEYE RUN OF 1949

(1) General Characteristics

The pack of sockeye from the run to the Nass River in 1949 was 9,268 cases, which is the second lowest pack in the past thirty-seven years. The escapement was reported as medium.

(2) Age-groups

The material for 1949 was obtained from 152 fish, taken in five random samplings of the commercial fishery from June 25th to August 3rd, inclusive. The age-groups were represented as follows: 4_2, 60 fish or 39 per cent; 5_2, 9 fish or 6 per cent; 5_3, 73 fish or 48 per cent; 6_3, 10 fish or 7 per cent. There is nothing unusual in this distribution. One individual fish was a 4_1 male, 23¼ inches long and 6¼ pounds in weight, and is not included in the table (Table XIII).

(3) Lengths and Weights

The average lengths of the males and females are shown in Tables XIV and XV. In the 5_2 female age-group the average length is less than in previous years, and the average weight of this group is well below previous averages.

(4) Distribution of the Sexes

The total number of males in the samplings is 81, and of females 71, percentages of 53 and 47 respectively. This is identical with the 1948 sex ratio. Unlike former years, the males are dominant in the 5_3 age-group and are in 50–50 ratio in the 6_3 age-group (Table XVIII).

Table I.—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 (46,351 cases)	53	46	1	----
1937 (84,832 cases)	60	37	3	----
1938 (87,942 cases)	27	70	1	2
1939 (54,143 cases)	67	32	1	----
1940 (63,469 cases)	69	28	3	----
1941 (93,378 cases)	59	40	1	----
1942 (79,199 cases)	8	91	----	1
1943 (47,602 cases)	8	91	----	1
1944 (36,852 cases)	76	23	1	----
1945 (89,735 cases)	57	41	2	----
1946 (73,320 cases)	37	63	----	----
1947 (140,087 cases)	3	97	----	----
1948 (37,665 cases)	55	44	1	----
1949 (39,495 cases)	84	14	1	----

Table II.—Rivers Inlet Sockeyes, 1949, Grouped by Age, Sex, Length, and by Their Early History

Length in Inches	Number of Individuals										Total
	4_1		4_2		5_2		5_3		6_3		
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	
18	-----	-----	1	-----	-----	-----	-----	-----	-----	-----	1
18¼	-----	-----	1	-----	-----	-----	-----	-----	-----	-----	1
18½	-----	-----	4	1	-----	-----	-----	-----	-----	-----	5
18¾	-----	-----	8	1	-----	-----	-----	-----	-----	-----	9
19	-----	-----	16	4	-----	-----	-----	-----	-----	-----	20
19¼	-----	-----	8	4	-----	-----	-----	-----	-----	-----	12
19½	-----	-----	26	12	-----	-----	-----	-----	-----	-----	38
19¾	-----	-----	13	9	-----	-----	-----	-----	-----	-----	22
20	-----	-----	36	13	1	-----	-----	-----	-----	-----	50
20¼	-----	-----	26	11	-----	-----	-----	-----	-----	-----	37
20½	-----	1	33	19	-----	-----	-----	1	-----	-----	54
20¾	-----	-----	17	9	-----	-----	-----	1	-----	-----	27
21	-----	-----	48	16	-----	1	-----	1	-----	-----	66
21¼	-----	-----	26	7	1	-----	-----	-----	-----	-----	34
21½	-----	-----	26	15	-----	4	-----	-----	-----	-----	45
21¾	-----	-----	21	7	-----	1	-----	-----	-----	-----	29
22	-----	-----	23	7	-----	3	1	1	-----	-----	35
22¼	-----	1	12	4	1	2	-----	-----	-----	-----	20
22½	-----	1	15	10	1	8	-----	-----	-----	-----	35
22¾	-----	-----	8	5	1	4	-----	-----	-----	-----	18
23	-----	1	6	4	2	12	1	-----	-----	-----	26
23¼	-----	-----	7	3	-----	1	-----	-----	-----	-----	11
23½	-----	-----	6	6	5	7	-----	-----	-----	-----	24
23¾	1	-----	4	-----	-----	2	-----	-----	-----	-----	7
24	-----	2	2	1	1	10	-----	-----	-----	-----	16
24¼	-----	-----	1	1	-----	1	-----	-----	-----	-----	3
24½	1	-----	1	2	-----	4	-----	-----	-----	-----	8
24¾	-----	-----	-----	-----	1	2	-----	-----	-----	-----	3
25	-----	-----	2	1	1	4	-----	-----	-----	1	9
25¼	-----	1	1	2	-----	3	-----	-----	-----	-----	7
25½	-----	-----	2	-----	1	1	-----	-----	-----	-----	4
25¾	-----	-----	-----	-----	1	2	-----	-----	-----	-----	3
26	1	-----	-----	-----	1	-----	-----	-----	-----	-----	2
26¼	-----	-----	-----	-----	2	-----	-----	-----	-----	-----	2
26½	-----	-----	1	-----	-----	-----	-----	-----	-----	-----	1
26¾	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
27	1	-----	-----	-----	-----	-----	-----	-----	-----	-----	1
27¼	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
27½	-----	-----	1	-----	-----	-----	-----	-----	-----	-----	1
Totals	4	7	402	174	20	72	2	4	-----	1	686
Average lengths	25.31	23.07	20.96	21.4	23.8	22.8	22.5	21.06	-----	25.0	-----

Table III.—Rivers Inlet Sockeyes, 1949, Grouped by Age, Sex, Weight, and by Their Early History

Weight in Pounds	Number of Individuals										Total
	4_1		4_2		5_2		5_3		6_3		
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	
2¾	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	1
3	.....	.....	7	6	.....	.....	.....	.....	.....	.....	13
3¼	.....	.....	27	9	.....	.....	.....	.....	.....	.....	36
3½	.....	.....	38	17	.....	.....	.....	.....	.....	.....	55
3¾	.....	1	49	27	2	1	.....	1	.....	.....	81
4	.....	.....	55	25	1	.....	.....	1	.....	.....	82
4¼	.....	.....	58	17	.....	.....	1	1	.....	.....	77
4½	.....	1	44	19	.....	7	.....	1	.....	.....	72
4¾	.....	.....	39	17	1	6	.....	.....	.....	.....	63
5	.....	.....	22	14	1	10	.....	.....	.....	.....	47
5¼	.....	1	14	5	4	3	.....	.....	.....	.....	27
5½	.....	.....	16	2	.....	4	.....	.....	.....	.....	22
5¾	1	.....	12	5	1	7	.....	.....	.....	.....	26
6	.....	1	8	3	3	4	1	.....	.....	.....	20
6¼	.....	1	2	2	1	9	.....	.....	.....	.....	15
6½	1	1	2	1	1	4	.....	.....	.....	.....	10
6¾	.....	.....	.....	2	.....	4	.....	.....	.....	.....	6
7	.....	.....	.....	1	1	5	.....	.....	.....	.....	7
7¼	.....	.....	.....	2	1	4	.....	.....	.....	.....	7
7½	.....	.....	1	.....	1	1	.....	.....	.....	1	4
7¾	.....	.....	3	.....	.....	1	.....	.....	.....	.....	4
8	.....	1	1	.....	.....	1	.....	.....	.....	.....	3
8¼	1	.....	.....	.....	2	.....	.....	.....	.....	.....	3
8½	.....	.....	1	.....	.....	1	.....	.....	.....	.....	2
8¾	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	1
9	1	.....	1	.....	.....	.....	.....	.....	.....	.....	2
Totals	4	7	402	174	20	72	2	4	.....	1	686
Average weights	7.37	5.75	4.37	4.33	5.85	5.84	5.12	4.12	.....	7.5	.....

Table IV.—Rivers Inlet Sockeyes, Average Lengths in Inches of the 4_2 and 5_2 Groups, 1912 to 1949

Year	4_2		5_2	
	M.	F.	M.	F.
1912–41	22.4	22.4	25.4	24.7
1912–41 (conversion)	21.6	21.6	24.6	23.9
1942	21.9	21.3	25.0	23.8
1943	20.5	21.1	24.3	23.7
1944	21.1	21.0	23.5	23.3
1945	20.9	21.2	24.2	23.9
1946	20.6	21.1	25.1	24.1
1947	20.6	20.7	24.0	23.5
1948	21.4	21.3	25.2	24.2
1949	20.9	21.4	23.8	22.8

Table V.—Rivers Inlet Sockeyes, Average Weights in Pounds of the 4_2 and 5_2 Groups, 1914 to 1949

Year	4_2		5_2	
	M.	F.	M.	F.
1914–41	4.9	4.8	7.0	6.5
1942	5.1	4.6	7.2	6.4
1943	4.1	4.4	6.8	6.3
1944	4.6	4.4	6.2	6.0
1945	4.3	4.4	6.6	6.4
1946	3.9	3.9	7.2	6.2
1947	4.1	3.9	6.4	5.9
1948	4.7	4.6	7.9	7.0
1949	4.4	4.3	5.9	5.9

Table VI.—Rivers Inlet Sockeyes, Percentages of Males and Females, 1915 to 1949

Year	4_1		4_2		5_2		Per Cent Total Males	Per Cent Total Females
	M.	F.	M.	F.	M.	F.		
1915–41 (average)	----	----	63	37	34	66	50	50
1942	----	----	61	39	35	65	38	62
1943	----	----	62	38	34	66	36	64
1944	----	----	67	33	33	67	59	41
1945	----	----	70	30	39	61	57	43
1946	----	----	79	21	37	63	53	47
1947	----	----	72	28	35	65	36	64
1948	----	----	50	50	38	62	45	55
1949	36	64	70	30	22	78	63	37

Table VII.—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
1937 (42,491 cases)	45	40	11	4
1938 (47,257 cases)	64	15	16	5
1939 (68,485 cases)	50	35	11	4
1940 (116,507 cases)	80	15	4	1
1941 (81,767 cases)	39	52	8	1
1942 (34,544 cases)	36	54	7	3
1943 (28,268 cases)	39	39	16	6
1944 (68,197 cases)	37	52	7	4
1945 (104,279 cases)	20	63	12	5
1946 (52,928 cases)	13	70	8	9
1947 (32,534 cases)	14	82	3	1
1948 (101,267 cases)	80	13	6	1
1949 (65,937 cases)	17	76	4	3

Table VIII.—Skeena River Sockeyes, 1949, 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.	
17½	1	.....	.....	.....	.....	.....	.....	.....	1
17¾	.....	.....	.....	.....	.....	.....	.....	.....	.....
18	.....	.....	.....	.....	.....	.....	.....	.....	.....
18¼	.....	.....	.....	.....	.....	.....	.....	.....	.....
18½	.....	.....	.....	.....	.....	.....	.....	.....	.....
18¾	.....	.....	.....	.....	.....	.....	.....	.....	.....
19	.....	.....	.....	.....	.....	.....	.....	.....	.....
19¼	.....	.....	.....	.....	.....	.....	.....	.....	.....
19½	1	.....	.....	.....	.....	.....	.....	.....	1
19¾	1	.....	.....	.....	.....	.....	.....	.....	1
20	1	1	.....	.....	.....	.....	.....	.....	2
20¼	.....	.....	.....	.....	.....	.....	.....	.....	.....
20½	3	1	.....	.....	.....	1	.....	.....	5
20¾	2	6	.....	1	.....	.....	.....	.....	9
21	3	8	1	.....	.....	4	.....	.....	16
21¼	6	4	.....	3	1	1	.....	.....	15
21½	7	6	.....	1	.....	3	.....	.....	17
21¾	5	9	1	.....	.....	2	.....	.....	17
22	9	16	.....	3	2	5	1	1	37
22¼	8	8	1	4	2	1	.....	.....	24
22½	17	18	6	17	3	1	.....	.....	62
22¾	9	7	2	15	4	3	.....	.....	40
23	13	8	4	25	3	1	2	.....	56
23¼	11	1	3	19	3	.....	1	1	39
23½	9	2	7	38	1	.....	.....	3	60
23¾	4	.....	7	37	4	.....	1	3	56
24	4	1	14	78	3	1	2	2	105
24¼	3	1	11	64	2	.....	3	1	85
24½	1	1	22	85	1	2	1	2	115
24¾	.....	1	20	61	1	2	3	3	91
25	2	1	24	98	.....	.....	4	.....	129
25¼	.....	.....	19	62	.....	.....	1	.....	82
25½	.....	.....	26	47	.....	.....	1	.....	74
25¾	.....	2	31	27	.....	.....	1	.....	61
26	1	.....	35	17	.....	.....	2	.....	55
26¼	.....	.....	10	9	.....	.....	.....	.....	19
26½	.....	.....	21	3	.....	.....	3	.....	27
26¾	.....	.....	13	2	.....	.....	.....	.....	15
27	.....	.....	9	1	.....	.....	.....	.....	10
27¼	.....	.....	5	1	.....	.....	.....	.....	6
27½	.....	.....	5	.....	.....	.....	.....	.....	5
27¾	.....	.....	2	.....	.....	.....	.....	.....	2
28	.....	.....	2	.....	.....	.....	1	.....	3
Totals	121	102	301	718	30	27	27	16	1,342
Average lengths	22.5	22.2	25.3	24.5	23.2	22.3	24.8	23.9	.....

Table IX.—Skeena River Sockeyes, 1949, 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
2¾	.....	.....	.....	.....	.....	.....	.....	.....	.....
3	2	.....	.....	.....	.....	.....	.....	.....	2
3¼	.....	1	.....	.....	.....	.....	.....	.....	1
3½	.....	1	.....	.....	.....	.....	.....	.....	1
3¾	5	5	.....	.....	.....	.....	.....	.....	10
4	7	4	1	1	1	5	.....	.....	19
4¼	3	17	.....	4	1	3	.....	.....	28
4½	10	26	1	12	3	5	.....	.....	57
4¾	13	14	2	13	4	5	.....	1	52
5	31	12	5	27	2	3	.....	4	84
5¼	15	8	11	41	7	.....	1	2	85
5½	15	3	11	62	2	1	4	1	99
5¾	7	5	10	53	3	2	2	.....	82
6	5	.....	21	79	3	2	3	3	116
6¼	2	2	16	80	2	1	4	2	109
6½	1	2	20	87	.....	.....	.....	2	112
6¾	2	1	19	68	1	.....	2	1	94
7	1	.....	25	78	1	.....	3	.....	108
7¼	.....	.....	28	52	.....	.....	1	.....	81
7½	.....	.....	34	32	.....	.....	5	.....	71
7¾	1	1	26	22	.....	.....	.....	.....	50
8	.....	.....	29	5	.....	.....	.....	.....	34
8¼	.....	.....	13	1	.....	.....	1	.....	15
8½	.....	.....	10	1	.....	.....	.....	.....	11
8¾	.....	.....	6	.....	.....	.....	1	.....	7
9	.....	.....	5	.....	.....	.....	.....	.....	5
9¼	.....	.....	3	.....	.....	.....	.....	.....	3
9½	.....	.....	2	.....	.....	.....	.....	.....	2
9¾	.....	.....	.....	.....	.....	.....	.....	.....	.....
10	.....	.....	1	.....	.....	.....	.....	.....	1
10¼	.....	.....	.....	.....	.....	.....	.....	.....	.....
10½	.....	.....	2	.....	.....	.....	.....	.....	2
Totals	121	102	301	718	30	27	27	16	1,342
Average weights	5.0	4.7	7.1	6.3	5.3	4.8	6.6	5.7	.....

Table X.—Skeena River Sockeyes, Average Lengths in Inches of Principal Age-groups, 1912 to 1949

Year	4_2		5_2		5_3		6_3	
	M.	F.	M.	F.	M.	F.	M.	F.
1912–41	23.7	23.1	25.8	24.9	24.2	23.4	25.8	24.8
1912–41 (conversion)	23.0	22.4	25.1	24.2	23.5	22.7	25.1	24.1
1942	22.6	22.3	25.2	24.3	24.1	23.7	26.3	24.9
1943	21.9	21.9	25.1	23.9	23.3	22.6	25.8	24.7
1944	22.4	21.7	24.8	23.9	22.5	21.7	25.0	23.7
1945	22.6	22.3	24.9	24.1	23.3	22.6	25.0	24.3
1946	22.7	22.0	25.4	24.3	23.9	23.2	25.5	24.4
1947	22.3	22.0	25.1	23.8	23.0	22.4	26.3	25.8
1948	23.0	22.3	25.3	24.1	23.0	22.1	26.0	24.5
1949	22.5	22.2	25.3	24.5	23.2	22.3	24.8	23.9

Table XI.—Skeena River Sockeyes, Average Weights in Pounds of Principal Age-groups, 1914 to 1949

Year	4_2		5_2		5_3		6_3	
	M.	F.	M.	F.	M.	F.	M.	F.
1914–41	5.4	5.0	6.8	6.1	5.7	5.1	6.8	6.0
1942	4.9	4.7	6.7	6.0	5.8	5.4	7.2	6.6
1943	4.7	4.6	6.8	5.9	5.5	4.9	7.3	6.1
1944	5.1	4.6	7.0	6.1	5.3	4.6	7.1	5.8
1945	5.2	4.9	6.7	6.1	5.6	5.0	6.7	6.2
1946	4.7	4.2	6.9	5.8	5.8	5.1	7.0	6.1
1947	4.9	4.7	6.9	5.9	5.3	5.0	7.7	6.8
1948	5.5	4.9	7.3	6.1	5.4	4.7	7.7	6.4
1949	5.0	4.7	7.1	6.3	5.3	4.8	6.6	5.7

Table XII.—Skeena River Sockeyes, Percentages of Males and Females, 1915 to 1949

Year	4_2		5_2		Per Cent Total Males	Per Cent Total Females
	M.	F.	M.	F.		
1915–41 (average)	48	52	43	57	46	54
1942	42	58	25	75	33	67
1943	50	50	31	69	43	57
1944	54	46	34	66	43	57
1945	41	59	35	65	38	62
1946	50	50	32	68	38	62
1947	50	50	29	71	33	67
1948	50	50	29	71	47	53
1949	54	46	30	70	36	64

Table XIII.—Nass River Sockeyes, Percentages of Principal Age-groups in Runs of Successive Years and Packs

Year	Percentage of Individuals			
	4_2	5_2	5_3	6_3
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
1937 (17,567 cases)	22	4	68	6
1938 (21,462 cases)	21	4	70	5
1939 (24,357 cases)	14	13	66	7
1940 (13,809 cases)	23	8	59	10
1941 (24,876 cases)	37	7	52	4
1942 (21,085 cases)	22	7	66	5
1943 (13,412 cases)	5	13	67	15
1944 (13,083 cases)	15	15	32	38
1945 (9,899 cases)	46	11	37	6
1946 (12,511 cases)	13	12	72	3
1947 (10,849 cases)	15	12	56	17
1948 (13,181 cases)	12	16	60	12
1949 (9,268 cases)	39	6	48	7

Table XIV.—Nass River Sockeyes, 1949, Grouped by Age, Sex, and Length, and 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.	
21¼	.....	1	.....	.....	.....	.....	.....	.....	1
21½	.....	.....	.....	1	.....	.....	.....	.....	1
21¾	.....	1	.....	.....	.....	.....	.....	.....	1
22	.....	3	.....	.....	.....	.....	.....	.....	3
22¼	1	1	.....	.....	.....	1	.....	.....	3
22½	1	5	.....	.....	2	1	.....	.....	9
22¾	3	6	.....	.....	.....	1	.....	.....	10
23	2	2	.....	.....	1	.....	.....	.....	5
23¼	6	2	.....	.....	1	7	.....	.....	16
23½	5	2	.....	.....	2	7	.....	.....	16
23¾	3	.....	.....	.....	2	4	.....	.....	9
24	5	2	.....	.....	5	4	.....	.....	16
24¼	1	1	.....	.....	3	4	.....	.....	9
24½	.....	.....	.....	2	5	3	1	.....	11
24¾	1	.....	.....	1	1	2	.....	.....	5
25	3	.....	.....	.....	3	.....	.....	1	7
25¼	1	.....	1	.....	1	1	1	1	6
25½	1	.....	.....	.....	2	1	.....	1	5
25¾	1	.....	1	.....	2	.....	.....	1	5
26	.....	.....	.....	.....	2	.....	1	.....	3
26¼	.....	.....	.....	.....	1	.....	.....	1	2
26½	.....	.....	2	.....	.....	.....	1	.....	3
26¾	.....	.....	.....	.....	2	.....	.....	.....	2
27	.....	.....	1	.....	1	.....	.....	.....	2
27¼	.....	.....	.....	.....	.....	.....	.....	.....	.....
27½	.....	.....	.....	.....	.....	.....	.....	.....	.....
27¾	.....	.....	.....	.....	1	.....	.....	.....	1
28	.....	.....	.....	.....	.....	.....	.....	.....	.....
28¼	.....	.....	.....	.....	.....	.....	1	.....	1
Totals	34	26	5	4	37	36	5	5	152
Average lengths	23.76	22.77	26.20	23.81	24.73	23.67	26.1	25.55	.....

Table XV.—Nass River Sockeyes, 1949, Grouped by Age, Sex, and Weight, and by Their Early History

Weight in Pounds	Number of Individuals								Total
	4_2		5_2		5_3		6_3		
	M.	F.	M.	F.	M.	F.	M.	F.	
4	.....	1	.....	.....	.....	.....	.....	.....	1
4¼	.....	1	.....	.....	.....	.....	.....	.....	1
4½	1	3	.....	.....	.....	4	.....	.....	8
4¾	1	1	.....	1	.....	1	.....	.....	4
5	.....	9	.....	.....	2	4	.....	.....	15
5¼	3	5	.....	.....	4	8	.....	.....	20
5½	8	2	.....	1	4	9	.....	.....	24
5¾	5	2	.....	.....	1	.....	.....	.....	8
6	6	.....	.....	1	4	5	.....	1	17
6¼	2	1	.....	.....	2	3	1	.....	9
6½	3	.....	.....	.....	4	2	.....	1	10
6¾	1	1	1	.....	2	.....	.....	1	6
7	.....	.....	.....	1	5	.....	1	.....	7
7¼	2	.....	.....	.....	1	.....	.....	1	4
7½	2	.....	1	.....	3	.....	.....	1	7
7¾	.....	.....	.....	.....	1	.....	.....	.....	1
8	.....	.....	.....	.....	1	.....	1	.....	2
8¼	.....	.....	2	.....	.....	.....	.....	.....	2
8½	.....	.....	.....	.....	2	.....	1	.....	3
8¾	.....	.....	1	.....	.....	.....	1	.....	2
9	.....	.....	.....	.....	.....	.....	.....	.....	.....
9¼	.....	.....	.....	.....	.....	.....	.....	.....	.....
9½	.....	.....	.....	.....	1	.....	.....	.....	1
Totals	34	26	5	4	37	36	5	5	152
Average weights	5.94	5.13	7.90	5.81	6.52	5.44	7.70	6.80	.....

Table XVI.—Nass River Sockeyes, Average Lengths in Inches of Principal Age-groups, 1912 to 1949

Year	4_2		5_2		5_3		6_3	
	M.	F.	M.	F.	M.	F.	M.	F.
1912–41	24.5	23.7	26.3	25.2	26.1	25.3	27.7	26.4
1912–41 (conversion)	23.8	23.0	25.6	24.5	25.4	24.6	27.0	25.7
1942	23.9	23.2	26.1	24.9	24.9	24.3	26.9	26.0
1943	22.8	22.2	26.1	24.8	24.1	23.5	27.1	25.8
1944	23.5	22.7	25.7	24.6	24.8	23.8	26.8	25.8
1945	23.4	22.8	25.0	24.4	24.7	24.0	25.1	25.5
1946	23.4	22.4	26.3	24.9	24.9	23.9	28.1	26.0
1947	23.4	22.9	25.9	24.1	24.5	23.6	27.0	25.6
1948	23.3	22.6	26.2	25.3	25.0	24.1	27.7	26.7
1949	23.8	22.8	26.2	23.8	24.7	23.7	26.1	25.5

Table XVII.—Nass River Sockeyes, Average Weights in Pounds of Principal Age-groups, 1914 to 1949

Year	4_2		5_2		5_3		6_3	
	M.	F.	M.	F.	M.	F.	M.	F.
1914–41	6.0	5.4	7.3	6.4	6.9	6.2	8.0	7.0
1942	5.8	5.1	7.1	6.3	6.2	5.6	7.5	6.7
1943	5.2	4.7	7.6	6.4	5.9	5.3	7.9	6.9
1944	5.7	5.0	7.7	6.5	6.7	5.7	8.2	7.1
1945	5.7	5.3	7.0	6.4	6.5	5.9	7.2	7.1
1946	5.6	4.9	8.1	6.7	6.5	5.4	8.9	7.0
1947	5.8	5.3	7.7	6.2	6.3	5.6	8.1	6.9
1948	5.8	5.3	8.1	7.1	7.0	6.0	9.1	7.9
1949	5.9	5.1	7.9	5.8	6.5	5.4	7.7	6.8

Table XVIII.—Nass River Sockeyes, Percentages of Males and Females, 1915 to 1949

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.		
1915–41 (average)	49	51	47	53	45	55	63	37	47	53
1942	42	58	48	52	44	56	70	30	45	55
1943	51	49	67	33	47	53	74	26	54	46
1944	53	47	45	55	39	61	60	40	50	50
1945	37	63	37	63	38	62	53	47	38	62
1946	62	38	59	41	45	55	75	25	50	50
1947	50	50	52	48	51	49	81	19	56	44
1948	45	55	54	46	52	48	66	34	53	47
1949	57	43	56	44	51	49	50	50	53	47

RESULTS OF THE WEST COAST OF VANCOUVER ISLAND HERRING INVESTIGATION, 1949–50

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INTRODUCTION

A long-term investigation of the herring populations of the west coast and lower east coast of Vancouver Island was begun in 1946-47 to investigate two contrasting methods of fisheries management. Since then each population has been subjected to different catch regulations. Fishing on the west coast of Vancouver Island has been unrestricted by quota, while the lower east coast fishery has been held to a fixed annual quota of 40,000 tons. A closure date, February 5th, has prevented fishing from taking place in either population when fish are massed close to shore prior to spawning. The immediate objective of the study is to determine whether catch quotas are effective in stabilizing herring populations or whether they are unnecessarily restrictive in view of the large natural fluctuations which occur in year-class strength.

The comparative study of the two populations has demanded intensive investigation of the fishable stocks. This has involved the collection of accurate catch statistics, the determination of the relative strengths of the year-classes supplying the fishery, the estimation of the relative size of the spawning stock as determined by surveys of the extent and intensity of spawn depositions, and the calculation of certain population statistics (on the west coast population) from tag-recovery data. By obtaining these data over a period of years at various levels of population abundance, it is anticipated that consider-

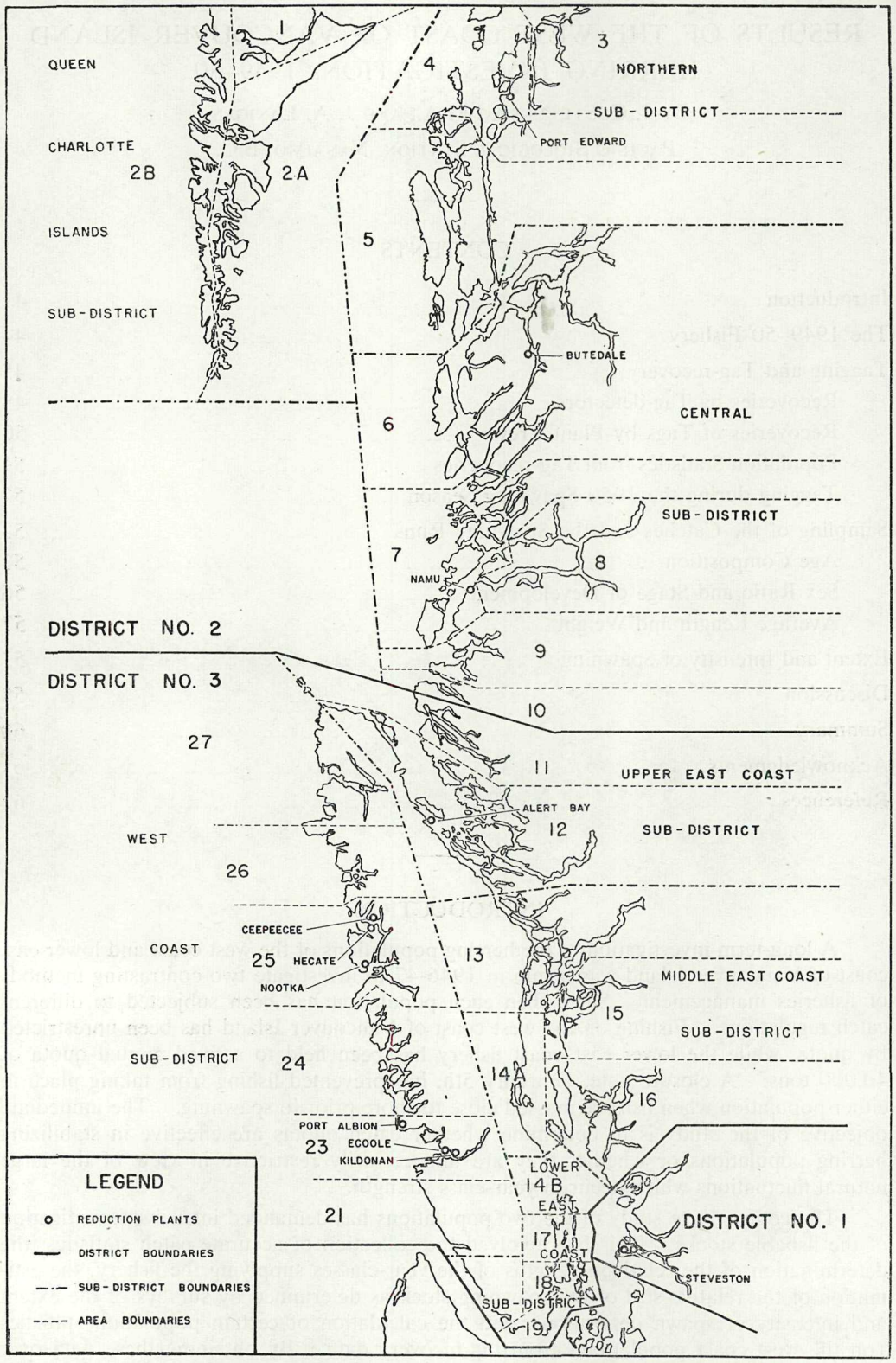

Fig. 1. Map showing the division of the British Columbia coast into districts, sub-districts, and areas.

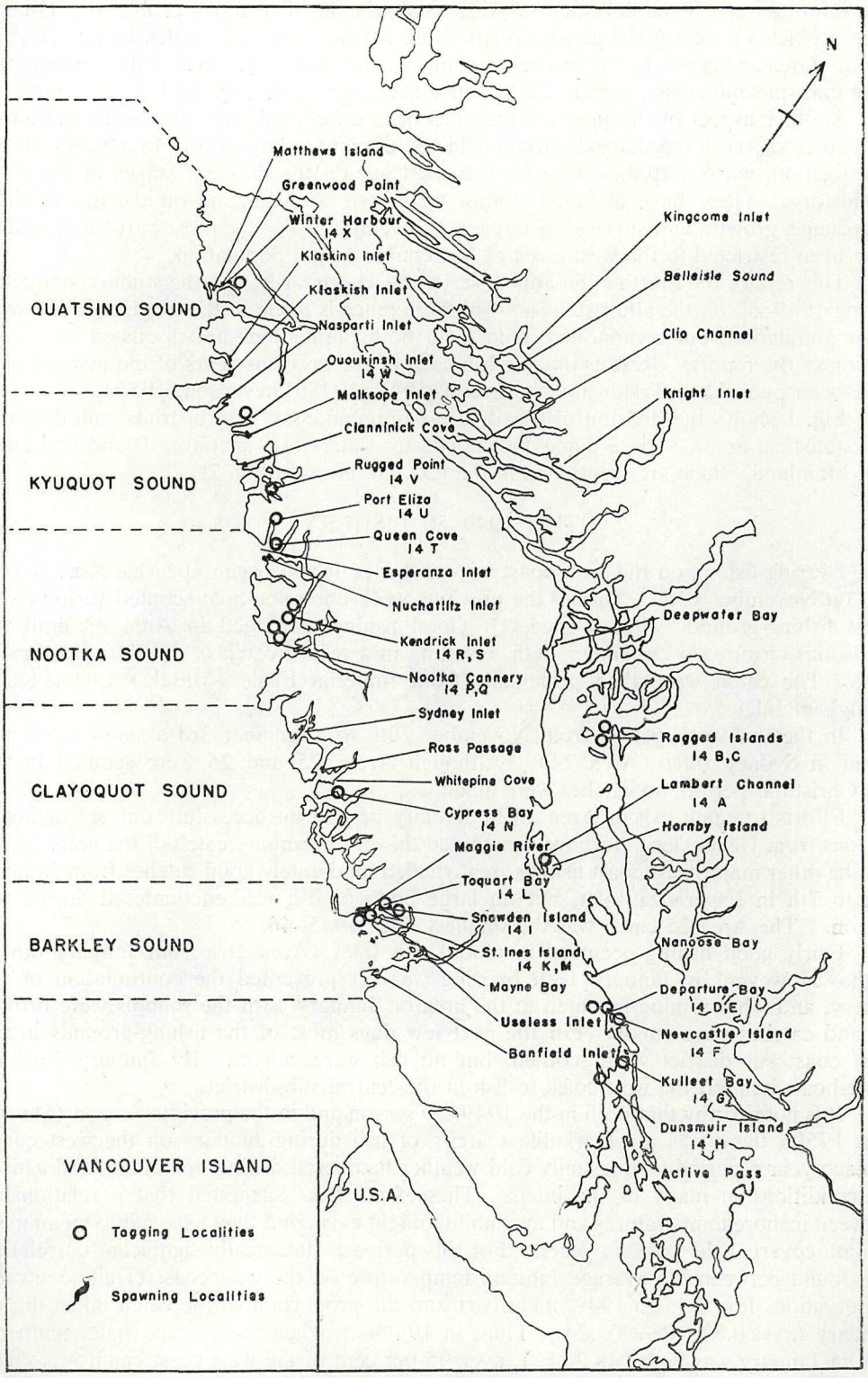

Fig. 2 Map of Southern British Columbia showing the location of places mentioned in the text.

able information will be collected on various fundamental fisheries problems. One of these problems concerns the general relationship between spawning potential and recruitment. Greater knowledge of this relationship would be a major step in determining the minimum spawning stock required to produce maximum sustained yield.

Another aspect of the present study has been concerned with the determination of the causes of the large natural variation in recruitment. During the four years of the investigation, various studies have been carried out on the different stages in the early life-history. These have included studies on spawn survival, and on the distribution, abundance, growth, and survival of larvæ and juveniles. For the most part these studies have been restricted to the west coast of Vancouver Island population.

This report, the fourth in an annual series, deals primarily with the studies conducted during 1949–50 on the adult stocks. Chief reference is made to the changes in the west coast population, but comparative data from both populations are discussed in a final section of the report. Results obtained in each of the previous years of the investigation have been published (Tester and Stevenson, 1947, 1948; Stevenson, 1950).

Fig. 1 shows the division of the British Columbia coast into districts, sub-districts, and statistical areas. Place-names in the coastal waters of Vancouver Island and adjacent Mainland, which are mentioned in the text, are given in Fig. 2.

THE 1949–50 FISHERY

Herring-fishing on the west coast of Vancouver Island began at Swale Rock (Area 23) on November 14th. During the previous week one seine-boat scouted various west coast fishing-grounds without success. Good fishing continued in Area 23 until the Christmas closure on December 16th, resulting in a record catch of 29,900 tons for the area. The catch was taken principally from Imperial Eagle (Middle) Channel and Effingham Inlet.

In the two-week period from November 20th to December 3rd a small catch was taken in Sydney Inlet (Area 24). Although Areas 25 and 26 were scouted in the pre-Christmas period, no catches were made.

Efforts to catch fish in Area 23 in January proved unsuccessful; one set of about 35 tons from Uchucklesit Harbour constituted the entire January catch of the area. Area 25, the other major west coast fishing area, yielded moderately good catches from January 4th to 7th in Esperanza Inlet, but no large body of fish was encountered during the season. The Area 25 catch was the smallest since 1945–46.

Fairly good fishing occurred in Ououkinsh Inlet (Area 26) from January 8th to 12th. However, by January 13th freezing weather prevented the continuation of the fishery, and when fishing resumed in the area on January 18th the schools were broken up and catches were small. For the next few days most of the fishing-grounds in the west coast sub-district were scouted, but no fish were caught. By January 23rd all seine-boats had left the west coast to fish in the central sub-district.

It is noteworthy that both in the 1949–50 season and in the previous season (Stevenson, 1950) there was a remarkable scarcity of fish during January on the west coast. In each year a period of unusually cold weather hampered fishing operations and caused ice conditions in many of the inlets. These facts have suggested that a relationship between inshore temperatures and availability might exist, and they have led to an analysis of data covering the past six years. For this period a statistically significant correlation was found between the average January temperature on the west coast (Daily Seawater Observations for 1945 to 1949, inclusive) and the proportion of the catch taken during January ($r = 0.87$; $P = 0.02$). Thus, in 1944–45, when the average water temperature in January was high (48.2° F.), over 95 per cent of the west coast catch was taken during the month, whereas in 1948–49 and 1949–50, when low water temperatures prevailed in January (41.3° F. in each year), very small proportions of the total catch

(5 per cent and 16 per cent respectively) were taken in the post-Christmas fishery. The data suggest that lowered temperatures in the inlets may act as a deterrent to inshore migration and may cause schools already in the inlets to move offshore. This is the first indication of possible factors which may influence inshore migration.

Data on catch, fishing effort, and availability are given in Table I for each area and for the sub-district as a whole. The area catch was estimated from records of landings at the various plants and from information supplied by the Department of Fisheries. The number of days spent by all vessels in scouting and catching fish was compiled from records submitted by seine-boat captains. Since these records were only 73 per cent complete, the number of active fishing-days was proportionately adjusted. The availability, or catch per unit effort, was also calculated from data supplied by seine-boat captains.

Catch statistics from the west coast fishery are presented for each season since the removal of quota restriction in the following tabulation:—

	1946–47	1947–48	1948–49	1949–50
Catch (tons)	59,000	45,200	55,000	37,300
Effort (seine-days)	777	948	686	790
Availability (tons per seine per day)	76	48	80*	47

* Correction to number given in previous report.

In the 1949–50 season the fishery yielded the smallest catch in the four-year period. This was chiefly a result of the greatly reduced fishery in Area 25. The other major west coast fishing area, Area 23, yielded the largest catch ever recorded. The availability for the sub-district was considerably less and fishing effort was greater than in 1948–49. Availability showed a greater decrease in Area 25 than in Area 23 (compare Table I in this report and Table I in Stevenson, 1950).

The catch data suggest that the abundance of herring on the fishing-grounds was less in 1949–50 than in 1948–49, and probably similar to the abundance in the 1947–48 season. However, the indications of less fish on the fishing-grounds in 1949–50 does not necessarily infer that population abundance on the west coast was smaller in 1949–50 than in 1948–49. In later sections of the report evidence will be given which suggests that population abundance in 1949–50 was greater than in the previous season.

TAGGING AND TAG-RECOVERY

Herring-tagging studies serve two main purposes in the west coast of Vancouver Island herring investigation. They permit an estimation of the extent of movement from, to, and within the west coast population each year, and they provide data from which calculations can be made of the changes in rate of exploitation from one season to the next.

Tagging is carried out each spring at or near the time of spawning. Most of the recovery from taggings of a particular year occurs during the fishing season which takes place seven to ten months after tagging, but lesser numbers of recoveries are obtained in subsequent seasons. In the spring of 1949 tagging was continued in the west coast of Vancouver Island population, as well as in the middle and lower east coast populations (Stevenson, 1950). The 1950 tagging programme was extended to include the herring populations of Northern British Columbia. In the 1949–50 fishing season, tags of the 1949 tagging (13-series) and of previous taggings were recovered from the catches. The places and dates of the individual taggings producing recoveries in 1949–50 are listed in Table VIII. Fishing-grounds yielding catches which contained or might have contained tags include the following: Area 4—Edye Pass, Lewis Channel, Chalmer Anchorage, Herbert Reef, and Butlers Cove; Area 6—Surf Inlet, Kent Inlet, Racey Inlet, Helmcken Inlet, David Bay, Poison Cove, Thistle Pass, Laredo Sound, and Meyers Pass; Area 7—

Kwakshua Passage, Bella Bella, Body Pass, Cultus Sound, Kildidt Sound, and Safety Cove; Area 9—Moses Inlet and Drainey Inlet; Area 12—Chatham Channel, Kingcome Inlet, Minstrel Island, Bones Bay, Knight Inlet, Simoom Sound, and Belleisle Sound; Area 13—Deepwater Bay; Area 14A—Lambert Channel, Hornby Island, and Deep Bay; Area 14B—Nanoose Bay and Northumberland Channel; Area 17—Walker Rock and Trincomali Channel; Area 18—Active Pass and Pender Island; Area 23—Effingham Inlet, Imperial Eagle (Middle) Channel, Peacock Channel, and Mayne Bay; Area 24—Sydney Inlet; Area 25B—Esperanza Inlet and Espinosa Inlet; Area 26—Kyuquot Sound and Ououkinsh Inlet.

Tag-recovery is effected by tag-detectors placed in the unloading systems of certain reduction plants and by magnets located in the meal-lines of all plants. Four tag-detectors were operated during the 1949–50 season—two old-type detectors working on the Wheatstone-bridge principle (Tester, 1946), and two new-type detectors operating on the principle of induced currents. In addition, magnets and certain machinery in thirteen reduction plants were searched for tags throughout the season.

Two of the four tag-detectors gave reasonably satisfactory performances. One of them (old type) was located at the Imperial plant, and the other (new type) operated at the Gulf of Georgia installation. Each showed a higher percentage efficiency of operation than in the previous season, as indicated in the following tabulation (efficiency in 1948–49 is given in parentheses):—

Detector Installation	While Operating on Catches from— Middle and Lower East Coasts	West Coast
Imperial	60 (54)	78 (58)
Gulf of Georgia	86 (55)	50 (36)

The increased efficiency of the Gulf of Georgia detector appears to have resulted from various improvements made to the plant installation in the summer of 1949. On the other hand, the better performance of the Imperial detector occurred in spite of difficulties arising from changes made in the plant to accommodate a new weighing-machine.

The third tag-detector, operated at Nootka, gave poor results for the fourth successive year. There was evidence that the detector itself (new type) performed more efficiently than in previous years, but various factors relating to the general installation continued to hamper operations. The exposed nature of the unloading system caused many of the working parts of the detector to freeze in the cold weather, and the location of the marine leg in relation to the chute prevented detector operation during certain stages of the tide. The fourth installation, located at Kildonan, was of an experimental nature. A reconditioned old-type detector was operated for a short period to test its usability. Further improvements were added to this machine during the summer of 1950.

The efficiency of tag-recovery in the plants was again determined by magnet-efficiency tests (Stevenson, 1950). Satisfactory tests were conducted in four of the six west coast reduction plants and in three of the four Steveston plants. Average plant efficiency was found to be similar in the past two seasons. Only one plant (Gulf of Georgia) showed an appreciable change in plant efficiency over the two years. The striking decrease recorded for that plant resulted mainly from a breakdown in one of the magnet installations. In 1949–50 four tags were recovered from tests made during the previous year, as compared to eight in 1948–49. One "hang-over" tag was recovered at the Kildonan plant, one at Ecoole, and two at Colonial. As in previous years, most of the tags from magnet tests were taken in the first five days after the tests were made. Detailed results of the 1949–50 magnet tests are given in Table II. A comparison of percentage plant efficiencies in 1948–49 and 1949–50 are presented in the following tabulation (1948–49 results are given in parentheses):—

West Coast Plants

	Number of Tests	Average Percentage Recovery
Kildonan	1 (2)	92.0 (84.0)
Ecoole	1 (1)	98.0 (90.0)
Port Albion	2 (1)	93.0 (98.0)
Nootka	2 (1)	68.0 (77.6)
Average of west coast plants		87.8 (87.4)

Steveston Plants

	Number of Tests	Average Percentage Recovery
Imperial	2 (1)	79.6 (68.0)
Gulf of Georgia	2 (2)	58.2 (99.0)
Colonial	2 (1)	74.0 (68.0)
Average of Steveston plants		70.6 (78.3)
Grand average		80.4 (83.5)

Knowledge of efficiency of tag-detectors and plants in recovering tags is essential in determining the probable number of tags in the catches—a valuable statistic in herring-tagging studies. In addition, magnet-efficiency tests provide information at each plant on the time between unloading of the fish and recovery of the tags; this information on time-lag is used to determine more accurately the fishing-ground or area from which various tag-recoveries originate. Finally, since diligence of plant crews in recovering and submitting tags is an important factor in recovery efficiency, the tests provide an opportunity for stimulating interest in recovering tags and for improving the quality of the data submitted with the recovered tags.

The apparent discrepancy between the percentage tag-recovery of more- and less-experienced taggers (tagging at the same time and place) was considerably less in the 1949–50 data than in the data of the previous year. In 1949–50 about 13 per cent more tags were recovered from taggings made by more-experienced taggers than from those made by taggers with less experience, whereas in 1948–49 the former groups accounted for 82 per cent more tags than the latter. The difference in recovery was considered to be statistically significant in the case of three of the six pairs of taggers in 1948–49 (Stevenson, 1950), but in the past season statistical analysis of the data did not indicate a significant difference in the recovery from any of the tagging pairs. In 1947–48 (Tester and Stevenson, 1948) the results were similar to those obtained in 1949–50. The fact that in all years taggings of less-experienced taggers gave generally fewer recoveries suggests that a greater tagging mortality is induced by taggers with less experience in the tagging technique.

A comparison is given in Table III of the percentage recovery from 1949 taggings made at the same time and place by more- and less-experienced taggers. Table III is summarized in the following tabulation:—

More-experienced Taggers				Less-experienced Taggers			
Tagger	Number of Tags Used	Number Recovered	Per Cent Recovered	Tagger	Number of Tags Used	Number Recovered	Per Cent Recovered
No. 2	2,531	49	1.94	No. 9	2,520	35	1.39
No. 2	2,531	49	1.94	No. 10	2,547	38	1.49
No. 2	1,024	46	4.49	No. 6	1,015	46	4.53
No. 2	3,573	132	3.69	No. 4	3,584	136	3.79
No. 6	494	3	0.61	No. 11	500	1	0.20
No. 6	1,517	31	2.04	No. 12	1,516	18	1.19

Recoveries by Tag-detectors

In 1949–50 tag-detectors recovered a total of 137 tags, all but 6 tags being taken by the Imperial and Gulf of Georgia installations. The recoveries are tabulated in Table IV according to area of tagging, code, area of recovery, and installation; the calculated probable number of tags in the catches are given in Table V.

The smaller tag-detector recovery in 1949–50 (a reduction of 40 per cent over that of 1948–49) was partly caused by the reduced west coast catch. Since the west coast population has been intensively tagged in recent years, a change in the sub-district catch greatly affects the potential number of tags which might be recovered. Another contributing factor was probably the reduction in the number of fish tagged on the west coast in 1949 (21,856 fish were tagged in 1949, compared with 31,947 in 1948). Furthermore, the fact that the decrease in tagging was not uniform in all the areas might have accentuated the drop in tag returns. In the fishing areas of the southern part of the west coast (Areas 23 and 24), where over four-fifths of the catch was made, the number of fish tagged decreased 27 per cent, whereas in the more northerly fishing areas (Areas 25 and 26), where catches were light, tagging decreased only 11 per cent.

A measure of the decrease in concentration of tags is given by the probable number of tags per ton of catch each season. In 1948–49 the estimate was 0.0639 tags per ton (Stevenson, 1950), whereas in 1949–50 the estimate was 0.0205 tags per ton. This decrease was also reflected in the number of tags recovered by the plants. The concentration of tags in the middle and lower east coast catches showed relatively little change in the two seasons.

To facilitate the analysis of movement of fish between the various sub-districts, pertinent data from Table V are summarized below (the figures show the probable number of tags taken from each area, as computed from the actual number of tags recovered by tag-detectors, shown in parentheses):—

Area of Tagging	Area of Recovery			
	West Coast	Lower East Coast	Middle East Coast	Total
West coast	747 (86)	92 (17)	7 (1)	846 (104)
Lower east coast	18 (2)	90 (18)	31 (6)	139 (26)
Middle east coast	.....	15 (3)	25 (3)	40 (6)
Totals	765 (88)	197 (38)	63 (10)	1,025 (136)

As in past years it was noted that most of the tags from the west coast and lower east coast taggings were recovered in the sub-district in which they were originally used. The "homing" was again found to be considerably more pronounced on the west coast, where 88 per cent ($^{747}/_{846}$) of the tags were recovered in the general region of tagging, than on the lower east coast, where only 65 per cent ($^{90}/_{139}$) of the tags showed no movement outside the tagging areas. The appreciable movement of lower east coast fish to the middle east coast—22 per cent ($^{31}/_{139}$)—accounts for most of the lower east coast migration. The small number of tags involved prevents drawing any conclusions of the movement of middle east coast fish, but it appears that migration to the lower east coast is considerable.

The data suggest that movement of west coast fish to the lower east coast was greater than in any previous year of the study. About 10.9 per cent ($^{92}/_{846}$) of the recoveries from west coast taggings were taken in lower east coast catches, as compared with 3.3 per cent (1948–49), 5.8 per cent (1947–48), and 1.8 per cent (1946–47). The immigration of lower east coast fish into the west coast sub-district was calculated at 12.9 per cent ($^{18}/_{139}$). This was much greater than that estimated from 1947–48 data (2.9 per cent). In 1948–49 a tremendously large movement of lower east coast

fish to the west coast was calculated (30 per cent), but since the calculation was based on very few tag-recoveries, it was not considered that the value was a good estimate of the extent of the migration (Stevenson, 1950).

No explanation can be offered at the present time for the apparently large immigration and emigration of herring to and from the west coast during the past season.

In order to consider the mixture of fish between the different west coast areas, the probable numbers of west coast tags in 1949–50 west coast catches are taken from Table V and presented as follows:—

Area of Tagging	Area of Recovery—12-series					Area of Recovery—13-series				
	23	24	25	26	All Areas	23	24	25	26	All Areas
23	84	.....	.....	.....	84	256	.....	16	.....	272
24	50	.....	.....	.....	50	19	3	.....	.....	22
25	14	.....	.....	.....	14	57	.....	107	.....	164
Totals	148	.....	.....	.....	148	332	3	123	.....	458

It will be noted that the catches in Areas 24, 25, and 26 yielded no tag returns from the 1948 taggings (12-series), and no tags from the 1949 taggings (13-series) were taken from the Area 26 catch. The poor recovery in these areas was largely a result of the small catches made during the 1949–50 season. This might also be related to the fact that a smaller proportion of the catches of Areas 24, 25, and 26 was examined for tags by detectors than was the Area 23 catch. In this connection it should be stressed that the figures in the foregoing tabulation are not actual tag-recoveries but the estimated number of tags which could have been recovered if the entire catch had been searched by tag-detectors working at 100 per cent efficiency.

The average dispersal from tagging areas, according to the 13-series data, amounted to 20 per cent ($^{92}/_{458}$). Comparative data from previous years indicate dispersals of 40 per cent (1948–49) and 30 per cent (1947–48). It is suggested that the smaller dispersal indicated for 1949–50 might be connected with the fact that most of the west coast catch (80 per cent) came from one area (Area 23).

Analysis of the 12-series and 13-series tag returns in the Area 23 catch showed that 77 per cent ($^{256}/_{332}$) of the 13-series tag-recoveries were from Area 23 taggings, while only 57 per cent ($^{84}/_{148}$) of the 12-series tag-recoveries originated in taggings made in Area 23. This indicates a greater dispersal for 1948 taggings (12-series) than for 1949 taggings (13-series)—a condition which would be expected on the basis that the longer tagged fish are at liberty the more widely they will be dispersed.

A considerably larger percentage of fish moved in a south-easterly direction along the west coast than in a north-westerly direction, according to the data pertaining to the 13-series. Area 23 tags were recovered in Area 25 to the extent of 5.9 per cent ($^{16}/_{272}$), whereas 34.8 per cent ($^{57}/_{164}$) of the Area 25 tags were returned from Area 23 catches. The relatively small north-easterly movement could be caused by a considerable proportion of the Area 25 herring not being subjected to a fishery (the latter possibility is discussed in later sections of this report). The only season in which the data have indicated a greater movement of fish in a north-westerly direction along the coast was 1948–49. It appears that this apparent reversal of the direction of the general movement might have been related to the extremely large catch in Area 25 in that season.

The large percentage of Area 24 tags taken in the Area 23 fishery is of interest in giving further evidence of the close relationship between the fish of Areas 23 and 24. Data from the 1947–48 and 1948–49 seasons also indicated that more Area 24 fish moved to Area 23 than to Area 25, but the extent of the movement was not as striking as in the past season. Although it is probable that the small catch in Area 25 was the cause of the lack of Area 24 tags being taken there in 1949–50, it is significant that in

1946–47, when the Area 25 catch was large, a strong south-easterly movement of Area 24 fish was indicated.

Recoveries of Tags by Plant Crews

During the 1949–50 fishery 996 decipherable tags were recovered by plant crews from the magnets and machinery of thirteen reduction plants. This total represents a decrease of 66 per cent from that of the previous year. Reasons to account for the reduced recovery from the plants are similar to those advanced previously to explain the decreased recovery from tag-detectors. The following tabulation shows the number of tags submitted by each plant during the season:—

Plant Code	Plant Name	Number of Tags	Plant Code	Plant Name	Number of Tags
A.	Imperial	118	L.	Gulf of Georgia	78
B.	Namu	12	M.	Hecate	16
C.	Port Albion	160	N.	Ecoole	112
D.	Kildonan	146	P.	Phoenix	5
E.	Ceepeecee	58	Q.	Colonial	114
F.	Nootka	93	R.	North Shore	81
K.	Alert Bay	3			

The distribution of the tags according to area of tagging and probable or certain area of recovery is given in Table VI. Methods used to determine the areas from which the tags were recovered followed the procedure as outlined in previous reports of this series. It will be noted that there was insufficient data on 116 (about 12 per cent) of the 1949–50 tag returns to ascertain the general recovery area. To facilitate the analysis of the movement of fish to and from the west coast, Table VI is summarized as follows (tag-recoveries for 1948–49 are given in parentheses):—

Area of Tagging	Area of Recovery			
	West Coast Sub-district	Other Sub-districts	Indeterminate Sub-district	Total
West coast sub-district	677 (2,116)	101 (94)	95 (500)	873 (2,710)
Other sub-districts	14 (15)	88 (153)	21 (62)	123 (230)
Totals	701 (2,131)	189 (247)	116 (562)	996 (2,940)

Movement of west coast fish to other sub-districts was calculated to be 13 per cent ($^{101}/_{778}$) on the basis of plant recoveries. Further analysis of the data indicated that migration to the lower and middle east coasts comprised most of this emigration from the west coast. On the basis of the 1949–50 data it appeared that about 12 per cent of the fish tagged on the west coast were taken in lower east coast or middle east coast catches. Since tag-detector recovery (where area of recovery is always specific) has consistently suggested that there is very little or no movement of west coast fish to the middle east coast, the 12-per-cent movement probably approximates the migration of west coast fish to the lower east coast. This estimate is in close agreement with the 10.9-per-cent migration as calculated from tag-detector recoveries in 1949–50. The estimates of the movement of herring from the west coast to the lower east coast are considerably higher than those obtained in the previous years of the investigation. In 1948–49 the percentage apparent movement was 3.3 per cent for detector recoveries and 4.3 per cent for plant returns (Stevenson, 1950).

The migration of west coast fish to the northern and central sub-districts was small—less than 1 per cent. This extent of movement was similar to that estimated in the 1948–49 season. As noted in previous years, fish tagged in Area 27 constituted most of the west coast fish recovered in the northern sub-districts.

The increase in the percentage emigration of west coast fish to the lower east coast in 1949–50 was accompanied by an increase in the movement of fish in the opposite direction. Plant recoveries indicated that the immigration of lower east coast and middle east coast tagged fish was 13.7 per cent ($^{14}/_{102}$), as compared with 8.9 per cent in 1948–49 (Stevenson, 1950). Again, this estimate closely resembled that obtained from tag-detector returns (12.9 per cent). The evidence obtained from tag-detector recoveries that movement of middle east coast fish to the west coast is very small indicates, as in the foregoing discussion on emigration, that the immigration of fish to the west coast is largely due to movement of lower east coast fish. The origin of the 14 " outside " tags taken from west coast catches (plant returns) suggests that about 11 per cent of the fish tagged in " outside " areas (areas other than the west coast) were lower east coast fish that were taken in west coast catches, and that about 3 per cent of the fish tagged in " outside " areas were middle east coast fish from west coast catches (addition of the percentages approximates the total immigration to the west coast—13.7 per cent).

It should be pointed out that the lack of northern or central sub-district tags in the 1949–50 west coast catch does not necessarily mean that immigration of fish from the northern and central populations was non-existent or very small in the past year. From 1946 to 1949 no taggings were made in the north, and it is likely that only very few tagged fish remain from the 1945 taggings. Since tagging was conducted in the northern sub-districts in 1950, it is expected that data on the immigration of northern and central fish to the west coast will be available in the 1950–51 season.

Population Statistics from Tag-recoveries

Certain statistics relating to changes in exploitation and initial abundance of the west coast population have been calculated from tag-recovery and catch data (Tester and Stevenson, 1948; Stevenson, 1950), using formulæ given by Ricker (1940). In these calculations it has been considered that the herring-fishery conformed most closely to Ricker's Type 1A fishery (1944), where fishing mortality is proportional to population present at any time during the fishing season and where recruitment and natural mortality are negligible. The applicability of all the various statistics which may be derived in this manner is restricted by limitations of the basic data and by known and possible deviations of the herring-fishery from the theoretical type. However, in spite of these limitations certain population statistics pertaining to the west coast fishery in recent years have shown general agreement with data obtained from age composition and spawning-ground studies. It is considered that continuance of this phase of the research is valuable in enabling eventually a more complete assessment to be made of the significance of these statistics in herring studies.

Although actual rate of exploitation cannot be determined directly from herring tag-recovery, it is possible to calculate the ratio of the exploitation rates in two successive seasons. Assuming that the tags are randomly distributed throughout the fishable population, the ratio of the probable percentage of first-year tags in the catches of two consecutive years should approximate the ratio of the exploitation rates in the same two seasons. On this basis the ratio of the exploitation rates in 1948–49 and 1949–50 was calculated at 0.27 (2.09/7.85) for tag-detector recoveries and 0.41 (3.37/8.24) for plant returns, or an average ratio of 0.33 (geometric mean). The probable percentage of tags in the catches was derived from data pertaining to 12-series tags in 1948–49 (Stevenson, 1950; Table VI) and 13-series tags in 1949–50 (Table VII of this report).

The tremendous decrease in the rate of exploitation in 1949–50 is in contrast to the slight decrease noted from 1947–48 to 1948–49 (Stevenson, 1950). Also, it is noteworthy that whereas the decrease in rate of exploitation in the earlier period (0.85) was accompanied by a decrease in fishing effort (0.72), and greater decrease in rate of exploitation in 1949–50 (0.33) was associated with an increase in fishing effort (1.15—

fishing effort in 1948–49 and 1949–50 was given in a previous section). This presents an anomalous situation, since Ricker's Formula 19 (1940) implies that when fishing effort increases from one season to the next, the rate of exploitation must also increase (although not necessarily proportionately), and that, likewise, when fishing effort decreases, the exploitation rate will decrease.

There are various factors which may have caused the apparently aberrant statistics. The inadequacy of the basic data and the scope of the assumptions made in analysis may be partly responsible. However, it is suggested that abnormal conditions affecting a part of the population in 1949–50 might have constituted a more important factor. Evidence from age composition and spawn studies indicated that only a small portion of the more northerly west coast herring was fished in 1949–50 (discussed in further detail in a later section). It was considered that certain unknown oceanographic factors might have prevented part of the population from coming inshore during the fishing season. If this were so, it would be expected that the catch would contain a relatively small number of tags, which in turn would result in a relatively small rate of exploitation in 1949–50. Since the conditions of the hypothetical fishery type require the whole adult population to be available to the fishery, any factors precluding this would be liable to influence the relationship existing between the various statistics.

The initial population abundance in 1949–50 was estimated to be 2.08 times as great as that in 1948–49 (Ricker, 1940; Formula 20). Although the numerical value of the estimate is questionable in view of the numerous assumptions involved in the calculations, it appears that the estimate is indicative of an increase in population size. Relatively great recruitment of the 1947 year-class appears to have caused the increased abundance.

Tagging during the 1950 Spawning Season

In the spring of 1950 herring-tagging was continued in the west coast, lower east coast, and middle east coast sub-districts, and resumed after a lapse of five years in the northern and central sub-districts. Three seine-boats loaned by the fishing industry were utilized in the tagging programme. One seine-boat operated exclusively on the lower and middle east coasts during the last two weeks of February and most of the month of March. The other two vessels were used on the west coast during March and in the northern and central sub-districts for about two weeks in April.

A list of the 1950 taggings, with information on the locality, date, and code letters of each tagging is given in Table XVI. In the following tabulation, comparative data are given on the numbers of fish tagged in the various areas in 1949 and 1950:—

	Area of Tagging													
	5	6	7	10	14A	15	14B	17	18	23	24	25	26	27
1949	.....	.....	.....	.....	2,531	2,984	2,013	1,996	3,494	7,650	3,036	11,170	.....	.....
1950	2,548	6,578	4,404	1,012	2,019	4,046	6,090	3,082	.....	8,025	2,011	10,081	4,510	2,029

A total of 56,435 herring was tagged in 1950. This represents an increase of about 60 per cent over the 1949 tagging, which reflects not only the expansion of activities into the northern sub-districts but also increased tagging in each of the other sub-districts. A total of 26,656 fish was tagged on the west coast in 1950, as compared with 21,856 in the previous year. Moreover, fish were tagged in all west coast areas in 1950, whereas tagging was limited to Areas 23, 24, and 25 in 1949. In the lower east coast sub-district, tagging was considerably increased in Area 14B, due mainly to the large quantity of herring available in Departure Bay during the spawning period. Although scouting took place in Area 18 on several occasions, no fish were located. Attempts to tag fish in

Area 13 (middle east coast sub-district) again failed, but an increased number of fish were tagged in Area 15.

The tagging along the Northern British Columbia coast-line this spring was the largest ever carried out, with the exception of the 1945 tagging (Tester, 1945, p. 46; Hart, Tester, and Boughton, 1942, p. 52). In the latter year 20,399 fish were tagged, as compared to 14,542 in 1950. It should be mentioned that direct comparison between the size of northern and central taggings in 1950 and size of taggings as reported in the above references cannot be made due to the fact that Area 5 was formerly considered in the central sub-district, whereas recently it has been included in the northern sub-district.

A purse-seine (180 fathoms long by 12 fathoms deep) of the type used in commercial operations was employed in catching herring for tagging this spring for the first time. Formerly much smaller and shallower seines were used exclusively. The experience gained this season with the larger seine suggests that it will facilitate the catching of fish in the deeper water, and thus obviate the necessity of waiting long periods for fish to spawn before they can be caught for tagging.

SAMPLING OF THE CATCHES AND THE SPAWNING RUNS

The determination of the relative strengths of the year-classes contributing to the west coast herring population is the chief purpose of the sampling programme. Age studies are conducted on the commercial fishing runs and the spawning runs in the individual areas of the sub-district. These studies also provide data which, along with information obtained from catch records and spawning surveys, permit rough estimation of relative year-class strength before the year-class has been fully recruited to the fishable stock. Various other data relating to growth, sex, and sexual maturity are also obtained in the sampling studies.

A total of 310 samples, each containing approximately 100 randomly chosen fish, was taken from all sub-districts in 1949–50. On the west coast 93 samples were obtained, as compared with 78 in the previous season. The distribution of the sampling according to area is shown in the following tabulation (with comparable numbers of samples taken in 1948–49 in parentheses):—

Area	Number of Samples: Fishery	Number of Samples: Spawning Runs
23	65 (24)	4 (3)
24	2 (—)	1 (2)
25	4 (39)	4 (10)
26	10 (—)	2 (—)
27	— (—)	1 (—)

A list of the 1949–50 samples is given in Table IX.

Age Composition

The average age composition of the west coast fishery as a whole (weighted to numbers of fish caught in each individual area) is given for several recent years in the following tabulation:—

Year	In Year of Age								
	I	II	III	IV	V	VI	VII	VIII	IX–XI
1945–46	—	11.1	74.0	10.0	2.8	0.9	1.0	0.2	+
1946–47	+	5.0	53.0	32.1	6.0	2.5	0.9	0.5	0.1
1947–48	+	2.4	58.2	27.8	8.5	2.1	0.5	0.3	0.1
1948–49	+	7.4	45.2	32.9	9.6	3.4	1.0	0.3	0.1
1949–50	+	4.4	68.8	20.5	5.3	0.8	0.2	0.1	—

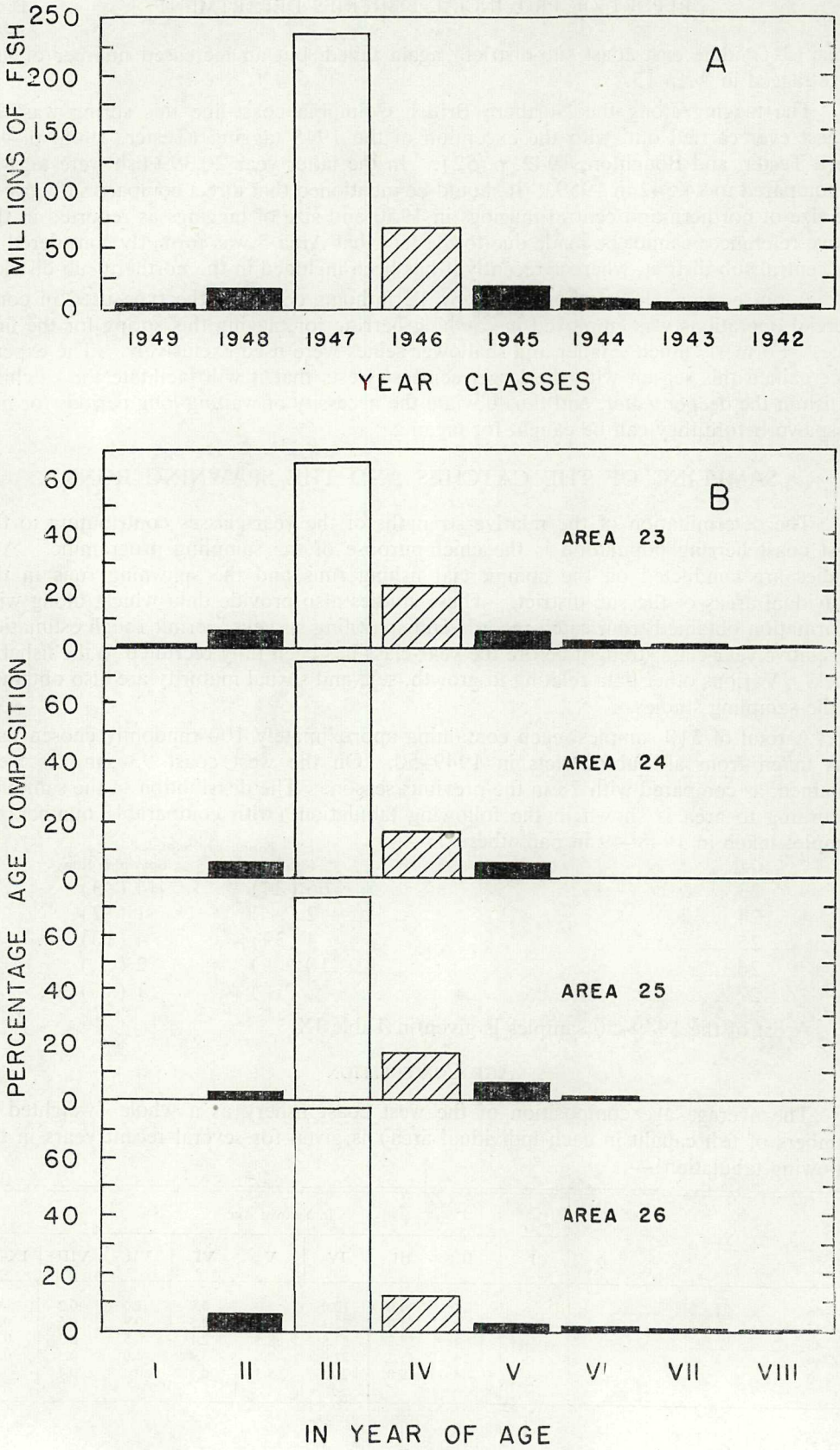

Fig. 3. Diagrams showing the total number of herring in each year-class caught by the commercial fishery in 1949–50 (A), and the average percentage age composition of samples from the commercial catches in Areas 23, 24, 25, and 26 (B).

The 1947 year-class constituted over two-thirds of the west coast catch in 1949–50 as III-year fish. This was the largest dominance of III-year fish in the west coast fishery since the extremely large entry of the 1943 year-class in the 1945–46 season. Forewarning of the relative abundance of the 1947 year-class was given by its relatively high contribution as II-year fish in the 1948–49 fishery and in the 1949 spawning runs (Stevenson, 1950). In spite of the reduced west coast catch in 1949–50 over that of the previous year, the 1947 year-class produced 233.7 million III-year fish in the 1949–50 fishery (Table X and Fig. 3(A)), as compared with 224.0 million III-year fish by the 1946 year-class in 1948–49.

Fish of Age IV and older were more poorly represented in the 1949–50 catch than in the catch of the previous year. This was largely a result of the strong recruitment of the 1947 year-class and the relative weakness of the 1946 year-class. The reduction in abundance of older fish might also be partly caused by four years of intensive fishing not subject to quota restriction.

The relatively large proportion of III-year fish in the 1949–50 west coast fishery was reflected in each of the area catches (Table XI and Fig. 3(B)), and in the samples from the spawning runs of all areas except Area 27 (Table XI). But whereas Area 23 yielded a record fishery, a very poor catch was taken from Area 25, the other major west coast fishing area. In view of the near-average spawnings which occurred in both areas in the spring of 1950 (discussed in the following section), it appears that the lack of fish on the Area 25 fishing-grounds was not caused by any drastic decrease in population abundance in the northern west coast areas. This suggests that a considerable proportion of the adult stocks did not move inshore during the fishing season.

As pointed out earlier in the section dealing with the 1949–50 fishery, there is evidence indicating that low water temperatures in January might be a factor in preventing herring schools from moving inshore. However, assuming that this accounts for the scarcity of fish in all west coast areas in January the lack of a fishery in Area 25 in the pre-Christmas period is not explained.

It is noteworthy that very similar conditions prevailed in the fishery during the 1945–46 season. As mentioned previously, a strong year-class (that of 1943) entered the fishing runs as III-year fish. A large catch was taken from Area 23; Area 25 provided a small fishery, and the amount of fish left to spawn was not greatly different from that of 1950. The only obvious dissimilarity between the conditions of the two seasons was that in 1945–46 fishing was stopped on the completion of the quota, whereas quota regulations were not in force in 1949–50. However, the data indicated that fish were not as abundant in Area 25 in 1945–46 as in the three subsequent years, and it is doubtful if removal of the quota limitations would have greatly increased the Area 25 catch.

In the season following 1945–46, the 1943 year-class (as IV-year fish) yielded a large Area 25 catch (Tester and Stevenson). Similarly, the present indications of a large residual population in the northern part of the west coast sub-district suggest that good fishing will probably occur in the 1950–51 season in Area 25, providing the fish move inshore during the fishing season.

From the analysis of data from the 1945–46 and 1949–50 seasons it appears possible that certain factors tend to prevent the fishing of an abundant year-class in Area 25 in its third year. Sampling data of previous years show that III-year fish dominate the catches and spawning runs in Area 25 less frequently than in Area 23. In some years fish of Age IV constitute the most abundant age-groups in the former area. This suggests either that the factors which prevent inshore migration have a greater effect on III-year fish in Area 25 than in Area 23 or that a larger proportion of the recruitment of new year-classes occurs at Age III in Area 23 than in Area 25. The possibility that there is a delay in the recruitment of fish in Area 25 poses the problem of what time of year recruitment occurs in the northern part of the sub-district. On the evidence that most of the recruitment may not have taken place by the end of the fishing season and

that in some years new recruits may join the adult population prior to spawning (in order to account for the sustained level of the spawning population), it would be presumed that recruitment would take place between the close of the fishery and the beginning of spawning. However, since previous information has generally indicated that almost all recruitment takes place after spawning and before the beginning of the fishery, acceptance of this theory presents considerable difficulty.

Although the abundance of fish in Area 25 in 1950–51 will probably depend largely on the 1947 year-class (as IV-year fish), the Area 23 fishery is expected to depend mostly on the strength of the 1948 year-class entering the fishery as III-year fish. Indications of relative year-class strength in the west coast populations have been given with reasonable accuracy in recent years by an analysis of the representation of II-year fish in the fishery and in the spawning runs. In 1949–50 II-year fish (1948 year-class) comprised a smaller proportion of the catch than the previous year, and in the spring of 1950 they were relatively much less abundant than in the preceding spring. Considering the data from the separate areas, it was found that II-year fish were less abundant in Area 23 fishing samples than in 1949–50 but more abundant in Area 25 samples than in the previous year. Thus it appears that the 1948 year-class will supply fewer recruits to the fishing stock than the 1947 year-class and that the abundance of fish in Area 23 will be less in 1950–51 than in the 1949–50 season. A possible indication of poorer survival in the 1948 brood during its early stages was obtained from reports received in the summer of 1948 on the relative abundance of juvenile herring on the west coast in the summers of 1947 and 1948 (Tester and Stevenson, 1948).

The dissimilarity between the age composition of the sample of spawning fish in Area 27 (Table XI) and that of spawning samples from other areas gives support to indications of previous years that the herring of Area 27 tend to be more or less segregated from the rest of the west coast population. The 1947 year-class was less strongly represented in the Area 27 sample than in the samples from other areas. This might account for the reduced spawning population in the area, as mentioned in the following section of this report. The large contribution made by the 1945 year-class (as V-year fish) suggests that this year-class was relatively stronger in Area 27 than elsewhere on the west coast. This is confirmed by the sampling of the spawning runs in 1947–48, which showed that the 1945 year-class (as III-year fish) was relatively most productive in Area 27.

Sex Ratio and Stage of Development

Sex ratio (number of females divided by number of males) and sexual development of herring based on samples from the commercial fishery and the spawning runs are given in Table XII. Comparison of results of the past four years (Tester and Stevenson, 1947, 1948; Stevenson, 1950) shows that males and females have been equally abundant in the fishing samples in all but one year. In that season (1947–48) females were slightly more numerous than males. However, in the spawning samples, males have predominated in all years, the ratio ranging from 0.81 in 1948–49 to 0.92 in 1946–47. This can be explained by the fact that the proportion of males to females is greater in samples of younger fish. In each of the years of the present study the average age of the spawning runs has been less than that of the fishing samples. In 1948–49, when the smallest ratio in the spawning samples was obtained, the average age of the spawning runs was the smallest ever recorded, whereas in 1946–47, when the ratio was only slightly less than one, the average age was the largest observed in the four-year period.

As in previous years, immature fish formed a small proportion of the fishery—just over 3 per cent in 1949–50. About one-third of the fish in the spawning samples were spent. In only one of the last four years, 1948–49, have spent fish been more numerous than unspent fish in spawning samples. The ratio of spent to unspent fish depends largely on whether the samples are taken from the tagging pond immediately after the fish have been impounded or after spawning has taken place on the web of the pond.

Average Length and Weight

The average lengths and average weights of west coast herring in samples from the commercial catch are given for each age in Table XIII according to area. Average lengths of fish in the spawning samples are presented in Table XIV.

No appreciable change in average length of fish of the same age has been discernible for the west coast as a whole during the four-year period of the investigation (Table XIII and comparable tables in previous reports). The growth of fish in the spawning runs was found to be similar at each age to the growth of fish from the fishery. Comparison of the average lengths of fish in Areas 23 and 25 showed a tendency for Area 25 fish of each age to be very slightly faster growing than fish from Area 23. The growth difference was only about one-half of 1 per cent at Ages III and IV, the ages which comprise most of the population. The data suggest that west coast fish were heavier in 1949–50 than in 1948–49, but the difference is probably not significant. It appears that the effect of the factors which influence herring growth has been more or less constant in recent years.

The following tabulation presents a comparison of the average length (A, in millimetres) and average weight (B, in grams) for samples from the 1948–49 and 1949–50 fisheries:—

Year	In Year of Age				
	II	III	IV	V	VI
A					
1948–49	159	188	201	213	222
1949–50	164	190	202	212	220
B					
1948–49	50	87	111	138	158
1949–50	56	94	117	137	152

EXTENT AND INTENSITY OF SPAWNING

For the fourth consecutive year, members of the herring investigation staff made a study of the extent and intensity of spawn depositions in the west coast of Vancouver Island sub-district. As in past years the fisheries officers also conducted an independent survey of the spawning-grounds. The purpose of this phase of the research is to estimate as accurately as possible the amount of spawn deposited in successive years (Stevenson, 1949). The information is used to assess the relative abundance of the spawning stock. The data also form an essential part of the early life-history studies.

The development of new methods to improve the accuracy of the spawning data was continued in 1950. In order to permit more accurate fixing of the date of previously unobserved spawnings, drawings of eggs at various stages of incubation were distributed to fisheries officers. Improvement in standard methods of obtaining the necessary data was also continued. Consultations were held with fisheries officers in the field and at their annual meeting in Vancouver to discuss the most effective ways of conducting spawning-ground surveys.

Dates, places, and size of individual west coast spawnings (Table XV) followed the general spawning pattern of previous years. The most striking exceptions to the usual pattern were (1) the spawning in Ross Passage (Area 24), noted this year for the first time, (2) the unusually large spawning between Nootka cannery and Marvinas Bay (Area 25), (3) the exceptionally large spawning around Nuchatlitz Village (Area 25), (4) the almost complete lack of spawning in the Port Eliza-Queen Cove locality (Area 25), and (5) the spawning at Rugged Point (Area 26), which was recorded for the first time this spring.

The spawning extent recorded for the sub-district as a whole was slightly greater in 1950 than in 1949. Increases were shown in Areas 23 and 25, the major west coast fishing areas, and in Area 26. A sharp decrease was recorded in Area 27, and in Area 24 the extent of spawning remained about the same in both years. The data on extent of spawn (in statutory miles) are summarized for 1949 and 1950, according to area, as follows:—

Area	Extent in Miles 1949	1950
23	11.7	13.4
24	4.3	4.2
25	16.3	18.2
26	2.2	3.2
27	6.6	4.5
Totals	41.1	43.5

The spawning intensity was generally lighter in 1950 than in the previous year. A comparison of the average spawning intensity in 1949 and 1950 is presented below. Average intensities of spawn deposition are calculated by weighting the various intensities of the individual spawnings—very heavy, heavy, medium, light, and very light—in the ratio of 1, 2, 3, 4, and 5 respectively, and by correcting for extent of the individual depositions.

Area	Average Spawning Intensity 1949	1950
23	3.1	2.4
24	3.1	2.8
25	3.5	3.2
26	3.4	3.3
27	2.6	3.0
All areas	3.2	2.9

It appears that the slight increase in the extent of west coast spawning in 1950 was offset by the decrease in average spawning intensity. One of these two factors (extent and intensity) appears to have more or less compensated for the other in all areas. The data suggest that the amount of spawn deposited was similar in both years. Similar conclusions were drawn on comparing the relative amounts of spawn in 1949 and 1948, and in 1948 and 1947. In each of the years since quota restrictions were removed from the west coast catch, fishing stopped well before the official closing-date because of inability to locate fish on the fishing-grounds. The maintenance of the size of the spawning stock during those years indicates that new schools moved inshore after the completion of the fishery. It appears that under conditions of non-quota fishing the spawning stock on the west coast of Vancouver Island has been kept at a level of abundance well above the critical amount necessary to maintain the population.

DISCUSSION

Since 1946 the west coast population has been exploited without limitation of catch by quota, whereas the lower east coast fishery has been rigidly held to a 40,000-ton annual catch. In both populations the 1947 year-class in 1949–50 (as III-year fish) constituted a large proportion (about two-thirds) of the catch and the spawning runs. The 1946 year-class was heavily recruited to the lower east coast population in the previous year. The resulting population supported an intensive fishery in that year and, in addition, a residual population of record size was left to spawn. This suggested that the carry-over of the 1946 year-class to the next season would be large. Moreover, there were good prospects of a second successive year-class (1947 year-class) entering the fishery. Thus it appeared that the lower east coast population might reach a record size in 1949–50.

However, although the quota was readily achieved in the 1949–50 season, catch per unit of effort showed a moderate decrease, and spawning-ground data in the spring of 1950 indicated a reduced spawning population. Since the 1949–50 catch and the 1950 spawning runs were largely composed of fish of the 1947 year-class, it appeared either that the year-class was tremendously abundant or that the carry-over from the previous year had been less than anticipated. The decreased spawning in the spring of 1950 gave support to the latter alternative.

The apparent decrease in the population of lower east coast herring recalls a more pronounced reduction in population abundance recently noted in the Queen Charlotte Islands sub-district. In 1948 spawn-deposition studies indicated that the latter population had reached an exceedingly high level of population abundance following several years of no fishing in the sub-district, and in 1949 extent of spawning decreased by about 65 per cent (Stevenson, 1949). In these two instances very large populations have suffered sudden decrease for reasons which were independent of the fishery.

Dymond (1947) pointed out that such conditions are frequently found amongst animals of various species. He suggested that emigration or disease might be causative factors. With reference to the herring populations concerned, no evidence of disease has been apparent. It also appears improbable that increased emigration could explain the situation. Although movement of lower east coast fish to the west coast appeared to be relatively high in 1949–50, migration of west coast fish to the lower east coast was also higher than in previous years (discussed previously).

Turning now to the west coast, a large catch was taken in 1948-49 in spite of a relatively small contribution made by the 1946 year-class as III-year fish. The large catch reflected the record fishery which occurred in Area 25, where the 1945 year-class in its fourth year entered the fishing runs in large numbers. The portion of the population which escaped the fishery was sufficient to produce normal spawning in the spring of 1949. The entry of a relatively strong 1947 year-class (III's) in 1949–50 was expected to maintain a high level of population, despite the fact that the preceding year-class was poor and the 1945 year-class (as V-year fish) would not continue to be a major contributor to the fishery. Statistics derived from tag-recovery and catch during 1949–50 suggested that this expectation was sound. A record fishery characterized by a predominant 1947 year-class occurred in one (Area 23) of the two major west coast areas. However, a very poor catch was produced in the other area (Area 25). It is considered that this low catch in the northern portion of the sub-district was a result of the main runs not moving inshore during the fishing season. For reasons little understood, strong year-classes on the west coast usually do not provide good fishing in the more northerly areas of the sub-district in their third year. The satisfactory spawning which took place in the spring of 1950 suggested that the main body of fish came inshore after fishing stopped.

Relatively good year-class survival has resulted in maintaining high abundance in both populations in the first four years of the present study. On the lower east coast a relatively large 40,000-ton quota has been readily taken in each year. In 1947, 1948, and 1949 the size of the lower east coast spawning population appeared to increase, but in 1950 it suddenly decreased by an amount which cannot be readily accounted for by the fixed catch. Over the same period large catches were made on the west coast (ranging from 37,300 to 59,000 tons), and the size of the spawning population has remained relatively uniform. On the basis of past studies on spawning extent and resultant recruitment, the level of west coast spawning in recent years appears to be great enough (probably unnecessarily large) to ensure that the extent of spawn deposition will not be a limiting factor in year-class survival.

These results have a direct bearing on the practical object of the investigation. They indicate apparent changes in the two populations during a period in which recruitment from a succession of good year-classes has been relatively large. It is noteworthy

that present data suggest that the level of the spawning stock on the west coast under conditions of non-quota fishing was maintained over the period, whereas the spawning portion of the lower east coast population which is subject to quota restrictions on catch decreased in the past season. The extent of the present decline is expected to be more apparent when the 1950–51 data become available. Among other organisms abrupt declines have been observed to follow peaks of abundance, and the lower east coast herring may be presenting a similar picture. However, at least one more example of this sequence will be necessary before it becomes reasonable to postulate that over-population is the cause of the decline.

If additional support to these present indications is given by results of future study, quota regulations on catch in periods of high population abundance will appear unnecessarily restrictive. This could possibly mark a first stage in the progress of the long-term investigation in which herring research is engaged.

Two further steps appear essential to the completion of the study. It will be necessary to determine the conditions obtaining in the two populations when population abundance is reduced by recruitment of a series of less productive year-classes. Also, the general applicability of the conclusions to the other herring populations of British Columbia will require careful consideration.

In addition to the studies heretofore described, other herring studies concerned primarily with survival in the early stages of the life-history are being undertaken. A major purpose of these studies is to discover the reasons for the great variations shown to exist in year-class strength. It appears likely that the results thus obtained will be of considerable importance in the final solution of the practical fisheries problems confronting herring investigators.

SUMMARY

A comparative study of the changes occurring in two major herring populations subjected to different methods of management is in progress. Chief emphasis is being laid on the west coast of Vancouver Island population, which since 1946 has had no quota limitations imposed upon catch. The other population, that of the lower east coast of Vancouver Island, has had catch restricted to 40,000 tons annually. The practical purpose of the research is to determine the most effective method of managing herring-fisheries to ensure maximum utilization of the stock. In this, the fourth in a series of annual reports, the 1949–50 results of studies on the adult population of the west coast sub-district are discussed, and a comparison is given of the changes considered to have occurred in both populations.

The 1949–50 fishery on the west coast yielded the smallest catch (37,300 tons) in the four-year period of the study. Although one of the two major fishing areas (Area 23) produced a record catch, the other (Area 25) had a very small fishery. Fishing effort was higher and availability was lower than in the previous year. The January catch was small, as in 1948–49. Data from previous years indicated that in seasons when average January temperatures were low, post-Christmas catches were small.

The reduced catch appeared to be primarily responsible for the smaller number of tags recovered by tag-detectors (40 per cent less) and by plant crews (66 per cent less). Analysis of both detector tag returns and plant recoveries suggested that a much greater percentage of fish migrated into and out of the west coast sub-district in 1949–50 than in the previous year. Reasons to account for the greater movement were lacking. As in past years, the interchange of fish between the west coast and the lower east coast sub-districts was found to be greater than between the west coast and any of the other sub-districts.

Considerable mixture of fish again occurred between the different west coast areas. Most of the movement along the coast took place in a south-easterly direction. The tendency for more fish to move south-easterly than north-westerly along the coast was

found in three of the four years of the present study. Tags which had been out about two years showed greater dispersal than those which had been out less than a year.

Tag-recovery data indicated that the rate of exploitation was much less in 1949–50 than in the previous year. The initial population abundance was estimated to be considerably larger than in 1948–49.

More herring were tagged in each of the southern British Columbia populations in the spring of 1950 than in the preceding spring. Also, tagging operations were expanded to include the central and northern populations. About 20 per cent more fish were tagged on the west coast of Vancouver Island in 1950, and a better distribution of taggings was achieved between the various areas.

The 1947 year-class (III-year fish) constituted about two-thirds of herring in the fishing samples. It was about equally dominant in all of the area catches. In the samples from the spawning runs of all areas except Area 27 it also formed an unusually large proportion of the fish. The data indicated that this year-class was of relatively greater strength than the previous year-class (that of 1946), and that its abundance was probably similar to that of the 1943 year-class. The fact that a very small fishery developed in Area 25 suggested that a portion of the northern west coast runs had not come inshore during the fishing season. This theory found support in the tag-recovery data, which indicated that the rate of exploitation was smaller in 1949–50 than in the previous year. It could not be determined what factors had prevented the fish from coming into Area 25 during the fishing season.

Spawning-ground studies also indicated that the population in the northern part of the west coast was not as low as the small fishery in Area 25 might suggest. Extent of spawning in Area 25 was at least as great as it was in the preceding year. For the west coast as a whole it appeared that the general level of spawning established in the preceding three years was maintained in 1950. Area 27 was the only area which showed a significant decrease in spawning. This was considered to indicate a decrease in the extent of the local runs, caused by a relatively poorer survival of the 1947 year-class in that area than in the areas to the south. Evidence from the age composition of a spawning sample from Area 27 supported this view.

The changes occurring in the west coast and the lower east coast herring populations, subjected to contrasting regulations on catch, were discussed. Heavy recruitment of a succession of better-than-average year-classes has resulted in relatively high population abundance in both populations in the last four years. On the west coast, where catch has not been restricted by quota, the spawning population has been maintained at a relatively constant level during the period, while the spawning portion of the lower east coast population, which is subjected to quota regulations, increased until 1949 and abruptly decreased in 1950. Further investigation is necessary to determine the significance of this apparent decline.

ACKNOWLEDGMENTS

The assistance and co-operation given to herring research by many individuals and organizations in the 1949–50 season is gratefully acknowledged.

Sincere thanks are extended to the personnel attached to the herring investigation for their conscientious and diligent efforts in carrying out the various phases of the study. The junior author devoted most of his attention to the tag-recovery programme and the survey of the west coast spawning depositions. Miss Anne Lazareff, junior biologist, and R. S. Isaacson, laboratory technician, were responsible for making the age determinations on herring taken in the sampling programme and for compiling the sampling data. The collection and organization of the catch statistics was also undertaken by Mr. Isaacson. A. G. Paul, the senior member of the technician staff, undertook a large share of the field responsibility in the tagging programme and in tag-detector operations.

Maintenance of the tagging equipment was also handled by Mr. Paul, while the servicing and overhauling of tag-detectors and other electrical equipment was carried out by J. H. Larkman. Mr. Larkman was also engaged in tagging operations. The other members of the technician staff, K. Herlinveaux, B. W. Wildman, J. Saker, and D. McDermott, assisted at one time or another in most phases of the field work and aided in the preliminary analysis of the data. Certain of the investigation's personnel devoted most of their attention during the year to early life-history studies, the results of which were not ready for publication in this report. A. S. Hourston, assistant biologist, initiated a major study of the juvenile herring, with the assistance of D. N. Outram, junior biologist, who recently returned to the staff. K. J. Jackson, junior biologist, continued the study of bird predation on spawn. Messrs. Hourston and Jackson also undertook a considerable amount of responsibility in field operations connected with larval studies. Preliminary analysis of the larval data was carried out by R. R. Gardner. Stenographic and clerical duties were performed by Miss Hazel Cox and Miss Alice Nyquist.

The responsibility for the interpretation of the data, as presented in this report, is assumed by the senior author, who supervised the herring studies in 1949–50.

It is a pleasure to extend the appreciation of the herring investigation to members of the fishing industry who have contributed to the study of the herring in many ways. For permission to operate tag-detectors at reduction plants located at Steveston, Kildonan, and Nootka, the investigation is indebted to the executives and plant managers of British Columbia Packers, Limited, and the Canadian Fishing Company, Limited. The companies also made vessels available again for general contact work and the scouting of herring during the fall and winter, and for tagging operations, spawn studies, and young-herring surveys in the spring and early summer months. British Columbia Packers, Limited, offered the " W. No. 10 " and the " Bessie Mac " for scouting trips, the " Mina H." for contact work and tagging, and the " Dominion No. 1 " for young-herring studies; the Canadian Fishing Company, Limited, loaned the " Skedans " for general field contact work and the " Pacific Queen " for tagging; Nelson Brothers Fisheries, Limited, placed the " Western Commander " at the disposal of the herring investigation for tagging studies; and the Anglo-British Columbia Packing Company made available the " Fir Leaf " for spawn and larval work. The herring investigation also wishes to express its thanks to the captains and crews of these vessels for their assistance and personal interest.

Various employees of the reduction plants assisted the research. Plant bookkeepers submitted records of the catches landed at plants, permitting estimates of catch by area and aiding in the interpretation of area of recovery for tag returns. Recovery of tags from magnets and plant machinery was undertaken by reduction-plant personnel. Staff members of certain plants aided the sampling programme by freezing samples of fish from the catches and shipping them at a later date to the Biological Station.

The captains of the herring seine-boats submitted catch records, from which data on fishing effort and availability were compiled.

The herring investigation again gratefully acknowledges the assistance and co-operation of the Dominion Department of Fisheries in the 1949–50 studies. Fisheries officers along the coast continued their surveys of spawn depositions and submitted reports. Without their aid the acquisition of information on changes in spawning populations would have been extremely difficult. To A. J. Whitmore, Chief Supervisor, and J. S. Tait, Supervisor of the Nanaimo regional office, the herring investigation is indebted for the many courtesies extended in connection with the west coast of Vancouver Island studies.

The herring research was again financed jointly by the Fisheries Research Board of Canada and the Provincial Fisheries Department of British Columbia. The support and advice of the respective executive officers of these organizations, Dr. R. E. Foerster and Dr. J. L. Hart, and G. J. Alexander, were sincerely appreciated.

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* Reprints of this paper are dated 1949.

Table I.—Catch (Tons), Fishing Effort (Total Number of Active Fishing-days Expended by All Seine-boats), and Availability (Average Catch per Seine per Day's Active Fishing) for West Coast Sub-district Areas during 1949–50 Fishing Season.

Area	Estimated Catch	Fishing Effort*	Availability
23	29,900	670	44.6
24	1,300	22	59.1
25	3,800	56	67.9
26	2,300	42	54.8
27†	------	-----	-----
Totals	37,300	790	47.2

* The total number of active fishing-days is calculated to the nearest whole number from availability based on incomplete data and from estimated catch.

† No records are available for the very small amount of scouting which took place in Area 27.

Table II.—Test-tags Recovered by Plant Crews from Magnets, etc., during the 1949–50 Fishing Season

Plant Code	Date of Test	Number Used	Number Recovered																Percentage Recovery
			Days of Plant Operation after Test															Total	
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15+	?		
D	Dec. 3	50	41	----	3	2	----	----	----	----	----	----	----	----	----	----	----	----	46	92.0
N	Dec. 3	50	7	8	----	28	1	5	----	----	----	----	----	----	----	----	----	----	49	98.0
C	Nov. 19	50	38	----	----	4	----	----	1	----	----	----	----	----	----	----	----	----	43	86.0
	Dec. 4	50	50	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	50	100.0
F	Nov. 1	50	----	----	1	----	----	----	----	----	5	4	----	2	6	3	1	----	22	44.0
	Jan. 11	50	33	7	----	----	----	----	----	----	6	----	----	----	----	----	----	----	46	92.0
A	Nov. 1	49	11	----	----	9	6	10	5	1	----	----	----	----	----	----	----	----	42	85.7
	Dec. 7	49	1	7	3	3	----	----	----	2	----	----	----	17	----	----	3	----	36	73.5
L	Oct. 25	50	17	11	----	----	----	----	----	----	----	----	----	----	----	----	1	----	29	58.0
	Dec. 7	48	4	----	----	----	----	----	----	1	----	----	----	----	----	----	----	23	28	58.3
Q	Nov. 1	50	14	15	1	12	----	----	----	1	----	----	----	----	----	----	----	----	43	86.0
	Dec. 7	50	3	----	27	----	----	----	----	----	----	1	----	----	----	----	----	----	31	62.0
P	Dec. 7	50	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	22	22	44.0

Table III.—Tagging and Recovery Data for Taggings Conducted Simultaneously by Two Taggers at One Time and Place

Tagging Code	More-experienced Tagger					Less-experienced Tagger				
	Tagger No.	Code Letters	Number Used	Number Recovered	Per Cent Recovered	Tagger No.	Code Letters	Number Used	Number Recovered	Per Cent Recovered
13G	2	POOP	498	13	2.61	9	PMMP	505	18	3.56
13M	2	SDDS	503	24	4.77	9	SBBS	505	10	1.98
13N	2	PZZP	504	1	0.20	9	PYYP	502	1	0.20
13R	2	PUUP	512	2	0.39	9	PTTP	504	1	0.20
13S	2	SIIS	514	9	1.75	9	SHHS	504	5	0.99
13G	2	POOP	498	13	2.61	10	PNNP	514	12	2.33
13M	2	SDDS	503	24	4.77	10	SCCS	510	15	2.94
13N	2	PZZP	504	1	0.20	10	PXXP	507	2	0.39
13R	2	PUUP	512	2	0.39	10	PSSP	508	1	0.20
13S	2	SIIS	514	9	1.75	10	SJJS	508	8	1.57
13H	2	SNNS	513	32	6.24	6	SLLS	505	23	4.55
13H	2	STTS	511	14	2.74	6	SOOS	510	23	4.51
13H	2	SNNS	513	32	6.24	4	SMMS	507	21	4.14
13H	2	STTS	511	14	2.74	4	SPPS	516	15	2.91
13P	2	SWWS	515	8	1.55	4	SUUS	504	1	0.20
13P	2	SYYS	513	3	0.58	4	SXXS	507	2	0.39
13I	2	TDDT	510	30	5.88	4	SZZS	515	38	7.52
13I	2	TEET	507	21	4.14	4	THHT	509	35	6.88
13I	2	TJJT	504	24	4.76	4	TIIT	526	24	4.56
13A	6	UEEU	494	3	0.61	11	UBBU	500	1	0.20
13A	6	UEEU	494	3	0.61	12	UCCU	491	0	0.00
13Q	6	UWWU	506	12	2.37	12	UTTU	519	10	1.93
13L	6	UZZU	517	16	3.09	12	WAAW	506	8	1.58

Table IV.—Tags Recovered by the Imperial (A), Gulf of Georgia (L), Kildonan (D), and Nootka (F) Tag-detectors during the 1949–50 Fishing Season

Tagging Area	Tagging Code	Area of Recovery															Total
		12	13	14A		14B		17		23				24	25B		
		L	A	A	L	A	L	A	L	A	L	D	F	F	A	L	
12	9H	1															1
14A	12A			1		1			2								4
15	13A			1													1
16	10F		1														1
14B	12C							1									1
	12D								1								1
18	13E				1		1	1	2		1						6
	13F			1	4	1	2	6	3		1						18
23	10J										1						1
	11H														1		1
	11I										3						3
	11J										1						1
	11K								1	1							2
	12G									1							1
	12I									1							1
	12J							1		2	2						5
	12K							1	1	4	3						9
	13G									1	1	2					4
	13H			1		1	1	1		10	6		1				21
	13I					1	2	1	2	4	7		1		1		19
24	11P									1						1	2
	12L									2	4						6
	12M					1				1							2
	13K						1			1							2
	13L									1	1			1			3
25	11R														1		1
	11W									1							1
	11X															1	1
	12P										1						1
	12Q									1							1
	13M									2	2				2	2	8
	13N					1				1							2
	13P								1	1							2
	13Q									2			1				3
	13S															1	1
	Totals	1	1	4	5	6	7	12	13	38	34	2	3	1	5	5	137
	Tonnages examined	2,007	552	1,508	1,282	2,248	3,198	2,163	2,422	2,376	4,057	260	321	879	188	116	
	Estimated catch	9,000	3,500	11,300		25,600		14,700		29,900				1,300	3,800		

Table V.—Probable Number of Tags in the Catches during the 1949–50 Season, Based on Detector Returns

Tagging Area	Tagging Code and Year	Area of Recovery								Total
		12	13	14A	14B	17	23	24	25B	
12	9H (1945)	5	-----	-----	-----	-----	-----	-----	-----	5
14A	12A (1948)	-----	-----	7	8	7	-----	-----	-----	22
15	13A (1949)	-----	-----	7	-----	-----	-----	-----	-----	7
16	10F (1946)	-----	11	-----	-----	-----	-----	-----	-----	11
14B	12C (1948)	-----	-----	-----	-----	5	-----	-----	-----	5
	12D 1948)	-----	-----	-----	-----	4	-----	-----	-----	4
18	13E (1949)	-----	-----	5	5	13	9	-----	-----	32
	13F (1949)	-----	-----	26	19	44	9	-----	-----	98
23	10J (1946)	-----	-----	-----	-----	-----	9	-----	-----	9
	11H (1947)	-----	-----	-----	-----	-----	-----	-----	16	16
	11I (1947)	-----	-----	-----	-----	-----	26	-----	-----	26
	11J (1947)	-----	-----	-----	-----	-----	9	-----	-----	9
	11K (1947)	-----	-----	-----	-----	4	5	-----	-----	9
	12G (1948)	-----	-----	-----	-----	-----	5	-----	-----	5
	12I (1948)	-----	-----	-----	-----	-----	5	-----	-----	5
	12J (1948)	-----	-----	-----	-----	4	28	-----	-----	32
	12K (1948)	-----	-----	-----	-----	9	46	-----	-----	55
	13G (1949)	-----	-----	-----	-----	-----	60	-----	-----	60
	13H (1949)	-----	-----	7	13	5	106	-----	-----	131
	13I (1949)	-----	-----	-----	19	13	90	-----	16	138
24	11P (1947)	-----	-----	-----	-----	-----	5	-----	25	30
	12L (1948)	-----	-----	-----	-----	-----	45	-----	-----	45
	12M (1948)	-----	-----	-----	8	-----	5	-----	-----	13
	13K (1949)	-----	-----	-----	5	-----	5	-----	-----	10
	13L (1949)	-----	-----	-----	-----	-----	14	3	-----	17
25	11R (1947)	-----	-----	-----	-----	-----	-----	-----	16	16
	11W (1947)	-----	-----	-----	-----	-----	5	-----	-----	5
	11X (1947)	-----	-----	-----	-----	-----	-----	-----	25	25
	12P (1948)	-----	-----	-----	-----	-----	9	-----	-----	9
	12Q (1948)	-----	-----	-----	-----	-----	5	-----	-----	5
	13M (1949)	-----	-----	-----	-----	-----	28	-----	82	110
	13N (1949)	-----	-----	-----	8	-----	5	-----	-----	13
	13P (1949)	-----	-----	-----	-----	4	5	-----	-----	9
	13Q (1949)	-----	-----	-----	-----	-----	19	-----	-----	19
	13S (1949)	-----	-----	-----	-----	-----	-----	-----	25	25
	Totals	5	11	52	85	112	557	3	205	1,030

Table VI.—Number of Tags Recovered by Plant Crews, According to Area of Tagging and Probable Area of Recovery, for the 1949–50 Fishing Season

Tagging Area	Tagging Code	Probable Area of Recovery																										Total
		4, 6	4, 7	4, 6, 7	6, 7	7, 9	9	12	12, 17	12, 14A, 17	13–14A	13–14B	13, 14A, 17	13, 14B, 17	14B	17	14A, 17	14B, 17	14A, 14B, 17	13, 18	23	23, 24	25B	23, 25B	25B, 26	23, 25B, 26	?	
5	9P	1																										1
6	9N			1	1	1	1					1							1								1	7
7	8M	1																	1									2
	9M		2			1									2													5
10	9K					1																						1
12	7N																										1	1
	9H							1		1																	2	4
	9J																										1	1
	10H							1																				1
14A	10E														1						1							2
	12A											2			1		1	3			1	1						9
15	10G															1												1
	11C																		1								1	2
	13A												2						2								1	5
14B	10C																1											1
	12C																		1									1
	12D											1									1							2
	13C																		1									1
17	12F																				1							1
	13D																		1									1
	13E							1		1		1			2		1	1	10		4						4	25
18	10A																	1										1
	13F									1		3	2		9	1	4	1	10	1	4	1					10	47
20	9A																			1								1
23	10I																				1							1
	11F																		1		2					2		5
	11H																				9	2				5	3	19
	11I																				3	2				2		7
	11J																				1				1	1	1	4
	11K									1											12	1				6	8	28

	11L	----	----	----	----	----	----	----	----	1	----	----	----	----	----	----	----	----	----	----	1	----	----	----	----	2	2	6
	11M	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	10	----	----	----	----	13	1	24
	11N	----	----	----	----	----	----	----	----	1	----	----	----	----	----	----	----	----	----	----	2	----	----	----	----	----	2	5
	12G	----	----	----	----	----	----	----	----	----	----	----	----	----	1	----	----	----	----	----	1	----	----	----	----	2	----	4
	12H	----	----	----	----	----	----	----	----	1	----	----	----	----	----	----	----	----	----	----	6	1	----	----	----	2	1	11
	12I	----	----	----	----	----	----	----	----	2	----	----	----	----	----	----	----	----	----	----	9	----	----	1	1	8	----	21
	12J	----	----	----	----	----	----	----	1	2	----	----	----	----	----	----	1	----	----	----	16	1	----	----	2	10	1	34
	12K	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	2	1	----	7	3	1	1	----	15	3	33
	13G	----	----	----	----	----	----	----	1	----	----	1	1	----	1	----	1	3	1	----	12	2	----	----	----	15	1	39
	13H	----	----	----	----	----	----	----	----	2	----	6	----	----	4	----	----	5	5	2	35	5	----	1	----	35	8	108
	13I	----	----	----	----	----	----	----	1	----	1	2	1	1	2	1	----	5	5	----	63	10	----	2	1	48	10	153
24	8N	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	1	1
	10K	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	1	1
	10L	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	1	----	----	----	----	----	----	1
	11P	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	2	----	----	----	----	5	1	8
	11Q	----	----	----	----	----	----	----	----	1	----	----	----	----	----	----	----	1	----	----	----	----	----	1	----	1	1	5
	12L	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	1	1	----	8	1	----	----	----	7	3	21
	12M	----	----	----	----	----	----	----	----	----	----	1	----	----	----	----	----	----	1	1	4	1	----	----	1	9	1	19
	13K	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	1	----	----	6	3	----	----	1	4	4	19
	13L	----	----	----	----	----	----	----	----	----	----	----	----	----	1	----	----	1	----	----	21	3	----	2	----	18	16	62
25	10P	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	2	2
	11W	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	1	----	----	2	----	----	----	3
	11X	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	1	----	----	----	1
	12N	----	----	----	----	----	----	----	----	1	----	----	----	----	----	----	----	----	----	----	3	----	----	----	----	5	----	9
	12P	----	----	----	----	----	----	----	1	1	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	6	1	9
	12Q	----	----	----	----	----	----	----	----	1	----	----	----	----	----	----	----	----	----	----	2	----	----	1	1	2	1	8
	12R	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	1	----	----	----	----	----	----	2	----	3
	12S	----	----	----	----	----	----	----	----	3	----	----	----	----	----	----	----	----	----	----	----	----	----	1	2	2	----	8
	13M	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	12	4	----	7	----	25	4	52
	13N	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	1	----	----	1	----	3	----	5
	13P	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	1	----	3	1	----	3	1	2	1	12
	13Q	----	----	----	----	1	----	----	----	----	----	1	----	----	----	----	----	1	----	----	4	----	----	2	1	10	1	21
	13R	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	2	3	----	5
	13S	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	4	1	----	4	5	8	8	30
26	10Q	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	1	1
	10R	----	----	----	----	----	----	----	----	1	----	----	----	----	----	----	----	----	----	----	----	----	1	----	1	----	----	3
	12T	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	3	21	1	25
	12U	----	----	----	1	----	----	----	----	----	----	----	----	----	----	----	----	----	2	----	----	----	1	1	6	2	2	15
27	12W	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	2	1	----	3
	12X	----	----	----	----	3	----	----	----	2	----	1	----	----	2	----	----	----	----	----	----	----	----	1	1	5	4	19
	Totals	2	2	1	2	7	1	3	4	23	1	20	6	1	26	3	9	26	47	5	274	43	3	32	32	307	116	996

Table VII.—Number of West Coast Tags Used, and Probable Number and Percentage in the 1949–50 West Coast Catch, According to Calculations Based on Recoveries by Both Detectors and Plant Crews.

Tagging Area	Tagging Code	Number Used	Probable Number in Catches		Probable Percentage in Catches	
			Detector Returns	Plant Returns	Detector Returns	Plant Returns
	Tagged 1947; Present in 1949–50 Catches					
23	11F	2,087	.....	6	.....	0.29
23	11H	2,670	16	23	0.60	0.86
23	11I	1,017	26	14	2.56	1.38
23	11J	2,074	9	7	0.43	0.34
23	11K	2,637	5	30	0.19	1.14
23	11L	994	.....	3	.....	0.30
23	11M	2,191	.....	34	.....	1.55
23	11N	1,011	.....	3	.....	0.30
24	11P	3,499	30	19	0.86	0.54
24	11Q	3,084	.....	6	.....	0.19
25	11R	2,021	16	.....	0.79	.....
25	11W	2,622	5	3	0.19	0.11
25	11X	968	25	2	2.58	0.21
	Totals	26,875	132	150	0.49	0.56
	Tagged 1948; Present in 1949–50 Catches					
23	12G	1,511	5	6	0.33	0.40
23	12H	1,053	.....	14	.....	1.33
23	12I	2,082	5	28	0.24	1.34
23	12J	2,025	28	46	1.38	2.27
23	12K	2,548	46	52	1.88	2.04
24	12L	3,063	45	33	1.47	1.08
24	12M	2,516	5	27	0.20	1.07
25	12N	1,986	.....	14	.....	0.70
25	12P	2,019	9	18	0.45	0.89
25	12Q	1,503	5	6	0.33	0.40
25	12R	1,985	.....	2	.....	0.10
25	12S	1,524	.....	2	.....	0.13
26	12T	2,043	.....	74	.....	3.62
26	12U	1,515	.....	8	.....	0.53
27	12W	1,381	.....	4	.....	0.29
27	12X	3,193	.....	19	.....	0.60
	Totals	31,947	148	353	0.46	1.10
	Tagged in 1949; Present in 1949–50 Catches					
23	13G	1,517	60	50	4.00	3.30
23	13H	3,062	106	115	3.46	3.76
23	13I	3,071	106	224	3.45	7.29
24	13K	1,004	5	25	0.50	2.49
24	13L	2,032	17	102	0.84	5.02
25	13M	2,024	110	117	5.43	5.78
25	13N	2,022	5	4	0.25	0.20
25	13P	2,039	5	17	0.25	0.83
25	13Q	1,025	19	34	1.85	3.32
25	13R	2,028	.....	8	.....	0.39
25	13S	2,032	25	41	1.23	2.02
	Totals	21,856	458	737	2.09	3.37

Table VIII.—Data on Taggings Referred to in Tables and Text

Tagging Code	Tagging Area	Place and Date of Tagging	Number Used
7N	12	Chatham Channel; April 5, 1943	2,978
8M	7	Gunboat Passage; Mar. 20, 1944	3,011
8N	24	Matilda Inlet; Mar. 26, 27, 1944	4,220
9A	20	Sooke; Oct. 10, 1944	1,409
9H	12	Cutter Creek; Mar. 22, 1945	3,177
9J	12	Cramer Passage; Mar. 7–15, 1945	2,893
9K	10	Takush Harbour, Angle Inlet; Mar. 26, 1945	3,172
9M	7	Gunboat Passage; Mar. 20, 21, 1945	4,310
9N	6	Parsons Anchorage; Mar. 25, 1945	3,450
9P	5	Union Passage; Mar. 30, 1945	3,010
10A	18	Prevost Island, Selby Creek; Feb. 16, 1946	1,570
10C	14B	Departure Bay; Mar. 12, 1946	3,952
10E	14A	Baynes Sound; Mar. 15, 1946	3,148
10G	15	Skuttle Bay; Mar. 16, 1946	3,085
10H	12	Cramer Passage; Mar. 23, 1946	1,691
10I	23	Pipestem Inlet; Feb. 26, 27, 1946	3,914
10K	24	Herbert Inlet, Whitepine Cove; Mar. 19, 1946	2,941
10L	24	Refuge Cove; Mar. 19, 20, 1946	2,947
10P	25	Queen Cove; Mar. 5, 6, 1946	3,961
10Q	26	Clanninick Cove; Mar. 13, 1946	3,182
10R	26	Clanninick Cove; Mar. 15, 1946	2,542
11C	15	Skuttle Bay; Mar. 5, 1947	2,557
11F	23	Banfield Inlet, head; Feb. 17, 1947	2,087
11H	23	Macoah Passage; Feb. 24, 1947	2,670
11I	23	Macoah Passage; Feb. 25, 1947	1,017
11J	23	Macoah Passage; Mar. 1, 1947	2,074
11K	23	Toquart Bay; Mar. 15, 1947	2,637
11L	23	Toquart Bay; Mar. 20, 1947	994
11M	23	Mayne Bay; Mar. 16, 1947	2,191
11N	23	Mayne Bay; Mar. 19, 20, 1947	1,011
11P	24	Refuge Cove; Mar. 12, 13, 1947	3,499
11Q	24	Sydney Inlet, Flores Island; Mar. 7, 8, 1947	3,084
11W	25	Nuchatlitz Inlet, near village; Mar. 4, 1947	2,622
11X	25	Nuchatlitz Inlet, near village; Mar. 5, 1947	968
12A	14A	Baynes Sound, Mud Bay; Mar. 5, 1948	2,514
12C	14B	Departure Bay, Horswell Point; Mar. 10, 1948	2,028
12D	14B	Hammond Bay; Mar. 4, 1948	2,538
12G	23	Banfield Inlet; Feb. 23, 1948	1,511
12H	23	Macoah Passage; Feb. 20, 1948	1,053
12I	23	Macoah Passage; Feb. 25, 1948	2,082
12J	23	Macoah Passage; Feb. 27, 1948	2,025
12K	23	Toquart Bay; Mar. 9, 10, 1948	2,548
12L	24	Herbert Inlet, Whitepine Cove; Mar. 19, 1948	3,063
12M	24	Refuge Cove; Mar. 14, 15, 1948	2,516
12N	25	Ewin Inlet; Mar. 16, 1948	1,986
12P	25	Kendrick Inlet, lagoon at head; Mar. 12, 1948	2,019
12Q	25	Kendrick Inlet, lagoon at head; Mar. 25, 1948	1,503
12R	25	Esperanza Inlet, Gillam Channel; Mar. 1, 2, 1948	1,985
12S	25	Queen Cove; Mar. 14, 1948	1,524
12T	26	Union Island, Kyuquot Channel; Mar. 3, 1948	2,043
12U	26	Malksope Inlet; Mar. 20, 1948	1,515
12W	27	Klaskish Inlet; Mar. 6, 1948	1,381
12X	27	Forward Inlet. Matthews Island; Mar. 8, 9, 1948	3,193
13A	15	Skuttle Bay; Mar. 8, 1949	2,984
13C	14B	Departure Bay; Mar. 11, 12, 1949	2,013
13D	17	Pylades Channel; Mar. 14, 1949	1,996
13E	18	Ganges Harbour; Mar. 4, 1949	1,472
13F	18	Prevost Island, Selby Creek; Feb. 18, 1949	2,022
13G	23	Banfield Inlet; Feb. 21, 1949	1,517
13H	23	Rainy Bay, Barkley Sound; Mar. 16, 1949	3,062
13I	23	Macoah Passage; Mar. 28, 1949	3,071
13K	24	Matilda Creek; Apr. 1, 1949	1,004
13L	24	Matilda Creek; Apr. 2, 1949	2,032
13M	25	Ewin Inlet; Mar. 7, 1949	2,024
13N	25	Kendrick Inlet; Mar. 6, 1949	2,022
13P	25	Kendrick Inlet; Mar. 20, 1949	2,039
13Q	25	Kendrick Inlet; Mar. 23, 1949	1,025
13R	25	Queen Cove; Mar. 5, 1949	2,028
13S	25	Queen Cove; Mar. 10, 1949	2,032
14A	14A	Lambert Channel; Mar. 27, 28, 1950	2,019
14B	15	Ragged Island; Mar. 10, 11, 1950	2,027
14C	15	Ragged Island; Mar. 15, 1950	2,019
14D	14B	Departure Bay; Feb. 22, 1950	2,030
14E	14B	Departure Bay; Feb. 27, 1950	2,018

Table VIII.—Data on Taggings Referred to in Tables and Text—Continued

Tagging Code	Tagging Area	Place and Date of Tagging	Number Used
14F	14B	Newcastle Island; Mar. 20, 21, 1950	2,042
14G	17	Kulleet Bay; Mar. 21, 1950	1,064
14H	17	Dunsmuir Island; Mar. 22, 24, 1950	2,018
14I	23	Snowden Island; Mar. 6, 1950	2,016
14K	23	St. Ines Island; Mar. 7, 1950	2,003
14L	23	Toquart Bay; Mar. 12, 13, 1950	1,994
14M	23	St. Ines Island; Mar. 7, 1950	2,012
14N	24	Cypress Bay; Mar. 9, 1950	2,011
14P	25	Nootka Cannery; Mar. 15, 1950	505
14Q	25	Nootka Cannery; Mar. 17, 1950	1,511
14R	25	Kendrick Inlet; Mar. 16, 1950	2,015
14S	25	Kendrick Inlet; Mar. 18, 1950	1,017
14T	25	Queen Cove; Mar. 20, 1950	2,543
14U	25	Port Eliza; Mar. 24, 1950	2,490
14V	26	Rugged Point; Mar. 14, 1950	2,019
14W	26	Ououkinsh Inlet; Mar. 26, 1950	2,491
14X	27	Winter Harbour; Mar. 21, 22, 1950	2,029
14AA	6	Parsons Anchorage; Mar. 30, 1950	3,061
14BB	6	Thistle Pass; Mar. 31, 1950	2,512
14CC	5	Willis Bay; Apr. 4, 1950	2,548
14DD	6	Wilby Point; Apr. 7, 1950	1,005
14EE	10	Takush Harbour; Mar. 25, 1950	1,012
14HH	7	Kildidt Channel; Mar. 27, 1950	2,362
14KK	7	Sabiston Island; Apr. 5, 1950	2,042

Table IX.—List of Samples Taken from Commercial Catches and Spawning Runs in West Coast Sub-district in 1949–50 Season

Place and Date	Number of Fish in Year of Age									Number Males	Number Females	?	Number Immature	Number Mature Not Spent	Number Mature Spent	Total Number
	I	II	III	IV	V	VI	VII	VIII	?							
Area 23—Commercial Catches																
Barkley Sound, Nov. 15	----	2	66	22	3	3	----	----	4	53	47	----	----	100	----	100
Effingham Inlet, Nov. 15 (A)	----	----	60	25	10	1	----	----	4	51	49	----	----	100	----	100
Effingham Inlet, Nov. 15 (B)	----	----	41	50	3	2	----	----	4	51	49	----	----	100	----	100
Barkley Sound, Nov. 16 (A)	----	1	53	23	14	3	----	----	6	49	51	----	----	100	----	100
Barkley Sound, Nov. 16 (B)	----	2	52	29	12	----	----	----	5	49	51	----	----	100	----	100
Peacock Channel, Nov. 16	----	3	53	26	3	----	2	----	6	47	46	----	----	93	----	93
Barkley Sound, Nov. 17 (A)	----	1	54	28	7	4	----	----	6	51	49	----	----	100	----	100
Barkley Sound, Nov. 17 (B)	----	5	37	33	11	1	----	1	12	61	39	----	----	100	----	100
Barkley Sound, Nov. 18 (A)	----	4	67	19	3	2	1	----	4	46	54	----	2	98	----	100
Barkley Sound, Nov. 18 (B)	----	3	64	21	4	4	1	----	3	57	43	----	----	100	----	100
Barkley Sound, Nov. 19	----	6	70	13	5	1	----	----	5	33	67	----	5	95	----	100
Barkley Sound, Nov. 20	----	3	51	32	14	----	----	----	----	47	53	----	3	97	----	100
Middle Channel, Nov. 21	----	1	54	29	10	2	----	----	4	51	49	----	1	99	----	100
Middle Channel, Nov. 22	----	14	63	13	3	----	----	----	7	59	41	----	----	100	----	100
Barkley Sound, Nov. 23 (A)	----	----	74	18	2	2	----	----	4	58	42	----	----	100	----	100
Barkley Sound, Nov. 23 (B)	----	2	39	22	5	----	----	----	4	32	40	----	1	71	----	72
Barkley Sound, Nov. 23 (C)	----	3	69	14	8	2	----	----	3	51	48	----	----	99	----	99
Barkley Sound, Nov. 24 (A)	----	1	54	30	5	----	1	1	8	59	41	----	2	98	----	100
Barkley Sound, Nov. 24 (B)	----	5	51	25	9	1	1	----	8	54	46	----	3	97	----	100
Barkley Sound, Nov. 25 (A)	----	2	52	34	5	----	----	----	7	47	53	----	1	99	----	100
Barkley Sound, Nov. 25 (B)	----	2	46	18	8	1	1	----	1	47	30	----	----	77	----	77
Middle Channel, Nov. 25	----	3	61	18	7	----	----	----	2	55	36	----	1	90	----	91
Barkley Sound, Nov. 26	----	4	63	21	3	----	1	----	3	48	47	----	1	94	----	95
Barkley Sound, Nov. 28 (A)	----	1	44	21	4	----	1	----	19	35	55	----	----	90	----	90
Barkley Sound, Nov. 28 (B)	----	----	75	19	3	----	----	----	3	45	55	----	----	100	----	100
Barkley Sound, Nov. 29 (A)	1	2	76	10	1	----	----	----	10	48	52	----	4	96	----	100
Barkley Sound, Nov. 29(B)	----	6	77	9	2	----	1	----	5	50	50	----	3	97	----	100
Mayne Bay, Nov. 30	----	5	70	12	6	----	----	----	----	42	51	----	2	91	----	93
Barkley Sound, Nov. 30	----	----	74	16	4	1	----	----	5	42	58	----	1	99	----	100
Mayne Bay, Dec. 1	----	1	74	15	6	----	----	----	4	57	43	----	1	99	----	100
Middle Channel, Dec. 2 (A)	----	5	68	23	1	----	----	----	3	47	52	1	2	98	----	100
Middle Channel, Dec. 2 (B)	----	4	78	13	1	----	----	----	4	53	47	----	1	99	----	100
Barkley Sound, Dec. 2 (A)	----	4	48	15	3	----	----	----	8	43	34	1	11	67	----	78
Barkley Sound, Dec. 2 (B)	----	2	54	15	4	----	----	----	5	43	37	----	22	58	----	80
Barkley Sound, Dec. 2, (C)	----	12	60	11	2	----	----	----	5	52	35	3	25	65	----	90
Barkley Sound, Dec. 2 (D)	----	5	75	10	2	----	----	----	8	50	50	----	5	95	----	100
Barkley Sound, Dec. 2 (E)	----	4	76	12	3	----	----	----	5	49	51	----	1	99	----	100
Barkley Sound, Dec. 2 (F)	----	3	74	16	5	----	----	----	1	43	56	----	4	95	----	99
Barkley Sound, Dec. 5	----	8	68	16	2	----	----	----	6	62	38	----	1	99	----	100
Effingham Inlet, Dec. 5 (A)	----	7	68	17	5	----	----	----	3	51	49	----	2	98	----	100
Effingham Inlet, Dec. 5 (B)	----	3	64	19	4	1	----	1	8	59	40	1	3	97	----	100
Effingham Inlet, Dec. 5 (C)	----	2	71	18	5	----	----	----	4	50	50	----	1	99	----	100
Mayne Bay, Dec. 6		1	64	23	4	----	----	----	8	57	43	----	1	99		100

Table IX.—List of Samples Taken from Commercial Catches and Spawning Runs in West Coast Sub-district in 1949–50 Season—Continued

Place and Date	Number of Fish in Year of Age									Number Males	Number Females	?	Number Imma-ture	Number Mature Not Spent	Number Mature Spent	Total Number
	I	II	III	IV	V	VI	VII	VIII	?							
Barkley Sound, Dec. 6 (A)	----	6	61	17	3	----	----	----	8	47	41	7	13	82	----	95
Barkley Sound, Dec. 6 (B)	----	2	52	10	4	----	----	----	12	46	33	1	9	71	----	80
Effingham Inlet, Dec. 6 (A)	----	4	63	16	5	----	----	----	12	52	48	----	1	99	----	100
Effingham Inlet, Dec. 6 (B)	----	11	64	17	3	----	----	----	5	48	52	----	1	99	----	100
Effingham Inlet, Dec. 6 (C)	----	7	73	16	1	----	----	----	3	48	52	----	7	93	----	100
Effingham Inlet, Dec. 6 (D)	----	2	67	22	5	1	----	----	3	50	50	----	1	99	----	100
Effingham Inlet, Dec. 6 (E)	1	14	59	21	4	1	----	----	----	55	44	1	5	95	----	100
Effingham Inlet, Dec. 6 (F)	----	6	68	21	2	----	----	----	3	56	44	----	6	94	----	100
Effingham Inlet, Dec. 6 (G)	1	7	54	29	8	1	----	----	----	49	50	1	1	99	----	100
Davids Channel, Dec. 7	----	6	70	18	2	----	----	----	4	46	54	----	4	96	----	100
Mayne Bay, Dec. 7	----	12	62	19	7	----	----	----	----	52	47	1	8	92	----	100
Effingham Inlet, Dec.7 (A)	----	2	65	20	7	1	----	----	5	55	45	----	1	99	----	100
Effingham Inlet, Dec. 7 (B)	----	5	74	15	3	----	----	----	3	49	51	----	3	97	----	100
Sechart Channel, Dec. 7 (A)	----	2	86	10	2	----	----	----	----	61	39	----	1	99	----	100
Sechart Channel, Dec. 7 (B)	----	2	53	25	11	5	----	----	4	47	53	----	2	98	----	100
Mayne Bay, Dec. 8	----	13	64	16	3	1	----	----	3	42	58	----	7	93	----	100
Effingham Inlet, Dec. 11 (A)	----	5	53	30	7	1	1	----	3	42	58	----	2	98	----	100
Effingham Inlet, Dec. 11 (B)	----	1	55	34	7	----	1	----	2	48	52	----	1	99	----	100
Effingham Inlet, Dec. 12 (A)	----	7	60	19	8	----	----	1	5	46	54	----	2	98	----	100
Effingham Inlet, Dec. 12 (B)	----	7	66	16	6	2	----	----	3	41	59	----	3	97	----	100
Effingham Inlet, Dec.13	----	3	59	24	7	----	----	----	7	43	57	----	2	98	----	100
Uchucklesit Inlet, Jan. 5	----	10	73	10	5	----	1	----	1	40	60	----	8	92	----	100
Area 24—Commercial Catches																
Sydney Inlet, Nov. 24	----	1	53	13	2	----	----	----	11	33	47	----	3	77	----	80
Sydney Inlet, Nov. 27	----	4	45	12	2	----	----	----	7	37	32	1	9	61	----	70
Area 25—Commercial Catches																
Espinosa Inlet, Jan. 6 (A)	----	3	69	18	4	1	----	----	5	36	64	----	3	97	----	100
Espinosa Inlet, Jan. 6 (B)	----	1	62	25	7	1	----	----	4	52	48	----	----	100	----	100
Queen Cove, Jan. 10 (A)	----	5	72	16	4	2	----	----	1	55	45	----	1	99	----	100
Queen Cove, Jan. 10 (B)	----	2	76	10	5	----	----	----	7	53	47	----	2	98	----	100
Area 26—Commercial Catches																
Kyuquot Sound, Jan. 9	----	3	66	20	4	3	----	1	3	40	60	----	2	98	----	100
Kyuquot Sound, Jan. 10	----	4	89	2	2	1	----	----	2	55	45	----	4	96	----	100
Ououkinsh Inlet, Jan. 11 (A)	----	6	80	4	2	----	----	----	5	42	54	1	3	94	----	97
Ououkinsh Inlet, Jan. 11 (B)	----	5	81	12	----	1	----	----	1	52	48	----	1	99	----	100
Ououkinsh Inlet, Jan. 12	----	1	67	23	3	2	1	----	3	49	51	----	1	99	----	100

Ououkinsh Inlet, Jan. 13	----	4	71	12	7	2	----	----	4	42	58	----	1	99	----	100
Ououkinsh Inlet, Jan. 19 (A)	----	12	75	8	1	1	----	----	3	58	42	----	3	97	----	100
Ououkinsh Inlet, Jan. 19 (B)	----	5	67	13	2	2	----	----	11	43	57	----	4	96	----	100
Ououkinsh Inlet, Jan. 19 (C)	----	5	73	9	6	2	1	----	4	52	48	----	3	97	----	100
Ououkinsh Inlet, Jan. 20	----	3	63	8	3	4	----	----	19	33	66	1	1	99	----	100
Area 23—Spawning Runs																
Toquart Bay, Mar. 6	----	3	79	9	2	----	1	----	6	60	40	----	----	98	2	100
St. Ines Island, Mar. 7 (A)	----	13	60	17	4	1	----	----	5	35	65	----	----	63	37	100
St. Ines Island, Mar. 7 (B)	----	4	68	21	2	----	----	----	5	59	40	1	1	65	34	100
Toquart Bay, Mar. 13	----	2	72	18	4	----	----	----	4	48	52	----	----	47	53	100
Area 24—Spawning Runs																
Cypress Bay, Mar. 9	----	6	64	19	5	3	----	----	3	66	33	1	1	53	46	100
Area 25—Spawning Runs																
Kendrick Inlet, Mar. 15	----	9	72	13	----	2	----	----	4	48	52	----	----	94	6	100
Nootka Harbour, Mar. 17	----	10	69	10	4	1	2	----	4	61	39	----	----	67	33	100
Queen Cove, Mar. 19	----	9	70	11	4	4	----	----	2	58	42	----	----	93	7	100
Port Eliza, Mar. 24	----	42	50	5	1	----	----	----	2	65	35	----	----	77	23	100
Area 26—Spawning Runs																
Rugged Point, Mar. 14	----	7	71	14	4	----	----	----	4	59	40	1	1	33	66	100
Ououkinsh Inlet, Mar. 26	----	5	63	16	7	2	1	1	5	30	70	----	----	87	13	100
Area 27—Spawning Runs																
Winter Harbour, Mar. 21	----	2	53	13	22	3	----	----	7	63	37	----	----	25	75	100

Table X.—Number of Fish (in Millions) of Each Age in West Coast Catches of 1949–50; Numbers of Fish in Total Weighted to Numbers of Fish Caught in Each Area

Area	In Year of Age								Total
	I	II	III	IV	V	VI	VII	VIII	
23	0.13	12.31	182.04	58.48	14.92	1.93	0.60	0.18	270.59
24	.....	0.46	8.83	2.26	0.36	.....	.....	.....	11.91
25	.....	1.01	25.87	6.38	1.86	0.36	.....	.....	35.48
26	.....	1.11	16.93	2.56	0.72	0.40	0.05	0.02	21.79
Totals	0.13	14.89	233.67	69.68	17.86	2.69	0.65	0.20	339.77

Table XI.—Average Percentage Age Composition of Samples from Commercial Catches and from Spawning Runs during the 1949–50 Season

COMMERCIAL CATCHES

Area	Number of Samples	In Year of Age							
		I	II	III	IV	V	VI	VII	VIII
23	65	0.05	4.55	67.28	21.61	5.51	0.71	0.22	0.07
24	2	.....	3.90	74.12	18.94	3.04	.....	.....	.....
25	4	.....	2.85	72.92	17.98	5.23	1.03	.....	.....
26	10	.....	5.08	77.71	11.75	3.30	1.86	0.21	0.10
All	....	0.04	4.38	68.77	20.51	5.25	0.79	0.19	0.06
SPAWNING RUNS									
23	4	.....	5.79	73.44	17.08	3.16	0.26	0.26	.....
24	1	.....	6.19	65.98	19.59	5.15	3.09	.....	.....
25	4	.....	17.96	67.33	10.07	2.32	1.80	0.52	.....
26	2	.....	6.28	70.14	15.71	5.77	1.06	0.52	0.52
27	1	.....	2.15	56.99	13.98	23.66	3.22	.....	.....
All	....	.....	9.66	68.86	14.47	5.19	1.39	0.35	0.09

Table XII.—Average Sex Ratio (Females/Males) and Stage of Development for Samples of Commercial Catches and Spawning Runs during 1949–50 Season

COMMERCIAL CATCHES

Area	Sex Ratio	Percentage		
		Immature	Mature, Unspent	Mature, Spent
23	0.98	3.1	96.9	.....
24	1.13	8.0	92.0	.....
25	1.04	2.2	97.8	.....
26	1.14	2.3	97.7	.....
All	1.00	3.1	96.9	.....
SPAWNING RUNS				
23	0.98	....	68.2	31.8
24	0.50	....	53.0	47.0
25	0.72	....	82.8	17.2
26	1.24	....	60.0	40.0
27	0.59	....	25.0	75.0
All	0.84	....	66.8	33.2

Table XIII.—Average Length (Millimetres) and Average Weight (Grams) for Each Age in Samples from Commercial Catches, with Numbers of Fish on Which Averages Are Based Indicated in Parentheses.

AVERAGE LENGTH

In Year of Age	Area 23	Area 24	Area 25	Area 26	All Areas
I	(3) 91.7	.....	.....	.....	(3) 91.7
II	(276) 164.1	(5) 164.2	(11) 165.3	(48) 165.4	(340) 164.3
III	(4,053) 189.6	(98) 190.1	(279) 188.7	(732) 191.2	(5,162) 189.8
IV	(1,298) 202.0	(25) 204.7	(69) 202.2	(111) 203.6	(1,503) 202.2
V	(331) 211.8	(4) 212.2	(20) 211.6	(30) 216.4	(385) 212.2
VI	(44) 219.0	.....	(4) 216.5	(18) 223.7	(66) 220.1
VII	(13) 219.2	.....	.....	(2) 232.0	(15) 220.9
VIII	(4) 229.2	.....	.....	(1) 232.0	(5) 229.8
?	(310) 197.7	(18) 192.2	(17) 199.0	(55) 201.3	(400) 198.0

AVERAGE WEIGHT

In Year of Age	Area 23	Area 24	Area 25	Area 26	All Areas
I	(3) 9.7	.....	.....	.....	(3) 9.7
II	(276) 56.5	(5) 55.4	(11) 55.4	(48) 53.1	(340) 56.0
III	(4,053) 94.1	(98) 93.5	(279) 90.9	(732) 91.8	(5,162) 93.6
IV	(1,298) 116.6	(25) 121.7	(69) 114.8	(111) 115.6	(1,503) 116.6
V	(331) 137.0	(4) 134.8	(20) 135.2	(30) 137.6	(385) 136.9
VI	(44) 150.9	.....	(4) 147.0	(18) 154.1	(66) 151.6
VII	(13) 162.2	.....	.....	(2) 179.0	(15) 164.5
VIII	(4) 179.8	.....	.....	(1) 176.0	(5) 179.0
?	(310) 108.0	(18) 99.9	(17) 114.8	(55) 110.2	(400) 108.3

Table XIV.—Average Length (Millimetres) in Samples from Spawning Runs, with Numbers of Fish on Which Averages Are Based Indicated in Parentheses

In Year of Age	Area 23	Area 24	Area 25	Area 26	Area 27	All Areas
II	(22) 164.6	(6) 162.8	(70) 164.4	(12) 163.9	(2) 173.0	(112) 164.4
III	(279) 187.4	(64) 185.2	(261) 188.2	(134) 188.4	(53) 189.9	(791) 187.8
IV	(65) 198.0	(19) 197.7	(39) 202.2	(30) 199.5	(13) 204.4	(166) 199.7
V	(12) 205.8	(5) 208.4	(9) 209.2	(11) 211.6	(22) 207.7	(59) 208.4
VI	(1) 209.0	(3) 220.0	(7) 218.7	(2) 223.0	(3) 212.7	(16) 217.8
VII	(1) 216.0	.....	(2) 236.5	(1) 234.0	.....	(4) 230.8
VIII	.....	.....	.....	(1) 236.0	.....	(1) 236.0
?	(20) 190.9	(3) 183.0	(12) 189.8	(9) 197.1	(7) 194.6	(51) 191.8

Table XV.—List of Spawnings Which Occurred on the West Coast of Vancouver Island in 1950, Including Intensity and Extent of Each

VL=Very Light. L=Light. M=Medium. H=Heavy. VH=Very Heavy.

Approximate Date	Location of Grounds	Intensity	Statutory Miles of Spawn
	Area 23—Barkley Sound Vicinity		
Jan. 21	Maggie River to Cabbage Rock	L	1.02
Jan. 21	Toquart River to Toquart Village	L	0.91
Feb. 17	Banfield Inlet	VL	0.71
Feb. 27 (?)	Maggie River to Cabbage Rock	L	0.68
Feb. 27 (?)	Maggie River to Toquart River	L–M	1.08
Mar. 1	Grappler Creek	VL	0.40
Mar. 4	Useless Inlet	L	1.42
Mar. 5, 6	Maggie River to Cabbage Rock	L–M	1.62*
Mar. 6, 7	Stopper Islands	M–H	1.27*
Mar. 7, 8	Snowden Island	M	0.69*
Mar. 11–13	Toquart Bay	M	1.22*
Mar. 15 (?)	Shears Island and adjacent shore	M	0.31
Mar. 27 (?)	Mayne Bay	L	0.24*
Mar. 27 (?)	Maggie River	L	0.58*
Mar. 31	Sunshine Bay	M	1.14
Apr. 3 (?)	Nettle Island	M	0.13*
			13.42
	Area 24—Clayoquot Sound Vicinity		
Mar. 8 (?)	Cypress Bay	L–M	0.91*
Mar. 12 (?)	Sydney Inlet, Flores Island shore	M	0.64*
Mar. 12 (?)	Little Whitepine Cove	L–M	1.76*
Mar. 15 (?)	Ross Passage	M–H	0.84*
			4.15
	Area 25—Nootka Sound Vicinity		
Feb. 5–8	Port Langford	L	0.07
Feb. 27, 28	Nuchatlitz Village vicinity	M	11.93*
Mar. 6–8	Entrance, Port Langford	H	0.17
Mar. 8	Rosa Harbour	M–H	0.84*
Mar. 13	Nootka cannery to Marvinas Bay	H	2.19
Mar. 15	Strange Island	M	0.46
Mar. 17	Graveyard Bay	H	0.11*
Mar. 18	Kendrick Inlet	L–M	0.28*
Mar. 28	Ewin Inlet	M	0.11*
Apr. 1	Pantoja Island	VH	0.33
Apr. 1	Owas-sit-sa Creek	M	0.98
Apr. 9	Double Island	M	0.17
Apr. 9	False Channel	H	0.51
			18.15
	Area 26—Kyuquot Sound Vicinity		
Feb. 19	Malksope Inlet, head	M–H	0.11
Mar. 6	Nasparti Inlet, head	VH	0.47*
Mar. 7, 8	Clanninick Cove	M–H	0.39
Mar. 16	Union Island	L	0.07
Mar. 16	Rugged Point	L–M	0.97*
Mar. 21–23	Union Island	M–H	0.45*
Mar. 23	Amai Inlet, head	M	0.03
Mar. 26, 27	Ououkinsh Inlet	M–H	0.46*
Mar. 27, 28	Malksope Inlet	M	0.28*
			3.23
	Area 27—Quatsino Sound Vicinity		
Feb. 25	Klaskish Inlet	M	0.46
Feb. 27	Klaskino Inlet	H	0.85
Feb. 28	Greenwood Point	H	0.51
Feb. 28	Hazard Point	M	0.17
Feb. 28	Winter Harbour, west side	M	0.28
Mar. 15 (?)	Winter Harbour vicinity	L	1.36*
Mar. 19	Matthews Island	H	0.20
Mar. 27	Greenwood Point	M	0.40
Mar. 27	Winter Harbour, west side	M	0.17
Apr. 29	Winter Harbour, west side	L	0.11
			4.51

* Spawning-grounds which were inspected by scientific investigators.

Table XVI.—Tags Inserted during 1950 Spawning Season

Code Letters	Tagging Code	Area	Place	Date	Number
TKKT	14D	14B	Departure Bay	Feb. 22, 1950	517
TLLT	14D	14B	Departure Bay	Feb. 22, 1950	505
TMMT	14D	14B	Departure Bay	Feb. 22, 1950	505
ULLU	14D	14B	Departure Bay	Feb. 22, 1950	503
UMMU	14E	14B	Departure Bay	Feb. 27, 1950	495
UNNU	14E	14B	Departure Bay	Feb. 27, 1950	506
UPPU	14E	14B	Departure Bay	Feb. 27, 1950	514
USSU	14E	14B	Departure Bay	Feb. 27, 1950	503
WDDW	14I	23	Snowden Island	Mar. 6, 1950	500
WEEW	14I	23	Snowden Island	Mar. 6, 1950	505
WHHW	14I	23	Snowden Island	Mar. 6, 1950	505
WIIW	14I	23	Snowden Island	Mar. 6, 1950	506
WJJW	14K	23	St. Ines Island	Mar. 7, 1950	504
WKKW	14K	23	St. Ines Island	Mar. 7, 1950	509
WLLW	14K	23	St. Ines Island	Mar. 7, 1950	495
WMMW	14K	23	St. Ines Island	Mar. 7, 1950	504
WNNW	14L	23	Toquart Bay	Mar. 12, 13, 1950	510
WOOW	14L	23	Toquart Bay	Mar. 12, 13, 1950	495
WPPW	14L	23	Toquart Bay	Mar. 12, 13, 1950	511
WSSW	14L	23	Toquart Bay	Mar. 12, 13, 1950	478
WTTW	14P	25	Nootka cannery	Mar. 15, 1950	505
WUUW	14R	25	Kendrick Inlet	Mar. 16, 1950	505
WXXW	14R	25	Kendrick Inlet	Mar. 16, 1950	499
WYYW	14R	25	Kendrick Inlet	Mar. 16, 1950	504
WZZW	14R	25	Kendrick Inlet	Mar. 16, 1950	507
XEEX	14Q	25	Nootka cannery	Mar. 17, 1950	507
XHHX	14Q	25	Nootka cannery	Mar. 17, 1950	511
XIIX	14Q	25	Nootka cannery	Mar. 17, 1950	493
XJJX	14T	25	Queen Cove	Mar. 20, 1950	502
XKKX	14T	25	Queen Cove	Mar. 20, 1950	497
XLLX	14T	25	Queen Cove	Mar. 20, 1950	500
XMMX	14T	25	Queen Cove	Mar. 20, 1950	523
XNNX	14T	25	Queen Cove	Mar. 20, 1950	521
XOOX	14U	25	Port Eliza	Mar. 24, 1950	516
XPPX	14U	25	Port Eliza	Mar. 24, 1950	481
XSSX	14U	25	Port Eliza	Mar. 24, 1950	486
XTTX	14U	25	Port Eliza	Mar. 24, 1950	503
XUUX	14U	25	Port Eliza	Mar. 24, 1950	504
XWWX	14W	26	Ououkinsh Inlet	Mar. 26, 1950	491
XYYX	14W	26	Ououkinsh Inlet	Mar. 26, 1950	500
XZZX	14W	26	Ououkinsh Inlet	Mar. 26, 1950	496
YAAY	14W	26	Ououkinsh Inlet	Mar. 26, 1950	502
YBBY	14W	26	Ououkinsh Inlet	Mar. 26, 1950	502
YCCY	14AA	6	Parsons Anchorage	Mar. 30, 1950	506
YDDY	14AA	6	Parsons Anchorage	Mar. 30, 1950	502
YEEY	14AA	6	Parsons Anchorage	Mar. 30, 1950	500
YHHY	14AA	6	Parsons Anchorage	Mar. 30, 1950	532
YIIY	14AA	6	Parsons Anchorage	Mar. 30, 1950	501
YJJY	14AA	6	Parsons Anchorage	Mar. 30, 1950	520
YKKY	14BB	6	Thistle Pass	Mar. 31, 1950	501
YLLY	14BB	6	Thistle Pass	Mar. 31, 1950	503
YMMY	14BB	6	Thistle Pass	Mar. 31, 1950	504
YNNY	14BB	6	Thistle Pass	Mar. 31, 1950	504
YOOY	14BB	6	Thistle Pass	Mar. 31, 1950	500
YPPY	14CC	5	Willis Bay	Apr. 4, 1950	503
YSSY	14CC	5	Willis Bay	Apr. 4, 1950	514
YTTY	14CC	5	Willis Bay	Apr. 4, 1950	507
YUUY	14CC	5	Willis Bay	Apr. 4, 1950	512
YWWY	14CC	5	Willis Bay	Apr. 4, 1950	512
YXXY	14DD	6	Wilby Point	Apr. 7, 1950	502
YZZY	14DD	6	Wilby Point	Apr. 7, 1950	503
ZJJZ	14B	15	Ragged Island	Mar. 10, 1950	509
ZKKZ	14B	15	Ragged Island	Mar. 10, 1950	502
ZLLZ	14B	15	Ragged Island	Mar. 11, 1950	508
ZMMZ	14B	15	Ragged Island	Mar. 11, 1950	508
ZNNZ	14C	15	Ragged Island	Mar. 15, 1950	497
ZOOZ	14C	15	Ragged Island	Mar. 15, 1950	509
ZPPZ	14C	15	Ragged Island	Mar. 15, 1950	504
ZSSZ	14C	15	Ragged Island	Mar. 15, 1950	509
ZTTZ	14F	14B	Newcastle Island	Mar. 20, 1950	503
ZUUZ	14F	14B	Newcastle Island	Mar. 20, 1950	507
ZWWZ	14F	14B	Newcastle Island	Mar. 21, 1950	526
ZXXZ	14F	14B	Newcastle Island	Mar. 21, 1950	506
ZYYZ	14G	17	Kulleet Bay	Mar. 21, 1950	516
ABAB	14G	17	Kulleet Bay	Mar. 21, 1950	548
ACAC	14H	17	Dunsmuir Island	Mar. 22, 1950	502

Table XVI.—Tags Inserted during 1950 Spawning Season—Continued

Code Letters	Tagging Code	Area	Place	Date	Number
ADAD	14H	17	Dunsmuir Island	Mar. 22, 1950	506
AEAE	14H	17	Dunsmuir Island	Mar. 24, 1950	504
AHAH	14H	17	Dunsmuir Island	Mar. 24, 1950	506
AIAI	14A	14A	Lambert Channel	Mar. 27, 1950	506
AJAJ	14A	14A	Lambert Channel	Mar. 27, 1950	519
AKAK	14A	14A	Lambert Channel	Mar. 28, 1950	497
ALAL	14A	14A	Lambert Channel	Mar. 28, 1950	497
AMAM	14M	23	St. Ines Island	Mar. 7, 1950	507
ANAN	14M	23	St. Ines Island	Mar. 7, 1950	504
AOAO	14M	23	St. Ines Island	Mar. 7, 1950	494
APAP	14M	23	St. Ines Island	Mar. 7, 1950	498
ASAS	14N	24	Cypress Bay	Mar. 9, 1950	501
ATAT	14N	24	Cypress Bay	Mar. 9, 1950	502
AUAU	14N	24	Cypress Bay	Mar. 9, 1950	501
AWAW	14N	24	Cypress Bay	Mar. 9, 1950	507
AXAX	14V	26	Rugged Point	Mar. 14, 1950	504
AYAY	14V	26	Rugged Point	Mar. 14, 1950	499
AZAZ	14V	26	Rugged Point	Mar. 14, 1950	502
BABA	14V	26	Rugged Point	Mar. 14, 1950	514
BCBC	14X	27	Winter Harbour	Mar. 21, 1950	509
BDBD	14S	25	Kendrick Inlet	Mar. 18, 1950	506
BEBE	14X	27	Winter Harbour	Mar. 21, 1950	494
BHBH	14S	25	Kendrick Inlet	Mar. 18, 1950	511
BIBI	14X	27	Winter Harbour	Mar. 22, 1950	505
BJBJ	14X	27	Winter Harbour	Mar. 22, 1950	521
BKBK	14EE	10	Takush Harbour	Mar. 25, 1950	512
BLBL	14EE	10	Takush Harbour	Mar. 25, 1950	500
BMBM	14HH	7	Kildidt Channel	Mar. 27, 1950	400
BNBN	14HH	7	Kildidt Channel	Mar. 27, 1950	437
BOBO	14HH	7	Kildidt Channel	Mar. 27, 1950	513
BPBP	14HH	7	Kildidt Channel	Mar. 27, 1950	512
BSBS	14KK	7	Sabiston Island	Apr. 5, 1950	506
BTBT	14HH	7	Kildidt Channel	Mar. 27, 1950	500
BUBU	14KK	7	Sabiston Island	Apr. 5, 1950	502
BWBW	14KK	7	Sabiston Island	Apr. 5, 1950	513
BXBX	14KK	7	Sabiston Island	Apr. 5, 1950	521
			Total		56,435

INVESTIGATION AT SEAL ISLAND, 1949

By D. B. Quayle, Ph.D.

The studies in the productivity of the experimental clam area at Seal Island, near Comox, B.C., have been carried on since 1942 by the Pacific Biological Station at Nanaimo, under the direction of Mr. Ferris Neave. Results have been reported by him annually since 1942. Responsibility for this work was transferred to the Provincial Department of Fisheries in 1948, and the controlled digging at Seal Island in 1949 was under its supervision.

Digging was opened on January 11th, 1949, and the catch was acquired by the British Columbia Packers, Limited, whose co-operation is sincerely appreciated. It required seventeen nights to obtain 82 tons (the catch-limit had previously been set at 100 tons annually), after which the company withdrew its buying facilities. Closure of the beach was not applied until much later, but no further digging occurred.

In spite of what was regarded as fine weather conditions for digging, the catch per man-tide was only 220.5 pounds, which was the lowest since 1942, when the initial controlled digging was instituted. The production and digging effort for the period of investigation is shown in the following table:—

Year	Man-tides	Man-hours	Catch	Average Catch per Man-tide	Average Catch per Man-hour
			Lb.	Lb.	Lb.
1942	393	1,586	235,757	599.89	148.64
1943	394	1,588	236,825	601.08	149.09
1944	264	1,160	209,211	792.57	180.38
1945	484	2,108	207,160	435.60	98.26
1946	442	1,918	196,072	443.60	102.23
1947	529	2,789	186,035	351.67	66.70
1948	813	3,313	196,287	241.44	59.25
1949	740	3,330	163,170	220.50	49.00

Analysis of the length and age distribution of clams on the beach and in the catch indicates that the fishery is still dependent on the 1934 and 1935 year-classes which initiated the fishery in 1942. Younger year-classes are very poorly represented, and only 7 per cent of the population is under the minimum legal size limit of 2½ inches. Of these, the 1946, 1947, and 1948 year-classes have the greatest strength, constituting 70 per cent of those clams under legal size. These three year-classes taken together would be insufficient, however, to form the nucleus of a population large enough to support an extensive fishery.

The weight of the present remaining stock, estimated to be approximately 100 tons, is probably lower than what it was when the area was closed in 1939, although then the bulk of the clams were undersized, whereas now they are practically all well above legal size and of advanced age. While occasional patches of dead or dying clams are found, it appears that natural mortality is still not excessive.

In order to make full use of this stock, the beach will be again opened for digging in 1950. It will be opened from the period February 15th to June 1st, with no extraordinary limitations.

REPORT OF THE BIOLOGIST, 1949

By D. B. Quayle, Ph.D.

This was the first full year of operation of the Biological Section of the Provincial Department of Fisheries, and, as such, the bulk of the time was taken up with organization and the collection of equipment.

THE LABORATORY

The shell-fish laboratory at Ladysmith was completed on July 1st, 1949. It is a five-roomed frame building, 28 by 32 feet, consisting of two laboratories, a workshop, an aquarium room, and a darkroom. The laboratories are equipped with hot and cold running water. Salt water for the aquarium is provided by a 500-gallon storage-tank with an automatic electric pump, which takes water from the harbour in front of the laboratory from a depth of 4 feet at low water.

The laboratory is equipped with the standard apparatus required for marine biological studies. The floating equipment consists of a 14-foot inboard motor-boat and several standard-type floats used for shell-fish culture. A larger vessel, 35 to 40 feet, is required and anticipated for the near future.

BIOLOGICAL INVESTIGATIONS

Biological investigations were, of necessity, limited in number and scope.

1. A study of the seasonal growth of the Pacific oyster was begun, and this investigation will take at least one year to complete. The object is to determine when Pacific oysters should be moved or the seed broken in order to interfere least with the natural rhythm of growth. The investigation will also add to the fund of knowledge of the biology of this oyster.

2. Studies on the breeding and larval habits of the Pacific oyster were made. Forecasts on the possibility and time of " sets " were made in order to assist oyster-growers to take full advantage of such spatfalls and to increase their supply of seed oysters. One such spatfall was forecast in Ladysmith Harbour during the summer of 1949, and growers there obtained an excellent " catch " of seed. This service will be increased, in time, to cover all oyster-growing areas in the Province.

OYSTER-CULTURE

Fifty cases of Pacific oyster seed were obtained from Japan and planted on Lot 164, Ladysmith Harbour, which is the experimental oyster area set aside for the use of this laboratory by courtesy of the Department of Lands. The object here is to obtain information on the productivity of the broken and unbroken oyster seed planted at various densities at various tidal levels, and treated in several different ways in respect to breaking clusters. This investigation will require at least four years.

Attempts are being made to collect native oyster seed, with the object of determining whether this species may be grown successfully from an economic (and biological) point of view as an adjunct to the culture of the larger Pacific oyster. Also, the stocks of this indigenous species are seriously depleted and the establishment of a breeding stock in Ladysmith Harbour would be of use and value.

In order to keep oyster-growers informed on recent developments in oyster culture and biology, bulletins are issued by the laboratory at intervals which give résumés and digests of work being done here and abroad. During the summer period the bulletins are principally concerned with reports on oyster breeding in the various areas, with indications of the possibility of spatfalls.

Each year approximately 5,000 cases of oyster seed—which are the equivalent of 50,000,000 seed oysters—are imported into British Columbia from Japan. In order to reduce or prevent the chance of oyster pests being introduced with the seed, it is inspected at the time of arrival at the American port. In this connection the Provincial Department of Fisheries works closely with the biologists of the Washington State Department of Fisheries.

An important function of the shell-fish laboratory is to provide a general advisory service to the oyster-growing industry, and, whenever it is possible, periodic visits are made to all oyster-growers in the Province, at which time their problems are discussed. In addition, a considerable amount of advice is given by correspondence to persons already in the oyster business and to those contemplating entering it.

Assistance was given to the officers of the Provincial Department of Health and Welfare in formulating regulations for the sanitary control of the shell-fish industry and in introducing and applying the regulations to the industry. These regulations were made effective in October, 1949, and have proved a great success both with the consumer and the producer. The introduction of the regulations was a much needed and important step in the organization and stabilization of the oyster industry in the Province. From the sanitation point of view, British Columbia oysters are now on a par with the best produced anywhere.

CLAMS

Razor-clams

Investigations into the life-history and abundance of the razor-clam on the Queen Charlotte Islands was begun by the Pacific Biological Station at Nanaimo, and is being continued by this laboratory. Analyses of the commercial catches are being made by studying size and age composition of the clams and the catch per unit of effort, which is a measure of relative abundance. Life-history studies are particularly difficult to carry on in this case because of the distance and isolation of the razor-clam beaches.

Hard-shell Clams

The investigations on the butter and little-neck clams were also begun at the Pacific Biological Station, and these are being continued at this laboratory. Until a larger vessel is obtained, the work here must be confined essentially to a partial analysis of age and size composition of the commercial catch and of the catch per unit of effort.

In 1949 the experimental area at Seal Island was dug by commercial diggers under the supervision of the biologist.

In the light of newer knowledge, fishery regulations governing the taking of clams were reviewed and altered somewhat. Much more information is required before completely adequate regulations may be formulated.

GENERAL

There was participation in the work of several committees on fishery and marine biological problems and a number of lectures were given to various organizations.

Two shipments of spores of the kelp *Macrocystis integrifolia* were made to the Scottish Seaweed Research Association for experimental purposes.

ACKNOWLEDGMENTS

Sincere appreciation is hereby expressed for the assistance and co-operation given by the Dominion Department of Fisheries, the Pacific Biological Station at Nanaimo, the Pacific Oceanographic Group at Nanaimo, the Provincial Department of Lands and Forests, the Provincial Department of Health and Welfare, and the shell-fish industry of British Columbia.

REPORT OF INTERNATIONAL FISHERIES COMMISSION, 1949

The International Fisheries Commission continued the regulation of the Pacific halibut-fishery, under authority of the treaty of January 29, 1937. It also continued the statistical and biological observations of the changes in the fishery and in the stocks of halibut, which are essential to rational regulation.

Members of the Commission during most of 1949 were as follows: Stewart Bates, Deputy Minister of Fisheries, Ottawa, and George W. Nickerson, Prince Rupert, for Canada; Edward W. Allen, Seattle, Wash., and Milton C. James, Assistant Director of the Fish and Wildlife Service, Washington, D.C., for the United States. Mr. Nickerson served as chairman, Mr. James as secretary. In September, Stewart Bates resigned and George R. Clark, western director of the Department of Fisheries, Ottawa, was appointed by the Governor-General to succeed Mr. Bates.

Meetings of the Commission were held at Seattle Wash., on January 11th, 12th, and 13th, and at Juneau, Alaska, on October 1st. The Seattle meetings were the regular annual meetings at which the Commission reviewed current results of regulations and investigations, and adopted regulatory changes and approved the investigational programme for the ensuing season. At the Juneau meeting, proposals of the fishermen and dealers for modification of the regulations in the 1950 season were considered.

Close contact was maintained with all branches of the halibut industry by means of conferences with the fleets and wholesale dealers and through public hearings.

On January 12th the Commission met with the Halibut Conference Board, composed of representatives from the fishermen's and vessel-owners' organizations in the major halibut ports. The representatives were informed about the current condition of the stocks of halibut and, in turn, presented proposals regarding the regulation of the fishery in 1950.

One proposal was that the fishing season in each area be split into a number of successive open and closed periods, to overcome some of the adverse biological and economic effects of the short, intense fishing season. This proposal, which appeared to have merit and to be practicable under the Commission's treaty authority, was referred to the fleets and other interested parties in the various ports for further consideration. It was found that some sections of the fleets considered that the application of such a split season would be economically disastrous to them. The Commission deferred decision in the matter until public hearings could be held.

Public hearings were held at Seattle, Vancouver, Prince Rupert, Ketchikan, Petersburg, and Juneau on September 23rd, 26th, 28th, 29th, 30th, and October 1st, respectively. They were well attended by halibut-fishermen, vessel-owners, and wholesale dealers.

Vessel-owners, fishermen, and most dealers agreed to the biological and economic need for spreading the catch over a longer season, but gave little support to the split-season proposal, involving alternate short open periods and longer closed periods. Preference was expressed for a programme of control, involving the application of between-trip tie-up to the vessels individually, which would provide a continuous supply of halibut. Considerable preference was also expressed for supplementing the current early fishing season with a short open period in late summer to permit fishing on stocks which became available later in the year and were not being reached by the fishery.

Subsequent to the hearings, the Commission was advised by the United States Government that, in its considered opinion, the present treaty authorized only one open period in an area during one year and would not authorize the application of between-trip tie-ups to fishing-vessels individually during the fishing season. These opinions precluded the adoption of such regulatory measures under the present treaty.

The Pacific Halibut Fishery Regulations for 1949 were approved by the Governor-General in Council on April 26th and by the President of the United States on April 28th

and became effective on the latter date. They were essentially the same as those for 1948. The section pertaining to the use of bait nets by vessels with halibut-fishing licences was revised to indicate that the character of bait nets and their use must conform to the laws of the country where the nets were used.

Under the regulations, all areas were opened to halibut-fishing on May 1st. Areas 2 and 1B, lying between Cape Blanco in Southern Oregon and Cape Spencer in South-eastern Alaska, were closed at midnight June 3rd upon attainment of the Area 2 catch-limit of 25,500,000 pounds. Areas 3, 4, and 1A, including the remainder of the convention waters, were closed at midnight July 12th, with the attainment of the Area 3 catch-limit of 28,000,000 pounds. Small landings of halibut continued to midnight November 15, under provisions which permitted set-line boats to secure permits to retain and land a proportion of incidentally caught halibut.

Landings of halibut reported on the Pacific Coast in 1949 amounted to 55,380,000 pounds, approximately the same as in 1948. The landings from the different areas were as follows: Area 1A, south of Cape Blanco in Oregon, 194,000 pounds; Area 1B, between Cape Blanco and Willapa Harbour in Washington, 243,000 pounds; Area 2, between Willapa Harbour and Cape Spencer in Alaska, 26,316,000 pounds; Area 3, between Cape Spencer and the Aleutian Islands, 28,627,000 pounds. Included in the Area 2 total were 926,000 pounds of incidentally caught halibut, landed under permit after closure of the area. No halibut were landed from Area 4, in Bering Sea.

Landings by Canadian vessels in 1949 amounted to 18,666,000 pounds—13,531,000 from Area 2 and 5,135,000 from Area 3. They constituted 51 and 18 per cent of the catches from Areas 2 and 3 respectively. Landings of United States vessels at Canadian ports amounted to 4,205,000 pounds.

Investigations which guide the regulation of the fishery were continued by the Commission's staff. Statistical and biological data were collected and analysed to determine the current condition of the stocks of halibut. Gear experiments were conducted. Special studies of the origin of catches were undertaken and new marking experiments were initiated to ascertain the extent to which the stocks on the different banks were being utilized.

The abundance of halibut, as indicated by the catch per standard unit of fishing effort, did not change significantly from 1948 to 1949 in Area 2 and was 167 per cent above the 1930 level. It was 5 per cent below the 1948 level in Area 3, due to a decline in the western part of that area, but was approximately 125 per cent above the level of 1930, when allowances were made for changes in the season, in the distribution of fishing, and in the character of the fleets fishing.

Observations of the changes occurring in the size and age composition of the stocks were continued. They were expanded, by sampling the landings at Prince Rupert as well as at Seattle, to include additional grounds in Area 2 and grounds in Area 3.

Analysis of Area 2 materials showed that the numbers of young halibut entering the fishery were well below average for the second consecutive year. The comparative scarcity of young fish of marketable size precluded any early increase in the size of the marketable stock, such as would be required to justify any immediate increase in the annual catch.

In the absence of sampling in Area 3 during the war and post-war period from 1943 to 1948, inclusive, comparisons could be made there only with 1942 and earlier years. These showed that the number and weight of medium and large halibut available to the fishery had increased about 150 per cent from 1933 to 1949. Conclusions regarding changes in the number of young entering that fishery must await special studies of changes in the fishermen's rejection of small fish.

A direct comparison of the catches taken by vessels using conventional halibut gear and by vessels using modified set-line gear, which carries small hooks and is hauled by drum, was made by fishing operations on a small chartered vessel. The catches taken

with the drum-type gear did not differ significantly from those taken with the standard halibut gear.

A programme of new marking experiments was initiated to ascertain the extent to which the stocks on different banks in Area 3 and Area 2 were being utilized with the present short season. The halibut vessel "Eagle" was chartered and operated for this purpose from mid-July to mid-September. During two trips to Area 3 a total of 2,762 halibut were caught and 1,272 were tagged on Portlock and Albatross Banks near Kodiak Island. During a short trip to northern Hecate Strait at the end of the charter, 1,239 were tagged out of a total catch of 3,839 halibut.

Tags recovered during 1949 from experiments started between the north end of Vancouver Island and Dixon Entrance in 1946 and 1947 followed the same pattern as recoveries in 1948. The percentage of tags recovered, relatively high from May and June experiments and relatively low from July and August experiments, indicated that a part of the stock on the fishing-grounds in July and August was not on the fishing-grounds in May and June and consequently was not available to the fishery.

An explanation of the above phenomenon was found in the results of a marking experiment on the spawning-ground at the south end of the Queen Charlotte Islands in December, 1939, and January, 1940, at a time when the fishing season in Area 2 extended from April to September. Analysis of recoveries according to size of fish and season of recovery gave the following results. Halibut under 10 pounds, few of which were mature, were equally available to the fishery from May to August, inclusive. Those between 10 and 20 pounds, some of which were mature, were slightly more available in July and August than in May and June. Halibut over 20 pounds, many of which were mature, were more than twice as available in July and August than in May and June. It was apparent that most of the mature fish did not return from the spawning-grounds to the summer fishing-grounds until late summer.

These results were supported by the statements of experienced fishermen, that larger-sized halibut were caught during July and August than during May and June in the Hecate Strait region.

A detailed study was made of the changes in the amount of halibut caught in different years in subsections of Area 2. It was found that the catches from the 1931–35 period to 1948 had increased 41 per cent, 60 per cent, and 71 per cent on the grounds off the north end of Vancouver Island, in middle and northern Hecate Strait, and inside South-eastern Alaska respectively. During the same period the catches from the grounds in southern Hecate Strait and off the coast of South-eastern Alaska had decreased 48 per cent and 25 per cent respectively. The reduction in catch from the latter grounds could only be attributed to the shortening of the fishing season and the consequent closure of those areas before their normal season of best fishing, July and August. On the basis of the general improvement in the Area 2 stock, it appeared that a potential catch of at least 4,500,000 pounds was being lost on these grounds annually.

The Commission's marking experiments and investigations indicated that the current short fishing season, resulting from the great increase in the abundance of halibut and a twofold increase in the size of the fleet, was not permitting the full and uniform utilization of the halibut stocks on the grounds in Area 2. They gave added force to the Commission's request of 1946 for broader authority, which would enable it to spread fishing over a longer season.

REPORT ON INVESTIGATIONS OF THE INTERNATIONAL PACIFIC SALMON FISHERIES COMMISSION FOR 1949

In 1949 Canada and the United States continued their joint effort to increase the yield of sockeye salmon from the Fraser River watershed and as nearly as practical to divide the allowable catch equally between the two countries.

The Commission met seven times during the year. Recommendations for the management of the fishery in convention waters for the 1949 season were considered by the Commission at meetings held in Bellingham, Wash., and Vancouver, B.C. Recommendations for regulations were adopted on January 23rd, 1949, in compliance with Articles IV and V of the treaty, and were transmitted to the Departments of Fisheries for Canada and the State of Washington. They were accepted for Canadian treaty waters by an Order in Council adopted on June 2nd, 1949, and for United States treaty waters by order of the Director of the Washington State Department of Fisheries promulgated May 11th, 1949.

The official 1949 sockeye-fishing season in United States treaty waters started July 19th and continued to August 20th, inclusive, with a forty-eight-hour weekly closed period for gill-net gear and a sixty-hour weekly closed period for all other types of gear. Because of price negotiations, actual fishing did not commence until July 25th. Beginning August 20th, the week-end closed period for all gear was thirty-six hours, as established by the Washington Director of Fisheries. An 8-inch minimum net size for gill-nets was in effect during the period June 1st and July 19th.

In Canadian treaty waters, Areas 19, 20, and 21 in District 3 were opened on July 19th, with a weekly closed period of seventy-two hours until the end of the season.

In District 1 the sockeye season opened on July 25th, with a seventy-two-hour weekly closed period in effect until the official end of the sockeye season on August 20th. During the period of July 1st to July 19th in Areas 19, 20, and 21, and from July 1st to July 25th in District 1, the 8-inch minimum net size for gill-nets was in effect. During this period it was unlawful to fish for, possess, sell, or purchase sockeye salmon.

United States catches by August 2nd exceeded the total Canadian catch by over 100,000 sockeye. The trend at that time because of increased units of gear indicated that the Canadian catch at the end of the season could not equal that of the United States. Consequently, the Commission added one day's restriction on United States fishermen, effective August 4th, and reduced the following week-end closed season in Canada by one day, effective August 5th. Practical division of the season's take of sockeye between Canada and the United States was obtained by this simple adjustment without interference with the catch of pink salmon, and no further modifications of the regulations were required.

A total of 2,078,916 fish was taken in treaty waters from the 1949 sockeye run, of which 1,058,117 were landed by the United States fishermen and 1,020,799 by the Canadian fishermen. The total catch in 1949 shows an increase of 392,800 sockeye over the brood-year catch in 1945.

The sockeye runs of 1949 were watched with particular interest because they included the first returning progeny of fish using Hells Gate fishways. It was already known that the block to ascending adults had been removed by the completion of the fishways in 1945, but the effect of its removal upon the survival of up-river races could not be ascertained until a return from unblocked fish occurred. The Commission's expectations were realized when the 1945 escapement to all spawning districts above Hells Gate, except the one to Chilko, produced at a very high rate.

The Stuart Lake escapement, including both the early and late runs, was the largest recorded since 1913. A total of 712,000 was present on the spawning-grounds during the 1949 season, fourteen times that of the 1945 cycle, which was 50,000. Individual spawning-streams had as many as twenty-five-fold increases.

The early escapement to the Stellako system, numbering 26,562, was very encouraging, while the late run increased from 20,800 in 1945 to 104,800 this season. The early runs to Bowron and the South Thompson showed substantial increases, with Bowron having 22,300 spawners as compared to 4,100 in 1945. The South Thompson early run had 11,800 in 1949. The number of spawners in the Quesnel district increased fourfold over the brood-year escapement of 3,000 to 12,300. This second continuous increase to the Quesnel district in spite of an intense fishery indicates that this area is once again capable of producing a large run of sockeye.

The number of adult spawners at the outlet of Chilko Lake declined considerably for the second time in this cycle. The Chilko race of sockeye has developed until it and the Adams River race have become the backbone of the sockeye-producing areas of the Upper Fraser River. In the early days both the Adams and Chilko systems, as they approached larger production, tended to develop one year of high productivity out of four. This dominant year of productivity appears to be fully developed in the Shuswap area, and the large run to Chilko last year (1948) with a lesser run this year is apparently following this historic pattern. There is no indication of any reduction in the total productivity of the Chilko area, but it does appear probable that the 1948 cycle is emerging as the dominant one and that in the exceedingly valuable portion of the Fraser region, production appears to be approaching a stage of stability.

The Adams River run on this cycle consists predominantly of three-year-old precocious males (jacks) preceding the normally dominant 1950 cycle. A total of 21,300 spawners, including jacks and adults, was present in the Adams-Little River area this season.

While the normal adult escapement above Hells Gate showed considerable increase in all areas except Chilko, the total escapement to the lower river areas declined. The Birkenhead was down approximately 6,000 from the brood-year to 74,000 in 1949. The Harrison River race, which had about 16,000 spawners in the brood-year, produced about 3,500 spawners this year. Cultus Lake had 9,300, Weaver Creek 12,500, and Big Silver Creek 2,100 sockeye in 1949, which were all equal to cycle escapement in 1945. Pitt River had 9,500 spawners, which are predominantly five-year fish. No escapement records are available for the brood-year for this area.

The scientific investigations and regulations of the Commission are directed primarily to the rehabilitation and perpetuation of the Fraser River sockeye. Fishing regulation can in part bring about the rehabilitation of the existing Fraser River races. However, where a race has been exterminated in a once-productive area, rehabilitation cannot be accomplished by regulation. Artificial measures appear necessary.

Construction of the Quesnel field station was nearly completed, and the first group of eggs was taken for rearing in the hatchery. Two experiments were started, the results of which will not appear for four years. In the first, which is a control test of artificial methods used, 302,000 native Horsefly River sockeye eggs were taken and fertilized. They will be hatched, reared, and marked by fin excision and released back into their parent river system. Successful return of these fish would indicate that fish return to their native stream when artificially propagated and released.

As a step toward rehabilitation, eggs were secured from the Seymour River, placed in the Quesnel field station, hatched and reared, to be later released in the Upper Adams River. The Upper Adams River, a once-productive area, is now entirely devoid of spawning sockeye. Its present lack of fish is attributed to a combination of the obstruction at Hells Gate and the splash dam on the Lower Adams River. Two requirements are now recognized to be necessary for a successful transplant. Water temperatures at spawning-time should be the same in both the parent and adopted stream, and the distance of migration from salt water to the spawning-grounds should be approximately the same for the donor and receiver streams. The Seymour River race was thought to be a suitable donor race, since it met these requirements.

With the advent of man's modern industrial developments in the Fraser River, new hazards are continually jeopardizing the security of the sockeye salmon. The species has over the centuries become adapted to certain environmental conditions. Interference by man may bring about changes in conditions which may be of such a nature that they are beyond the tolerance of the species. It is quite apparent that in order to evaluate the effect of any change in the environmental conditions, it is necessary to obtain measures of the optimum natural environment. The Nechako district is at present being considered by the Aluminum Company of Canada as a potential source of power. Surveys are now being conducted by the company for a dam which will divert the flow of water from the Nechako River to the coast. While the Upper Nechako system does not support spawning sockeye, studies are now being conducted by the Commission, engineering and biological staff to evaluate the effect of the diversion which will lower the flow of the Nechako River in that area now used by sockeye migrating to the Stuart and Fraser-Francois Lake systems. The distribution of spawning adults and changing water-levels during the incubation period of the resultant spawn is being recorded for the Chilko and Adams Rivers.

Records collected by the Commission in 1949 and previous years indicate that a close relationship exists between water temperatures on the spawning-beds and time of arrival at the spawning-beds. Early arrivals on the grounds often die unspawned when temperatures are too high. The effect of low temperatures on the survival of eggs at different stages of development is now being studied experimentally at the University of Washington and in the field. Arrangments are also being made to expand this work to the University of British Columbia.

If maximum productivity of a race depends on an adequate utilization of the optimum spawning temperature, care must be exercised to guarantee that sufficient numbers of fish reach the spawning-beds when temperatures are at an optimum level. The fishery itself may be instrumental in changing the time of arrival on the spawning beds and may, by so doing, influence the productivity of the race. Only by a thorough understanding of the environmental requirements of the sockeye races can the effects of the industrial expansion and any selectivity of the commercial fishery be evaluated.

During the summer, district biologists made surveys of Beaver Lake, at the headwaters of Salmon River near Prince George; Pinchi Lake in the Stuart system; Tatla, Tsuniah, and Taseko Lakes in the Chilcotin system; Mabel Lake in the South Thompson district; and Chilliwack Lake in the Vedder River area to determine their potential as sockeye-producers. A survey of the Blackwater River and its system of numerous small lakes was started and will be completed in 1950.

All tagging at Hells Gate has been discontinued since the fishways have been thoroughly checked as to their efficiency. A report on this study is being prepared for early publication. Dip-netting was continued this year, according to an established procedure, in an effort to determine the relationship of catch per hour to the daily escapement past this point. The effect of any regulatory restriction to increase escapement is readily observable in the catch figures at Hells Gate, but the amount of error in calculating the actual number of fish passing up-stream cannot be determined until more than one year's data is available.

The damage caused by the flood conditions of 1948 has been reported upon. The repair work has, except for one item, been completed. The fishways were cleaned of all extraordinary debris deposited during the flood period. A new bridge was constructed, with width and capacity to permit the transportation of mobile equipment to the fishways of either bank. At the close of 1949 preparatory work was started on the placement of a retaining-wall which will complete the bank repairs on the east bank and will permit the future construction of high-level fishways without disturbing the embankment. The fishway decks were submerged under 22 feet of water on May 16th this year, correspond-

ing to a gauge elevation of 75 feet. While the river this year produced a better-than-average flood crest, it did not approach the discharge of 1948, when on May 31st a gauge level of 108 feet was recorded, submerging the fishways under 55 feet of water. The fishway remained in operation throughout all periods of the sockeye runs.

The Bridge River Rapids fishways were cleaned of extraordinary debris caused by the flood of 1948 and remained in operation during the sockeye runs throughout their designed operation levels.

The fifth and final fishway at Farwell Canyon has been completed and is ready for operation in the spring of 1950. The four fishways previously constructed operated throughout the time of passage of sockeye runs through this difficult reach of the Chilcotin River.

Membership of the Commission during 1949 is a follows:—

Canadian Commissioners: A. J. Whitmore, secretary; Senator Thomas Reid, member; Olof Hanson, member.

United States Commissioners: Milo Moore, chairman (resigned); Edward W. Allen, chairman; Albert M. Day, member; Alvin Anderson, member.

SALMON-SPAWNING REPORT, BRITISH COLUMBIA, 1949

By A. J. Whitmore, Chief Supervisor of Fisheries

GENERAL SUMMARY

Sockeye.—Of outstanding importance in relation to the sockeye-fisheries of British Columbia is the splendid escapement of sockeye salmon during 1949 to the upper areas (Chilko excepted) of the Fraser watershed. This was the return from the first runs to pass through the Hells Gate fishways completed in 1945 by the International Pacific Salmon Fisheries Commission. Although not of the same magnitude, but of no less significance, was the return of 11,000 sockeye in the Horsefly River and 400 sockeye to Mitchell River in the Quesnel system, once the greatest sockeye-producer of the Fraser River, but to which during the past thirty years the sockeye runs have been practically non-existent. The rehabilitation measures of the Commission, as indicated by 1949 spawning-ground returns, are meeting with marked success.

To the Skeena watershed the escapement of sockeye from the moderate run which passed through the commercial area may be regarded as equitable. The escapement to the Babine area, the principal spawning-ground of the system, was large, and satisfactory supplies ascended the Bulkley River. Medium to heavy runs were present in such sections as Bear Lake, Kispiox, Kitwanga, and Kitsumgallum, while spawning was only fair at Lakelse.

Sockeye-supplies to the spawning areas of Rivers Inlet were satisfactory as to volume, but the fish individually were small. Moderate supplies spawned in the Smith Inlet, Nass, and Bella Coola systems; whereas on Vancouver Island, in the Nimpkish, Alberni, and Kennedy Lake systems, the supplies of sockeye were much greater than for many years.

Springs.—The escapement of springs to the Fraser watershed was satisfactory, particularly in the Prince George and Kamloops areas. Moderate supplies were present on practically all the spawning areas of District No. 2, with the exception of the Nass, where spawning was light. It is a source of some gratification that several of the more important streams along the east coast of Vancouver Island carried improved stocks, including Cowichan, Puntledge (Comox system), Big Qualicum River, Salmon River, and the Nimpkish River.

Cohoes.—Generally, supplies of this variety appeared to be satisfactory. There was a moderate seeding of practically all streams along the northern coast. Spawning was fairly good in the Vancouver Island and adjacent Mainland streams, with the exception of Quathiaski, Pender Harbour, and the Nanaimo-Ladysmith sections, where it was disappointingly light. In the Fraser River area the escapement was average, with increases recorded at Mission-Harrison and Chilliwack sections. Squamish River received a better-than-average seeding.

Pinks.—Pink-supplies on the spawning-grounds in District No. 2 were satisfactory generally and above the brood-year level—heavy to the Nass, Lower Skeena, and Bella Coola areas, moderate but also in excess of the brood-year in the Butedale and Bella Bella areas, and light at Grenville-Principe area. As it was the "off" year for this variety in the Queen Charlotte Islands, comparatively few were present. In District No. 3 spawning in the Mainland streams of the Alert Bay sub-district was generally good; with an "off" year for Vancouver Island streams, the usual small runs were present, but in numbers somewhat better than those of the brood-year. With few exceptions, supplies in the Quathiaski area were fairly light. Stocks at Jervis Inlet, although about average, were below those of 1947, when an abnormally large escapement occurred. Main streams in the Comox area received a fairly heavy seeding; elsewhere in District No. 3 supplies were light.

A decline in the escapement to the Fraser spawning-grounds is again recorded. It will be recalled that the escapement in the brood-year 1947 was of lesser abundance than in the parent year of 1945. In 1949 the escapement is estimated as being from 30 to 50 per cent below that of 1947, notwithstanding the application of special restrictive measures on the Fraser commercial fishery. The observation made in the 1947 Salmon-spawning Report in this respect, as follows, continues to be apt: "This condition (lesser escapement) unquestionably reflected the unusually heavy toll claimed by commercial operations en route and raises speculation as to whether the time has not yet arrived to consider bringing pinks under the International control now provided for sockeye by the Fraser Treaty, if adequate protection for the maintenance of this highly valuable run is to be assured."

Squamish and Indian rivers were heavily seeded with pinks.

Chums.—In District No. 2 moderate supplies only were found in the principal areas such as Butedale, Bella Bella, and Bella Coola. Supplies to the streams of the lower east coast of Moresby Island, with few exceptions, were light to medium, and to Skidegate Inlet and Narrows medium to heavy, while on the west coast of the Queen Charlottes, with the exception of good supplies at Port Chanal Harbour and Peel Inlet, were generally light. At Naden Harbour spawning was fairly heavy; light in Masset Inlet. In District No. 3, at the Alert Bay area, stocks were good in the larger producing streams, with the exception of the Vancouver Island streams along Johnstone Strait, as well as Seymour and Belize Inlet streams, where the spawning was light. Stocks were fairly satisfactory but below brood-year levels in the Quathiaski sub-district, and below normal in the Comox area. Escapement was good in streams in the Pender Harbour area, fair in the Nanaimo-Ladysmith section, better than average in the Cowichan area, and satisfactory in the Victoria sub-district. On the west coast of Vancouver Island, where net fishing was not permitted after September 1st to allow total escapement of all varieties, the supplies were heavy in the main streams in the Barkley Sound and Nootka areas, moderately heavy in Kyuquot area, and, with few exceptions, satisfactory in the Quatsino section.

The chum escapement to the Fraser, particularly the early run, was the best in some years. Squamish and Indian Rivers were satisfactorily seeded.

Damage by Flash Floods

Tributaries of the Lower Fraser and other streams of the Lower Mainland and along the east coast of Vancouver Island experienced severe storms and heavy precipitation on two occasions in the latter part of November and early part of December, 1949. In the resultant flash floods the spawning areas of many of the streams suffered damage, in some cases unquestionably of severe proportions. Heavy loss of salmon-eggs which had been deposited in this area, particularly of the pink and chum varieties, undoubtedly occurred.

IN DETAIL

Masset Inlet and North Coast of Graham Island Area

The cohoe spawning was light in all streams. This being the "off" year, there were no pinks present in either Masset Inlet or Naden Harbour. A fairly good escapement of chums occurred to Naden River, while supplies on the grounds in Masset were light.

Skidegate Inlet and West Coast of Graham-Moresby Island Area

Light to medium cohoe-supplies were present, stocks in Tlell and Copper Rivers showing some increase over the brood-year. This being the "off" year, the pink seeding was generally light, and although there was some improvement in the small streams, there was a slight decrease in the number of spawners in Copper River. Chum-

supplies were medium in Skidegate Inlet and heavy in the streams of Skidegate Narrows. On the west coast, chum spawning was disappointing, all streams being lightly seeded, with the exception of those on Port Chanal and Peel Inlet, where stocks were adequate.

East Coast of Moresby Island and South Queen Charlotte Islands Area

There was a moderate to heavy seeding of cohoe, the main streams showing increase over the brood-year 1946. This being the " off " year for pinks, there was none of this variety present other than a very light supply in Mathers Creek, Big Goose Creek, and Little Goose Creek. In general the chum seeding was light to medium, the best spawning taking place in Lagoon Bay, Big and Little Goose Creeks, Dana Inlet, Lockeport and Scaat Harbour, Powrivco Bay and Baag Harbour, and Harriet Bay. Elsewhere supplies ranged from light to medium.

Nass Area

There was a medium escapement of sockeye to the Meziaden Lake area, the principal spawning-ground for this variety in the Nass system—about equal to 1944 but not quite as good as 1945. Spring-salmon stocks were light in all streams, with the exception of the Kitsault, where a heavy escapement occurred. At time of inspection, cohoe-supplies were generally light, but new fish were continuing to arrive on the grounds. There was a heavy seeding of pinks in all streams. Chums were present in moderate numbers, showing some increase over the brood-year.

Skeena

Babine-Morice Area.—Although sockeye were somewhat later than usual in appearing in the Babine Lake area, a heavy seeding was reported on most grounds. A total of 509,000 sockeye passed through the counting-fence maintained by the Fisheries Research Board. Escapement of this variety to the Morice River area is reported as fairly good and to the Bear Lake area medium to heavy. The spring-salmon seeding in the Babine area was from medium on some grounds to heavy on others, a total of 7,443 passing through the counting-fence during this season. The escapement of this species to the Morice Lake and Bear Lake areas was excellent. A total of 11,938 cohoes passed through the counting-fence in Babine River. In other streams in the area moderate supplies were present. The pink-salmon seeding was light in all streams over the area, and only 28,663 of this variety were counted passing through the fence in Babine River.

Lakelse Area.—Sockeye-supplies generally were only fair; light in the Lakelse and Allistair areas, medium to heavy in the Kitsumgallum and Kispiox systems. Spring-salmon stocks were average, the Kitsumgallum system receiving the heaviest seeding. Cohoe-supplies were good in all streams, particularly so in the Lakelse River. Pink stocks showed a notable increase over those of the brood-year, especially in the Lakelse, Kispiox, and Kitwanga Rivers. Moderate supplies of chums were present.

Lower Skeena Area

Medium supplies of sockeye in the Shawatlans River compared unfavourably with the heavy seeding reported in the brood-year 1945. Stocks of this variety were normal on the limited grounds of the Ecstall system. A medium spring-salmon spawning occurred. Cohoe-supplies were light. There was an exceedingly heavy escapement of pinks to practically all streams over the area, showing a notable increase over the brood-year. Chum stocks were average.

Grenville-Principe Area

The escapement of sockeye were generally favourable, a medium to heavy seeding occurring in the major streams, Minktrap Bay, Bare Bay, Quinstonsta, Union Pass,

Cridge Inlet, and Gale Bay; medium supplies were present in Endhill Bay, Mikado, Sheneeza, and Curtis Inlet streams, while light supplies were found in Lewis Creek, Bonilla Arm, Deer Lake, and Lowe Inlet streams. Cohoe-supplies were satisfactory. With the exception of Deer Point Creek, Gale Bay, Bare Bay, and Endhill Bay creek not normally supporting pink salmon and Kumelean Creek, which were heavily seeded with pinks, the spawning of this variety over the area was disappointingly light. Moderate supplies of chums were present.

Butedale Area

A light to medium escapement of sockeye occurred from the moderate run of this variety. Compared with the brood-year, larger rivers such as the Kitlope and Kitkiata showed slight decreases, as did all the smaller rivers on Aristazabel Island, as well as Qua Qua and Talamosa. Although cohoe-supplies were moderate, there was an increase over the brood-year, with the exception of streams in Laredo Inlet. There was a medium escapement of pink salmon, showing an increase over most of the area compared with the brood-year, with the exception of Laredo Inlet, which was a failure. Spawning in Douglas Channel and vicinity, Poison Cove, and Matheson Channel was good, and in Kainet River the seeding was exceptionally heavy. Generally the escapement of chums from the medium run of this variety which occurred through the commercial area was slightly down from the brood-year, with the exception of Laredo Inlet, which was practically a failure.

Bella Bella Area

There was a medium spawning of sockeye on the limited spawning-grounds in this area, showing some decrease from the brood-year. The moderate seeding of cohoe was much heavier than the light seeding reported in 1946. Generally the escapement of pinks to all but the smaller streams was heavy, the run to Koeye River being exceptionally heavy. While the larger streams in the area were well seeded with chum salmon, there was light spawning in the smaller streams; generally the light to moderate spawning of this variety was much below brood-year levels.

Bella Coola Area

Sockeye-supplies were heavy in the Bella Coola-Atnarko system, medium in the Kimsquit watershed, and light on the limited grounds of the Dean River. There were moderate supplies of spring salmon present in the Bella Coola, Atnarko, and Kimsquit Rivers, while light supplies only reached the Dean River. Generally the seeding of cohoe was medium in all streams. Pinks-supplies were heavy, particularly so in the Bella Coola and Kwatna Rivers, where there was an exceptional increase over the brood-year spawnings. Bella Coola River and Cascade Inlet were heavily seeded with chums; elsewhere stocks were moderate.

Rivers Inlet Area

There was a satisfactory escapement of sockeye to the Owekano Lake system, heavier than that of the brood-year, the Waukwash, Genessee, Quap, and Dallec Rivers being especially well stocked. The Asklum River was the only point in this system that was below par. The size of the individual fish, however, was below average, and very few large or five-year-old fish were observed. Spring-salmon supplies were normal. Moderate supplies of cohoe were present. The pink-salmon seeding on the limited grounds in this area was light. The escapement of chum salmon to Moses Inlet and the late run to the head of Rivers Inlet were very good, but the seeding in Draney Inlet was light.

Smith Inlet Area

The salmon-spawning grounds of Smith Inlet were inspected twice during the sockeye-spawning period. Both spawning areas—namely, the Geluck and Delebah

Rivers—received medium seedings. The sockeye observed generally were small in size. Cohoe stocks were average. Escapement of pinks to the Nekite River was good. Chum-salmon supplies were moderate on all spawning-grounds, with the exception of Takush River, which was well seeded.

Alert Bay Area

The run of sockeye to Nimpkish River was the heaviest since 1935, all grounds being satisfactorily seeded. Supplies in Keogh River, Knight Inlet, and McKenzie River were better than the brood-year, while areas such as Kakweiken River, Fulmore River, Quatse River, Shushartie River, and Nahwittie River had average seeding. Spring-salmon supplies were satisfactory, particularly so in the Nimpkish River system. The escapement of cohoe was heavier than in the brood-year and far in excess of last year. Very satisfactory numbers of pinks reached the spawning-grounds in the Mainland portion of the sub-district, particularly heavy seeding occurring in the Kakweiken and Ahnuhate Rivers and in Lull Creek. It being the "off" year for this variety in Vancouver Island streams, the light runs in this area were expected. Chum stocks were very similar to those of the brood-year. The spawning in some of the better producing streams, such as Keogh River, Wakeman River, and Viner River, was heavy, while in the streams of Vancouver Island flowing into Johnstone Strait the seeding was light. The spawning-grounds throughout Seymour and Belize Inlets were lightly seeded, with the exception of Quicella Creek, where heavy spawning took place.

Quathiaski Area

Sockeye stocks were good in Hayden Bay creek and light in Phillips River. Spring-salmon spawning in Campbell River, Salmon River, and the Bute Inlet streams was good; elsewhere stocks were light. Cohoe-supplies were light and below expectation in all streams. Good supplies of pinks were present in Apple River and Frazer Creek in Loughborough Inlet, Orford River, Phillips River, and Quatum River in Ramsay Arm, while in the other streams supplies were light and about equal to those of the brood-year. With the exception of the streams flowing into Loughborough Inlet, there was a fairly satisfactory showing of chum salmon, although somewhat less in numbers than in the brood-year.

Comox Area

The escapement of springs to the Puntledge River was very satisfactory and the best in many years. Between 200 and 250 springs were present in Big Qualicum River for the first time in a number of years. In general the spawning of cohoes was good and above average. The pink-salmon spawning was heavy in the Tsolum and Oyster Rivers, the main spawning-ground of this variety, and medium in the Puntledge River and very light elsewhere, the over-all escapement being lighter than in 1948 but about equal to that of the brood-year of 1947. Chum-supplies were lighter than during the brood and intervening years. Spawning was good in Puntledge, Tsable, Little Qualicum, and Big Qualicum Rivers, also in Cook and Cougar Creeks, light in Rosewall Creek, Waterloo Creek, and Tsolum River, and average elsewhere.

Pender Harbour Area

A total of 3,931 sockeye entered Saginaw Lake, which compares fairly well with the escapement of recent years. Sockeye-supplies in Tazoonie River at Narrows Arm were satisfactory. The spawning of spring salmon was normal, there being a good escapement to Toba River and a fair run to Jervis Inlet and Narrows Arm. Cohoe-supplies were light and disappointing in almost all streams in the area. Pink-salmon stocks in the spawning-streams of Jervis Inlet and adjacent waters were considerably lighter than during the brood-year, when the over-all run was abnormally heavy. In the streams in the Toba portion of the area the seeding of this variety was satisfactory.

A good escapement of chums occurred to all the large rivers and most of the smaller ones, and generally the escapement compared favourably with the brood-year.

Nanaimo-Ladysmith Area

Spring-salmon supplies in the Nanaimo River were light—somewhat less than during any of the previous four years. Only light supplies of cohoe were present. Approximately 800 pinks were found on the spawning-grounds of the Nanaimo River, where in previous years the average has been less than 200. This is the only stream in which pink salmon were observed. The seeding of chums was somewhat lighter than during the brood-year, good supplies being present in Englishman River, Nanaimo River, and many others.

Cowichan Area

The spawning of spring salmon in the Cowichan River was better than that of 1948 or 1945, approximately 8,500 spawners being present over the watershed. The cohoe spawning was also heavier than last year or the brood-year 1946, the total run to the Cowichan River being estimated at 53,000 fish. Chum-supplies were very good in comparison with average years, and the local officer estimates that a total of 150,000 spawners were present.

Victoria Area

Cohoe-supplies were average. Chum-supplies were satisfactory, their being a heavy spawning in Goldstream.

Alberni-Nitinat Area

The escapement of sockeye to the Somass River system, in the opinion of the local officer, was the best on record. It is estimated that approximately 100,000 parent sockeye entered Great Central Lake and that from 80,000 to 90,000 reached Sproat Lake. Very satisfactory numbers of this variety reached the spawning-grounds of Anderson Lake, about 15,000 to 20,000, while approximately 5,000 sockeye were present on the spawning-grounds at Hobarton Lake. Satisfactory numbers of spring salmon also ascended the Somass, Nahmint, Sarita, and Nitinat Rivers. Fair supplies of cohoes were present, somewhat lighter than the brood-year. Light stocks were particularly noticeable in the San Juan, Nitinat, and Somass River systems. The number counted (partial count only) over Stamp Falls fishway was 10,776, practically the same as the number in similar counting in the brood-year 1946. Fair stocks of chums were present in all the streams throughout the area, while in a few of the main rivers spawning was heavy.

Clayoquot Area

Good supplies of sockeye spawned in the Kennedy Lake system. The spring-salmon spawning was generally satisfactory, particularly so in the Megin, Moyeha, and Cypress Rivers. Generally the escapement of cohoe was lighter than the brood-year; fair supplies, however, spawned in the Upper Megin River, Lemmens Inlet, and South Bay streams. Chum salmon were present in fair numbers in all the streams throughout the area, while in a few of the main streams spawning was heavy, the over-all seeding being about equal to that of the brood-year.

Nootka Area

Spring-salmon supplies on the limited spawning-grounds in this area were normal. Cohoe seeding was slightly greater than the spawning in 1946, an increase in numbers being particularly noticeable in the Burman, Camp Bay, Sou End, Inner Basin, and Big Zeballos Rivers. There was a fairly heavy escapement of chums to many of the streams in this area, the over-all spawning being much in excess of that of 1945.

Kyuquot Area

The escapement of spring salmon was equal to that of last year and the previous several years, the seeding in Tahsish River being very good. The cohoe spawning was disappointingly light—only slightly better than 50 per cent of that of the brood-year. There is no run of pink salmon of importance to this area. This variety, however, was seen in small numbers in some of the streams, with fair showings in Tahsish and Clannick Rivers. Generally moderate to heavy chum-supplies were present, with practically all the smaller streams being satisfactorily seeded, while supplies in several of the larger rivers, such as Artlich and Kaouk, were light.

Quatsino Area

There was some increase in the small runs of sockeye to this area. Approximately 10,000 fish ascended Mahatta River, and the escapement to Fisherman River was estimated at approximately 6,000. Canoe Creek had a spawning population of approximately 8,000 and Marble Creek about 1,500. The spring-salmon spawning in the main stream, Marble Creek, was satisfactory, although there was a slight decline from the previous year, and in the several other streams spawning was average. Cohoe-supplies were disappointing—quite good in the streams on the west coast but poor in all others, with the exception of Coal Harbour and Colony Creek, as well as Crawford's and Price's Creeks in Holberg Inlet, where there was a fair escapement. This was the " off " year for pinks and, as usual, very few were present. With the exception of Neroutsos Inlet, where in streams such as Cayuse, Jeune, and Teeta seeding was only fair, supplies of chums were generally satisfactory and much better than during the brood-year.

Fraser River

Prince George Area.—There was a tremendous increase in the number of sockeye reaching this area compared with the previous two cycles. An estimated 700,000 sockeye ascended the Stuart Lake system, compared with 50,000 in 1945 and 12,000 in 1941. The early run, comprised of some 570,000 fish, spawned in the streams tributary to Middle River and Takla Lake, while the late run of about 130,000 spawned in Middle River and Tachie River. Approximately 125,000 spawners were present in the Fraser-Francois system, the early run spawning in various streams flowing into Fraser and Francois Lakes, and the late or main run of about 100,000 in the Stellako River and to some extent around the shores of Francois Lake. The fish arrived in good condition. The spring-salmon seeding in the Upper Fraser River area was the best for some years; also in the Upper Nechako River more than 2,000 spring salmon were counted and a further 1,000 spawned in Stuart River.

Quesnel-Chilko Area.—An estimated 60,000 sockeye reached the Chilko spawning area a decrease of approximately 140,000 from the brood-year 1945. The run was fairly well distributed over the usual spawning-grounds in the Chilko River below the outlet of Chilko Lake. Biologists of the International Pacific Salmon Fisheries Commission do not believe this is indication of reduction of Chilko area productivity; rather, that 1948 cycle is emerging as the dominant year, with 1949 cycle as becoming less dominant. In the Quesnel system, sockeye-supplies were far larger than in any recent year, although still on a small scale in comparison with the large runs of thirty years ago. Approximately 11,000 reached the Horsefly River, and spawning occurred in the 3½-mile stretch of the stream-bed located between High Bank Island to well below Jones Crossing. Sexes appeared to be about equal. About 400 sockeye reached the Mitchell River, the head-water stream of the Quesnel system. A total of 22,300 sockeye ascended the Bowron system, compared with 4,050 in the brood-year 1945. Water-levels on the Upper Bowron remained at satisfactory stage throughout the fall season. The seeding of spring salmon over the sub-district was moderate, very similar to that occurring in the brood-year.

Kamloops Area.—The early run of sockeye was distributed between Raft River, tributary to the North Thompson River, and the streams tributary to Shuswap Lake. The number reaching these spawning-grounds was approximately 13,000—a considerable increase over the brood-year, when 3,500 were present. The late run of sockeye is mainly to the Adams River. Jacks formed by far the greater proportion of this run, there being approximately 15,000 present—a considerable decrease when compared with the 60,000 jacks reported in the brood-year 1945. There was a notable increase in spring-salmon supplies over the whole watershed, compared with the brood-year 1945. Approximately 6,000 were present in the Lower Shuswap River, tributary to Mara Lake. In Clearwater River, tributary to the North Thompson River, 5,000 to 6,000 spawned, whilst a heavy seeding estimated at 2,000 to 2,500 occurred in the North Thompson at the outlet of Finn Creek. Cohoe-supplies were average. This was the first time in a great many years that pink salmon reached this area, a total of about 500 spawning in the South Thompson and Nicola Rivers.

Lillooet Area.—A run of upwards of 95,000 sockeye spawned in the Birkenhead River, compared with 80,000 in the brood-year 1945. Jacks were again quite numerous, comprising about 15 per cent of the total run. Owing to changes in the river near Creekside, more than usual spawned farther up-stream. Stocks of this variety in the Seton-Anderson system were small, similar in number to those of the brood-year. As the spring-salmon runs to Tyaughton Creek and Ferguson Creek were blocked this year by the B.C. Electric dam at Bridge River, no spawning occurred in these streams. The Fish Culture Development Branch of this Department, in carrying out a salvage programme below the dam, secured 196,000 eggs from springs caught just below the dam. Of these, 48,000 were planted in Portage Creek and 148,000 in Gates Creek. A light run of spring salmon was present in the Yalakom River, flowing into Bridge River below the dam, and it is possible that a few stragglers from the blocked Tyaughton Creek spring-salmon run entered this stream to spawn. The cohoe spawning in the Birkenhead River in the Upper Lillooet was moderate. The spawning of pinks in this area was insignificant, other than a light run of this variety to Cayoosh Creek.

Yale-Lytton Area.—This area does not contain any major salmon-spawning grounds. Streams being of the mountainous variety, they have only short spawning areas near their confluences with the Fraser River. A light seeding of pink salmon occurred in Anderson, Nahatlatch, and Spuzzum Creeks. Cohoe-supplies consisted of approximately 400 individuals observed in Nahatlatch Creek.

Chilliwack Area.—The run of sockeye to Cultus Lake was light, totalling slightly over 9,000 spawners, compared with 9,300 in 1945. The usual small numbers of this variety were observed in the Chilliwack Lake area. There was a good run of cohoe to the Chilliwack-Vedder, while other streams in the area received a moderate seeding. Pink-supplies were considerably below brood-year levels. In the Coquihalla River the run was late in starting, and it was estimated to be in the vicinity of 12,000 fish. In the Upper Chilliwack River it is estimated 30,000 to 35,000 pinks spawned. In the smaller streams entering the Fraser in this area the runs were, on the whole, lighter than the brood-year. The greatest decrease in the runs was in the Vedder River below Vedder Crossing. In the previous two cycle-years, huge quantities of pinks spawned in this area, but during the past season it is estimated that the run was possibly only 50 per cent of the previous cycle. The chum seeding was average—only slightly better than the brood-year.

Mission-Harrison Area.—With the exception of Weaver Creek, where the run was about on a par with that of the brood-year, the sockeye seeding was light and below expectations. Moderate supplies of spring salmon were present. There were good supplies of cohoe in practically all streams frequented by this variety, a marked increase over the brood-year. Stocks of pinks were below brood-year levels. It is estimated that between 85,000 and 100,000 pinks spawned in this area, being considerably less than

the figure of 130,000 in the brood-year. The preponderance of this run spawned in the Chehalis and Harrison Rivers. Chum-supplies were below average but in most cases above brood-year levels. While the larger systems were sufficiently well seeded, spawning in the smaller streams was in most cases light.

Lower Fraser Area

The tributaries of Upper Pitt River were fairly well seeded with sockeye. There was a moderate seeding of spring salmon. Cohoe stocks were fairly light in all spawning areas. Pink salmon were later than usual in appearing on the spawning-grounds and disappointingly light in all streams, there being a decrease of over 50 per cent compared with the brood-year 1947. The seeding of chums was fair, showing some increase over the brood-year in all streams, with the exception of the South Alouette River.

North Vancouver Area

The cohoe escapement was good in all streams—about equal to that of the brood-year—with the exception of Indian River, where an increase was noted. There was an exceptionally heavy run of pinks to Indian River, where it is estimated that 100,000 of this species spawned in an area some 6 miles in length. Fair supplies of chums were present.

Squamish River Area

Spring-salmon supplies were satisfactory and the cohoe showing was better than average. There was an excellent escapement of pink salmon, all grounds being heavily seeded. It is estimated that from 200,000 to 300,000 pinks spawned in this system. Moderate spawning of chum salmon occurred in about the same intensity as that of the brood-year. Supplies totalling approximately 5,000 chums were present in the Cheakamus River, about 1,000 in the Mamquam River, and an estimated 40,000 in the Squamish River proper.

STATISTICAL TABLES

LICENCES ISSUED BY THE DEPARTMENT OF FISHERIES FOR THE 1949 SEASON

Kind of Licence	Number of Licences	Revenue
Salmon-cannery	24	$4,800.00
Herring-cannery	5	500.00
Pilchard-cannery	-----	----------
Herring-reduction	17	1,700.00
Pilchard-reduction	-----	----------
Tierced salmon	8	800.00
Fish cold-storage	20	2,000.00
Fish-processing	24	24.00
Shell-fish cannery	6	6.00
Tunafish-cannery	4	4.00
Fish-offal reduction	16	16.00
Fish-liver reduction	6	6.00
Whale-reduction	1	100.00
Herring dry-saltery	4	400.00
Processing aquatic plants	1	10.00
Harvesting aquatic plants	1	10.00
Fish-buyers'	518	12,950.00
Non-tidal fishing	319	325.00
Dogfish-reduction	1	1.00
	975	$23,652.00
General receipts	1	25.00
Total		$23,677.00

PACK OF BRITISH COLUMBIA SALMON, SEASON 1949, SHOWING THE ORIGIN OF SALMON CAUGHT IN EACH DISTRICT

District	Sockeye	Springs	Steelhead	Cohoe	Pinks	Chums	Total
Fraser River	96,159½	9,889	214½	10,286	66,626	6,763	189,938
Queen Charlotte Islands	----------	----------	----------	8,141½	1,550	24,852½	34,544
Nass River	9,268	174½	51	6,665	34,324	7,854	58,336½
Skeena River	65,937	2,507½	1,283½	21,333½	33,069½	4,896	129,027
Rivers Inlet	39,494½	743	239	5,978	11,937	11,819	70,210½
Smith Inlet	13,189	159	56	785	2,533	2,361	19,083
Central Area	16,140½	1,007	355	44,169	173,456	116,292½	351,420
Vancouver Island and adjacent Mainland	19,486½	6,361½	151½	98,958½	361,783½	51,629	538,370½
Alaska	146	342½	23	19,059½	24,708	1,255½	45,534½
Cold storage, 1948 catch	----------	----------	----------	568	----------	2,834	3,402
Totals	259,821	21,184	2,373½	215,944	709,987	230,556½	1,439,866

NOTE.—6,955½ cases of bluebacks are combined with cohoes in this table for Vancouver Island.

STATEMENT SHOWING THE TOTAL SALMON-PACK BY SPECIES FROM 1941 TO 1949, INCLUSIVE

	1949	1948	1947	1946	1945	1944	1943	1942	1941
Sockeye	259,821	261,230½	286,497	543,027	329,001½	247,714	164,889	666,570	455,298
Spring	21,184	16,445½	10,025	8,100½	12,801	19,362	10,658	24,744½	51,593
Chum	230,556½	511,404	486,615½	576,133½	350,188½	255,316½	363,347½	633,834	926,801
Pink	709,987	321,721½	600,787½	116,607½	825,513	389,692	530,189	270,622½	427,774
Cohoe	215,944	221,804	146,293	100,154½	218,886½	181,546½	186,043	211,138	430,513
Steelhead	2,373	5,663½	3,260½	4,115½	2,922	3,926½	3,095	4,649	3,454
Totals	1,439,866	1,338,271	1,533,478½	1,348,138½	1,739,312½	1,097,557½	1,258,221½	1,811,558	2,295,433

STATEMENT SHOWING THE TOTAL SALMON-PACK OF BRITISH COLUMBIA BY DISTRICTS

Total Packed by Districts in 1941 to 1949, Inclusive

	1949	*1948*	*1947*	*1946*	*1945*	*1944*	*1943*	*1942*	*1941*
Fraser River	189,938	104,485	171,302½	413,542	221,351½	130,883½	126,541½	549,617	431,299
Skeena River	129,027	193,435½	79,718	105,912½	221,471½	149,948½	133,589	152,418½	200,497
Rivers Inlet	70,210½	72,117	168,935½	123,304	135,412	59,391	79,697½	105,539	138,650
Smith Inlet	19,083	14,675	46,172	23,177	21,682	6,194½	21,942	23,777	32,109
Nass River	58,336½	38,538½	29,450	38,313	54,980½	61,096	52,333½	100,142½	71,330
Vancouver Island and adjacent Mainland	538,370½	317,572	552,940½	264,922	492,281½	193,459	347,710½	536,803½	985,835
Other districts	431,498½	567,314	456,639	378,968	592,133½	496,587	496,407	343,260½	398,152
Cold storage	3,402	30,134	28,321	----------	----------	----------	----------	----------	46,561
Grand totals	1,439,866	1,338,271	1,533,478½	1,348,138½	1,739,312½	1,097,557½	1,258,221½	1,811,558	2,295,433

TABLE SHOWING THE TOTAL SOCKEYE-PACK OF THE FRASER RIVER, ARRANGED IN ACCORDANCE WITH THE FOUR-YEAR CYCLE, 1895–1949

British Columbia	1895— 395,984	1896— 356,984	1897— 860,459	1898— 256,101
Washington	65,143	72,979	312,048	252,000
Total	461,127	429,963	1,172,507	508,101
British Columbia	1899— 480,485	1900— 229,800	1901— 928,669	1902— 293,477
Washington	499,646	228,704	1,105,096	339,556
Total	980,131	458,504	2,033,765	633,033
British Columbia	1903— 204,809	1904— 72,688	1905— 837,489	1906— 183,007
Washington	167,211	123,419	837,122	182,241
Total	372,020	196,107	1,674,611	365,248
British Columbia	1907— 59,815	1908— 74,574	1909— 585,435	1910— 150,432
Washington	96,974	170,951	1,097,904	248,014
Total	156,789	245,525	1,683,339	398,446
British Columbia	1911— 58,487	1912— 123,879	1913— 719,796	1914— 198,183
Washington	127,761	184,680	1,673,099	335,230
Total	186,248	308,559	2,392,895	533,413
British Columbia	1915— 91,130	1916— 32,146	1917— 148,164	1918— 19,697
Washington	64,584	84,637	411,538	50,723
Total	155,714	116,783	559,702	70,420
British Columbia	1919— 38,854	1920— 48,399	1921— 39,631	1922— 51,832
Washington	64,346	62,654	102,967	48,566
Total	103,200	111,053	142,598	100,398
British Columbia	1923— 31,655	1924— 39,743	1925— 35,385	1926— 85,689
Washington	47,402	69,369	112,023	44,673
Total	79,057	109,112	147,408	130,362
British Columbia	1927— 61,393	1928— 29,299	1929— 61,569	1930— 103,692
Washington	97,594	61,044	111,898	352,194
Total	158,987	90,343	173,467	455,886
British Columbia	1931— 40,947	1932— 65,769	1933— 52,465	1934— 139,238
Washington	87,211	81,188	*128,518	352,579
Total	128,158	146,957	180,983	491,817
British Columbia	1935— 62,822	1936— 184,854	1937— 100,272	1938— 186,794
Washington	54,677	59,505	60,259	*135,550
Total	117,499	244,359	160,531	322,344
British Columbia	1939— 54,296	1940— 99,009	1941— 171,290	1942—446,371
Washington	*43,512	*63,890	110,605	263,458
Total	97,808	162,899	281,895	709,829
British Columbia	1943— 31,974	1944— 88,515	1945— 79,977	1946— 341,957
Washington	*19,117	*37,509	*53,055	*268,561
Total	51,091	126,024	133,032	610,518
British Columbia	1947— 33,952	1948— 64,823½	1949— *96,159	
Washington	6,760	90,441	80,547	
Total	40,712	155,264½	176,706	

* These figures are based on reports submitted by Canadian canners.

STATEMENT SHOWING THE SALMON-PACK OF BRITISH COLUMBIA, BY DISTRICTS AND SPECIES

Fraser River, 1934 to 1949, Inclusive

	1949	1948	1947	1946	1945	1944	1943	1942
Sockeyes	96,159½	64,823½	33,952½	341,957	79,977	88,515	31,973½	446,371
Springs	9,889	2,955½	1,455	1,096½	6,130½	12,577½	3,505½	9,688
Chums	6,763	20,209	16,475½	60,713	27,610	13,803½	52,149	82,573
Pinks	66,626	31	113,136½	429	95,748½	130	29,860½	134
Cohoes	10,286	16,102	6,105	9,168½	11,615	15,564½	8,809	10,542
Steelheads	214½	364	178	178	270½	293	244	309
Totals	189,938	104,485	171,302½	413,542	221,351½	130,883½	126,541½	549,617

	1941	1940	1939	1938	1937	1936	1935	1934
Sockeyes	171,290	99,009	54,296	186,794	100,272	184,854	62,822	139,238
Springs	34,038	4,504	5,993	4,308	5,444	15,126	9,401	16,218
Chums	95,070	35,665	30,150	58,778	20,878	31,565	8,227	104,092
Pinks	102,388	12	95,176	63	94,010	.....	111,328	2,199
Cohoes	28,265	13,028	13,557	27,127	11,244	28,716	24,950	11,392
Steelheads	248	145	69	14	.....	.....	.....	.....
Totals	431,299	152,363	199,241	277,084	231,848	260,261	216,728	273,139

Skeena River, 1934 to 1949, Inclusive

	1949	1948	1947	1946	1945	1944	1943	1942
Sockeyes	65,937	101,267½	32,534	52,928	104,279½	68,197	28,268½	43,544
Springs	2,507½	4,018½	2,113	2,439	2,382	1,500½	1,783	6,374
Chums	4,896	11,863	8,236	11,161	9,264	8,741½	6,597	11,421
Pinks	33,069½	50,656	13,190½	10,737	69,783½	48,837	54,509	52,767
Cohoes	21,333½	22,086½	21,600½	26,281½	34,201½	20,191½	40,479½	44,081½
Steelheads	2,507½	3,544	2,044	2,366	1,561	2,481	1,952	3,231
Totals	129,027	193,435½	79,718	105,912½	221,471½	149,948½	133,589	152,418½

	1941	1940	1939	1938	1937	1936	1935	1934
Sockeyes	81,767	116,507	68,485	47,257	42,491	81,973	52,879	70,655
Springs	4,985	6,118	4,857	4,318	4,401	4,551½	4,039	8,300
Chums	10,707	4,682	7,773	16,758	10,811	15,297½	8,122	24,388
Pinks	50,537	47,301	95,236	69,610	59,400	91,389	81,868	126,163
Cohoes	50,605	20,614	29,198	52,821	15,514	25,390	23,498	54,456
Steelheads	1,896	133	55	42	21	33	14	114
Totals	200,497	195,355	205,604	190,806	132,638	218,634	170,420	284,096

STATEMENT SHOWING THE SALMON-PACK OF BRITISH COLUMBIA, BY DISTRICTS AND SPECIES—*Continued*

Rivers Inlet, 1934 to 1949, Inclusive

	1949	1948	1947	1946	1945	1944	1943	1942
Sockeyes	39,494½	37,665½	140,087	73,320	89,735	36,582½	47,602½	79,199
Springs	743	899½	475	1,108½	1,191½	805	765	985
Chums	11,819	11,486½	13,873	37,395½	16,793	2,705	11,448	15,874
Pinks	11,937	13,491	9,025	1,641½	9,916	5,289½	8,347	954
Cohoes	5,978	8,143	5,182	9,524½	17,516½	13,921	11,466	8,467
Steelheads	239	431½	293½	314	260	88	69	60
Totals	70,210½	72,117	168,935½	123,304	135,412	59,391	79,697½	105,539

	1941	1940	1939	1938	1937	1936	1935	1934
Sockeyes	93,378	63,469	54,143	87,942	84,832	46,351	135,038	76,923
Springs	1,692	1,226	745	1,209	917	581½	429	436
Chums	15,442	9,025	5,462	7,759	9,415	11,505	7,136	895
Pinks	4,807	3,329	12,095	9,063	7,536	6,432½	4,554	2,815
Cohoes	23,202	11,561	10,974	16,285	6,012	7,122½	8,375	4,852
Steelheads	129	55	83	105	70	19	39	79
Totals	138,650	88,665	83,502	122,363	108,782	72,011½	155,571	86,000

Smith Inlet, 1934 to 1949, Inclusive*

	1949	1948	1947	1946	1945	1944	1943	1942
Sockeyes	13,189	10,456½	36,800	14,318	15,014	3,165	15,010	15,939
Springs	159	186½	43	45	26	66	118	8
Cohoes	785	929½	348	177	560	343	541	1,813
Pinks	2,533	1,481½	1,054	235	2,362	498½	556	527
Chums	2,361	1,521½	7,910	8,369	3,692	2,122	5,693	5,490
Steelheads	56	99½	21	33	28	666	24	.....
Totals	19,083	14,675	46,172	23,177	21,682	6,194½	21,942	23,777

	1941	1940	1939	1938	1937	1936	1935	1934
Sockeyes	21,495	25,947	17,833	33,894	25,258	12,788	31,648	14,607
Springs	124	142	215	68	21	30	216	164
Cohoes	1,955	1,102	3,880	1,058	241	310	1,201	3,941
Pinks	749	755	3,978	1,761	483	65	4,412	6,953
Chums	7,741	6,015	2,771	8,076	9,494	1,653	12,427	15,548
Steelheads	45	37	50	64	5	42	24	43
Totals	32,109	33,998	28,727	44,921	35,502	14,888	49,928	41,256

* Previously reported in Queen Charlotte and other districts.

STATEMENT SHOWING THE SALMON-PACK OF BRITISH COLUMBIA, BY DISTRICTS AND SPECIES—*Continued*

Nass River, 1934 to 1949, Inclusive

	1949	1948	1947	1946	1945	1944	1943	1942
Sockeyes	9,268	13,181½	10,849	12,511	9,899	13,083	13,412½	21,085
Springs	174½	416	398	472	202	681½	1,002½	1,515
Chums	7,854	7,272½	8,925	13,810	4,981½	9,143	10,146½	12,518
Pinks	34,324	8,565	5,047	7,147	35,918½	31,854	17,669	49,003½
Cohoes	6,665	8,954½	4,075	4,239	3,895	6,102	9,768	15,487
Steelheads	51	149	156	134	84½	232½	335	534
Totals	58,336½	38,538½	29,450	38,313	54,980½	61,096	52,333½	100,142½

	1941	1940	1939	1938	1937	1936	1935	1934
Sockeyes	24,876	13,809	24,357	21,462	17,567	28,562½	12,712	28,701
Springs	519	1,716	708	773	1,251	2,167	560	654
Chums	6,246	5,461	2,500	15,911	10,080	20,620½	17,481	2,648
Pinks	22,667	29,278	26,370	61,477	8,031	75,887½	25,508	32,964
Cohoes	16,648	10,060	1,996	14,159	12,067	11,842	21,810	9,935
Steelheads	374	117	15	188	46	496	143	311
Totals	71,330	60,441	55,946	113,970	49,042	139,575½	78,214	75,213

Vancouver Island District and Adjacent Mainland, 1934 to 1949, Inclusive

	1949	1948	1947	1946	1945	1944	1943	1942
Sockeyes	19,486½	9,981½	14,543	35,381½	5,988	5,288½	7,185	51,961
Springs	6,361½	6,622	4,942½	2,283½	2,323	3,068½	2,937	5,407
Chums	51,629	147,227½	99,679½	190,313	136,724	56,029½	132,843	383,005
Pinks	361,783½	43,574½	355,992	6,809½	242,590½	49,092	130,825	14,474
Cohoes*	98,958½	109,939½	77,684½	29,983	104,528	79,813½	73,846½	81,837½
Steelheads	151½	227	99	151½	128	165	74	119
Totals	538,370½	317,572	552,940½	264,922	492,281½	193,459	347,710½	536,803½

	1941	1940	1939	1938	1937	1936	1935	1934
Sockeyes	40,273	15,177	16,259	27,965	25,427	32,696½	22,928	27,282
Springs	8,038	2,454	2,889	4,254	2,359	6,340	6,525	1,630
Chums	593,016	279,064	212,949	266,566	203,900	347,951	143,960	210,239
Pinks	177,292	33,785	235,119	70,108	318,780	82,028½	191,627	54,526
Cohoes*	166,908	88,885*	123,388	89,471	52,244	90,625	104,366	78,670
Steelheads	308	214	132	190	88	105	21	.....
Totals	985,835	419,579	590,736	458,554	608,798	559,746	469,427	372,347

Since 1940, bluebacks have been included with the cohoe-pack for Vancouver Island.

Queen Charlotte Islands, 1940 to 1949, Inclusive

	1949	1948	1947	1946	1945	1944	1943	1942	1941	1940
Sockeyes	.....	20	.....	.....	.....	157	53	1	149	16
Springs	.....	145	.....	.....	4	20	.....	38	236	62
Chums	24,852½	71,287	14,096	32,414	12,132	81,916	35,370	43,801	76,745	164,911
Pinks	1,550	51,722	1,200	8,024	4,809	90,993	313	83,329	524	44,966
Cohoes	8,141½	4,145	392	1,192	1,108	19,615	14,488	16,935	27,421	8,897
Steelheads	.....	.....	.....	5	.....	1	.....	41	11	.....
Totals	34,544	127,319	15,688	41,635	18,053	192,702	50,224	144,145	105,086	218,852

STATEMENT SHOWING THE SALMON-PACK OF BRITISH COLUMBIA, BY DISTRICTS AND SPECIES—*Continued*

CENTRAL AREA, 1940 TO 1949, INCLUSIVE

	1949	1948	1947	1946	1945	1944	1943	1942	1941	1940
Sockeyes	16,140½	23,246½	17,343½	12,611½	24,109	32,715	21,101	17,470	20,854	32,042
Springs	1,007	1,195½	514½	656	542	643	547	723½	460	1,518
Chums	116,292½	225,686	292,604½	221,958	138,992	80,793	109,101	79,152	111,587	135,802
Pinks	173,456	152,200½	101,241½	81,584½	364,385	162,986	288,109½	69,434	66,130	54,478
Cohoes	44,169	36,816	28,778	19,589	45,462½	25,823	26,645	31,274	45,218	49,886
Steelheads	355	850½	469	934	590	666	397	355	330	506
Totals	351,420	439,995	440,951	337,333	574,080½	303,626	445,900½	198,408½	244,579	274,232

STATEMENT SHOWING THE SOCKEYE-PACK OF BRITISH COLUMBIA, BY DISTRICTS, 1934 TO 1949, INCLUSIVE

	1949	1948	1947	1946	1945	1944	1943	1942
Fraser River	96,159½	64,823½	33,952½	341,957	79,977	88,515	31,973½	446,371
Skeena River	65,937	101,267½	32,534	52,928	104,279½	68,197	28,268½	34,544
Rivers Inlet	39,494½	37,665½	140,087	73,320	89,735	36,582½	47,602½	79,199
Smith Inlet	13,189	10,456½	36,800	14,318	15,014	3,165	15,010	15,939
Nass River	9,268	13,181½	10,849	12,511	9,899	13,083	13,412½	21,085
Vancouver Island and adjacent Mainland	19,486½	9,981½	14,543	35,381½	5,988	5,288½	7,185	51,961
Other districts	16,286½	23,266½	17,343½	12,611½	24,109	32,883	21,437	17,471
Packed out of cold-storage stocks	.....	588	388	.....	.....	.....	.....	.....
Totals	259,821	261,230½	286,497	543,027	329,001½	247,714	164,889	666,570

	1941	1940	1939	1938	1937	1936	1935	1934
Fraser River	171,290	99,009	54,296	186,794	100,272	183,120	62,822	139,238
Skeena River	81,767	116,507	68,485	47,257	42,491	81,973	52,879	70,655
Rivers Inlet	93,378	63,469	54,143	87,942	84,832	46,351	135,038	76,923
Smith Inlet	21,495	25,947	17,833	33,894	25,258	12,788	31,648	14,607
Nass River	24,876	13,809	24,357	21,462	17,567	28,562½	12,712	28,701
Vancouver Island and adjacent Mainland	40,273	15,177	16,259	27,965	25,427	34,430½	22,928	27,282
Other districts	22,219	32,484	34,514	36,357	29,989	27,584	32,417	20,438
Totals	455,298	366,402	269,887	441,671*	325,836	414,809†	350,444	377,844

* 5,779 cases of Alaska sockeye packed at Skeena River are not shown in the above table for the year 1938.
† 216 cases of Alaska sockeye packed in British Columbia canneries are not shown in the above table for the year 1936.

STATEMENT SHOWING THE SPRING-SALMON PACK OF BRITISH COLUMBIA, BY DISTRICTS, 1938 TO 1949, INCLUSIVE

	1949	1948	1947	1946	1945	1944
Fraser River	9,889	2,955½	1,455	1,096½	6,130½	12,577½
Queen Charlotte Islands	----------	145	----------	----------	4	20
Nass River	174½	416	398	472	202	681½
Skeena River	2,507½	4,018½	2,113	2,439	2,382	1,500½
Rivers Inlet	743	899½	475	1,108½	1,191½	805
Smith Inlet	159	186½	43	45	26	66
Central Area	1,007	1,195½	514½	656	542	643
Vancouver Island and adjacent Mainland	6,361½	6,622	4,942½	2,283½	2,323	3,068½
Alaska	342½	----------	----------	----------	----------	----------
Packed out of cold-storage stocks	----------	7	84	----------	----------	----------
Totals	21,184	16,445½	10,025	8,100½	12,801	19,362

	1943	1942	1941	1940	1939	1938
Fraser River	3,505½	9,688	34,038	4,504	5,993	4,308
Queen Charlotte Islands	----------	38	236	62	36	66
Nass River	1,002½	1,515	519	1,716	708	773
Skeena River	1,783	6,374	4,985	6,118	4,857	4,318
Rivers Inlet	765	985	1,692	1,226	745	1,209
Smith Inlet	118	8	124	142	215	68
Central Area	547	723½	460	1,518	655	540
Vancouver Island and adjacent Mainland	2,937	5,407	8,038	2,454	2,889	4,254
Alaska	----------	6	383	----------	----------	----------
Packed out of cold-storage stocks	----------	----------	1,118	----------	----------	----------
Totals	10,658	24,744½	51,593	17,740	16,098	15,536

STATEMENT SHOWING THE COHOE-SALMON PACK OF BRITISH COLUMBIA, BY DISTRICTS, 1938 TO 1949, INCLUSIVE

	1949	1948	1947	1946	1945	1944
Fraser River	10,286	16,102	6,105	9,168½	11,615	15,564½
Queen Charlotte Islands	8,141½	4,145	392	1,192	1,108	19,615
Nass River	6,665	8,954½	4,075	4,239	3,895	6,102
Skeena River	21,333½	22,086½	21,600½	26,281½	34,201½	20,191½
Rivers Inlet	5,978	8,143	5,182	9,524½	17,516½	13,921
Smith Inlet	785	929½	348	177	560	343
Central Area	44,169	36,816	28,778	19,589	45,462½	25,823
Vancouver Island and adjacent Mainland	98,958½	109,939½	77,684½	29,983	104,528	79,813½
Alaska	19,059½	----------	----------	----------	----------	173
Packed out of cold-storage stocks	568	14,688	2,128	----------	----------	----------
Totals	215,944	221,804	146,293	100,154½	218,886½	181,546½

	1943	1942	1941	1940	1939	1938
Fraser River	8,809	10,542	28,265	13,028	13,557	27,127
Queen Charlotte Islands	14,488	16,935	27,421	8,897	3,020	16,616
Nass River	9,768	15,487	16,648	10,060	1,996	14,159
Skeena River	40,479½	44,081½	50,605	20,614	29,198	52,821
Rivers Inlet	11,466	8,467	23,202	11,561	10,974	16,285
Smith Inlet	541	1,813	1,955	1,102	3,880	1,058
Central Area	26,645	31,274	45,218	49,886	44,426	56,716
Vancouver Island and adjacent Mainland	73,846½	81,837½	166,908	88,885	123,388	89,471
Alaska	----------	701	31,187	20,489	14,658	26,828
Packed out of cold-storage stocks	----------	----------	39,104	----------	----------	----------
Totals	186,043	211,138	430,513	224,522	245,097	301,081

STATEMENT SHOWING THE PINK-SALMON PACK OF BRITISH COLUMBIA BY DISTRICTS, 1938 TO 1949, INCLUSIVE

	1949	1948	1947	1946	1945	1944
Fraser River	66,626	31	113,136½	429	95,748½	130
Queen Charlotte Islands	1,550	51,722	1,200	8,024	4,809	90,993
Nass River	34,324	8,565	5,047	7,147	35,918½	31,854
Skeena River	33,069½	50,656	13,190½	10,737	69,783½	48,837
Rivers Inlet	11,937	13,491	9,025	1,641½	9,916	5,289½
Smith Inlet	2,533	1,481½	1,050	235	2,362	498½
Central Area	173,456	152,200½	101,241½	81,584½	364,385	162,986
Vancouver Island and adjacent Mainland	361,783½	43,574½	355,992	6,809½	242,590½	49,092
Alaska	24,708	----------	----------	----------	----------	12
Packed out of cold-storage stocks	----------	----------	905	----------	----------	----------
Totals	709,987	321,721½	600,787½	116,607½	825,513	389,692

	1943	1942	1941	1940	1939	1938
Fraser River	29,860½	134	102,388	12	95,176	63
Queen Charlotte Islands	313	83,329	524	44,966	2,123	57,952
Nass River	17,669	49,003½	22,667	29,278	26,370	61,477
Skeena River	54,509	52,767	50,537	47,301	95,236	69,610
Rivers Inlet	8,347	954	4,807	3,329	12,095	9,063
Smith Inlet	556	527	749	755	3,978	1,761
Central Area	288,109½	69,434	66,130	54,478	150,498	130,842
Vancouver Island and adjacent Mainland	130,825	14,474	177,292	33,785	235,119	70,108
Alaska	----------	----------	2,680	----------	----------	----------
Totals	530,189	270,622½	427,774	213,904	620,595	400,876

STATEMENT SHOWING THE CHUM-SALMON PACK OF BRITISH COLUMBIA BY DISTRICTS, 1938 TO 1949, INCLUSIVE

	1949	1948	1947	1946	1945	1944
Fraser River	6,763	20,209	16,475½	60,713	27,610	13,803½
Queen Charlotte Islands	24,852½	71,287	14,096	32,414	12,132	81,916
Nass River	7,854	7,272½	8,925	13,810	4,981½	9,143
Skeena River	4,896	11,863	8,236	11,161	9,264	8,741½
Rivers Inlet	11,819	11,486½	13,873	37,395½	16,793	2,705
Smith Inlet	2,361	1,521½	7,910	8,369	3,692	2,122
Central Area	116,292½	225,686	292,604½	221,958	138,992	80,793
Vancouver Island and adjacent Mainland	51,629	147,227½	99,679½	190,313	136,724	56,029½
Alaska	1,255½	----------	----------	----------	----------	63
Packed out of cold-storage stocks	2,834	14,851	24,816	----------	----------	----------
Totals	230,556½	511,404	486,615½	576,133½	350,188½	255,316½

	1943	1942	1941	1940	1939	1938
Fraser River	52,149	82,573	95,070	35,665	30,150	58,778
Queen Charlotte Islands	35,370	43,801	76,745	164,911	45,519	40,882
Nass River	10,146½	12,518	6,246	5,461	2,500	15,911
Skeena River	6,597	11,421	10,707	4,682	7,773	16,758
Rivers Inlet	11,448	15,874	15,442	9,025	5,462	7,759
Smith Inlet	5,693	5,490	7,741	6,015	2,771	8,076
Central Area	109,101	79,152	111,587	135,802	79,384	127,089
Vancouver Island and adjacent Mainland	132,843	383,005	593,016	279,064	212,949	266,566
Alaska	----------	----------	3,908	2,816	82	----------
Packed out of cold-storage stocks	----------	----------	6,339	----------	----------	----------
Totals	363,347½	633,834	926,801	643,441	386,590	541,819

STATEMENT SHOWING THE QUANTITY OF PILCHARD PRODUCTS PRODUCED IN BRITISH COLUMBIA, 1930 TO 1949

Season	Canned	Meal	Oil
	Cases	Tons	Gals.
1930–31	55,166	13,934	3,204,058
1931–32	17,336	14,200	2,551,914
1932–33	4,622	8,842	1,315,864
1933–34	2,946	1,108	275,879
1934–35	35,437	7,628	1,635,123
1935–36	27,184	8,666	1,634,592
1936–37	35,007	8,715	1,217,087
1937–38	40,975	8,483	1,707,276
1938–39	69,473	8,891	2,195,850
1939–40	7,300	906	178,305
1940–41	59,166	4,853	890,296
1941–42	72,498	11,437	1,916,191
1942–43	42,008	11,003	1,560,269
1943–44	94,512	15,209	2,238,987
1944–45	78,772	8,435	1,675,090
1945–46	79,536	5,812	1,273,329
1946–47	4,359	699	81,831
1947–48	2,656	67	12,833
1948–49	.....	.....	.....
1949–50	.....	.....	.....

STATEMENT SHOWING THE QUANTITY OF HERRING PRODUCTS PRODUCED IN BRITISH COLUMBIA, 1935 TO 1949

Season	Canned	Dry-salted	Pickled	Meal	Oil
	Cases	Tons	Tons	Tons	Gals.
1935–36	26,143	14,983	.....	5,313	328,639
1936–37	20,914	16,454	.....	10,340	786,742
1937–38	27,365	10,230	.....	14,643	1,333,245
1938–39	23,353	7,600	.....	18,028	1,526,117
1939–40	418,021	7,596	.....	22,870	1,677,736
1940–41	640,252	5,039	892	10,886	923,137
1941–42	1,527,350	.....	779	8,780	594,684
1942–43	1,253,978	.....	502	4,633	323,379
1943–44	1,198,632	.....	591	7,662	512,516
1944–45	1,190,762	.....	26	9,539	717,655
1945–46	1,307,514	302	100	5,525	521,649
1946–47	1,634,286	5,807	129½	7,223	484,937
1947–48	1,283,670	3,084*	1	18,948	1,526,826
1948–49	92,719	412	.....	31,340	2,614,925
1949–50	77,913	3,858	.....	30,081	3,823,464

* Previously reported as 2,988 tons.
The above figures are for the season October to March 31st, annually.

STATEMENT SHOWING THE QUANTITY OF MEAL, OIL, AND FERTILIZER PRODUCED FROM SOURCES OTHER THAN HERRING AND PILCHARD, 1935 TO 1949.

Season	From Whales			From Fish-livers	From Other Sources	
	Whalebone and Meal	Fertilizer	Oil	Oil	Meal and Fertilizer	Oil
	Tons	Tons	Gals.	Gals.	Tons	Gals.
1935–36	211	354	426,772	.....	2,226	260,387
1936–37	332	687	763,740	.....	2,857	356,464
1937–38	268	527	662,355	.....	2,445	266,009
1938–39	273	512	543,378	.....	2,059	186,261
1939–40	.....	.....	.....	.....	3,559	331,725
1940–41	181	434	361,820	.....	4,998	415,856
1941–42	270	561	619,025	.....	5,410	405,340
1942–43	130	205	255,555	916,723	4,768	338,502
1943–44	62	90	134,553	822,250	4,332	60,000
1944–45	.....	.....	.....	545,736	2,721	301,048
1945–46	.....	.....	.....	445,858	4,560	513,442
1946–47	.....	.....	.....	211,914	4,208	453,008
1947–48	.....	.....	.....	11,109,063*	3,929	519,802
1948–49	119	324	186,424	10,121,374*	1,172	141,098
1949–50	921	21	312,055	12,079,015*	1,635	175,202

* Fish-liver oil, formerly reported in gallons, is now reported in million U.S.P. units Vitamin A.

CATCH OF FISH TAKEN FROM NON-TIDAL WATERS, 1949–50 SEASON

Lakes and Rivers	Kind of Licence			Trout		Kokanee		Lake-trout		Whitefish		Carp		Ling		Squawfish		Suckers		Other Fish		No. of Fish Taken	Approximate Weight (Lb.)
	Fur-farm	Ordinary	Sturgeon	No.	Lb.	No.	Lb.	No.	Lb.	No.	Lb.	No.	Lb.	No.	Lb.	No.	Lb.	No.	Lb.	No.	Lb.		
Arrow Lakes	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Bowron Lake	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Bennett Lake	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Bednesti Lake	1	—	—	5	5	—	—	—	—	79	161	—	—	72	290	350	350	831	1,744	90	180	1,427	2,730
Burns Lake	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Cluculz Lake	2	1	—	12	12	—	—	3	41	2,942	3,292	—	—	322	1,378	6,312	3,407	3,528	8,958	2,585	1,315	15,704	18,403
Cobb Lake	1	—	—	5	5	—	—	—	—	79	161	—	—	72	290	350	350	831	1,744	90	180	1,427	2,730
Chief Lake	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Cameron Lake	—	2	—	—	—	—	—	10	100	100	3,000	—	—	—	—	—	—	—	—	—	—	110	3,100
Christina Lake	—	17	—	—	—	20,084	7,810	—	—	6	7	8	127	17	103	20	50	36	137	—	—	20,171	8,234
Eaglet Lake	2	—	—	—	—	191	70	—	—	—	—	—	—	97	195	525	511	817	951	320	116	1,950	1,843
Eulatazella Lake	1	—	—	5	7	—	—	4	55	2,774	2,949	—	—	176	797	5,612	2,703	1,865	5,470	2,225	1,135	12,661	13,116
Francois Lake	1	4	—	—	—	191	70	70	563	37	204	—	—	110	286	345	191	307	141	—	—	1,060	1,455
Fraser River	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Hogsback Lake	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Jack of Clubs Lake	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Jack Fish Lake	—	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	25	6	25
Klua Lake	—	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	25	6	25
Moberly Lake	—	2	—	—	—	—	—	95	850	1,460	4,780	—	—	—	—	—	—	—	—	—	—	1,555	5,630
Naltesby Lake	1	—	—	—	—	—	—	—	—	214	308	—	—	2	18	1,853	1,837	840	883	*1,470	750	4,379	3,796
Nechako River	—	—	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	†1	95	1	95
Ootsa Lake	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Okanagan Lake	—	268	—	—	—	34,279	12,429	3	16	—	—	—	—	1	8	—	—	20	20	1	11	34,304	12,484
Pouce Coupe River	1	—	—	2	4	—	—	—	—	1	3	1	2	—	—	—	—	29	50	35	67	68	126
Swan Lake	2	2	—	2	3	—	—	—	—	1	3	—	—	—	—	—	—	29	50	34	66	66	122
Sinclair Lake	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Stuart Lake	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	325	600	550	1,050	—	—	875	1,650
Sinkut Lake	1	—	—	—	—	—	—	—	—	—	—	2,379	762	—	—	876	472	—	—	—	—	3,255	1,234
Slocan Lake	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Totals	—	—	—	31	36	54,745	20,379	185	1,625	7,693	14,868	2,388	891	869	3,365	16,568	10,471	9,683	21,198	6,863	3,965	99,025	76,798

* Includes 480 grayling reported caught, approximately 240 pounds. † Sturgeon.

Licences Issued during the 1949–50 Season

Fur-farm	14
Ordinary	301
Sturgeon	4
Total	319

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